

Collaboration to Clarify the Cost of Curation



The Digital Curation Sustainability Model (DCSM)

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The Digital Curation Sustainability Model



Introduction

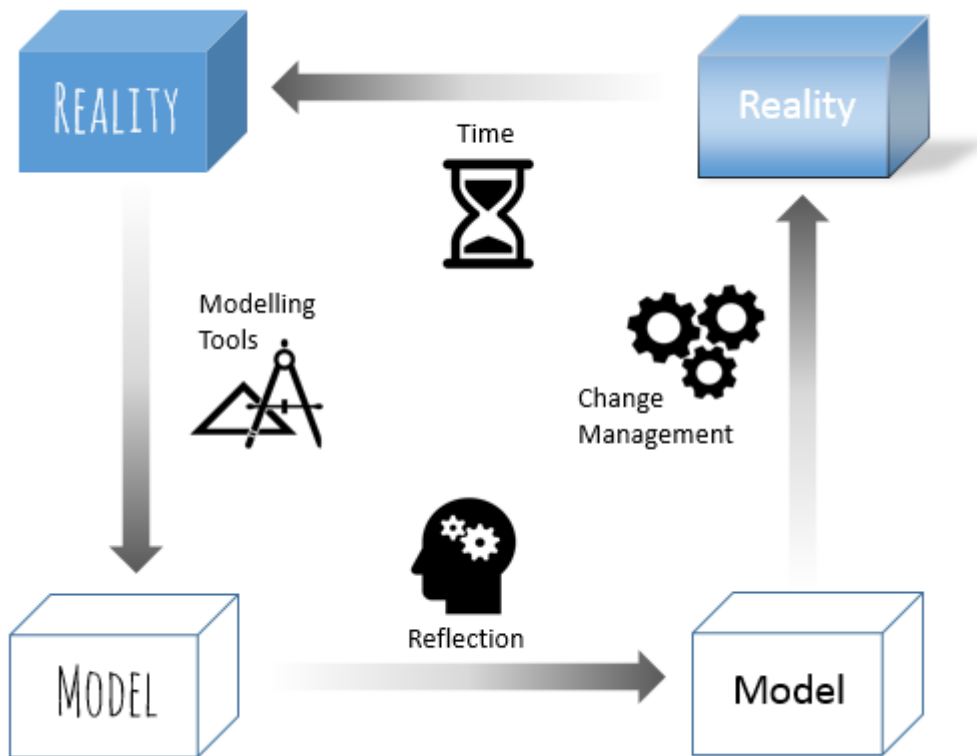
The purpose of the Digital Curation Sustainability Model (DCSM) is to highlight the key concepts, relationships and decision points for planning how to sustain digital assets into the future. The core assumption is that *digital curation* is the principal active means to achieve this and that understanding and successfully negotiating the case for sufficient resources to support digital curation is key. The DCSM builds on existing definitions and common understandings, not least the idea that:

Digital curation and data preservation are ongoing processes, requiring considerable thought and the investment of adequate time and resources¹

The point of any model is to provide a more readily understandable view of something more complex so that its overall 'shape' and general contours can be communicated and used for appropriate purposes at an appropriate level of detail. The DCSM can be understood in these terms and offers a generic template and a series of components to support discussions, analysis and planning for designing a sustainability strategy. The objective is to provide a set of reference points and concepts against which organisations or individuals can evaluate and compare their activities. Ultimately, the purpose of a model is to allow its users to reflect on and (if necessary) consider changes to the reality that it describes. The challenge for the model is to usefully simplify without being overly simplistic.

DCSM

¹ Digital Curation Centre: <http://www.dcc.ac.uk/digital-curation/what-digital-curation#sthash.aPdonyzo.dpuf>
For other key definitions, including 'digital curation' and 'sustainability' refer to DCSM Appendix 1.



DCSM Figure 1—Using models to consider and design changes to actual practice²

DCSM Figure 1 sets out a scenario where the current reality (such as a workflow, a process, a transaction) is represented by the top left hand side object. Key aspects of this reality are then modelled (using tools and methodologies as appropriate) to facilitate a shared understanding. Reflection on the model may involve analysis and discussion and various formal processes. The objective is to make appropriate and constructive amendments to the model that can then be translated back into the real-life environment through a process of change and change management. This will be a cyclical process as the ‘new reality’ will—at some point in the future—need to be reassessed and updated.

The nature of the ‘reality’ that the DCSM attempts to simplify is the collection of factors that must be considered by those responsible for ensuring that digital assets (and the digital curation capability that realises the value of those assets) are sustainable over time. These factors are often complex and interdependent. It addresses the key things that organisations will need to understand for effective planning and also acknowledges that all sustainability planning is subject to uncertainty.

Who is the Model for?

Understanding whether and how resources can be made available and having a clear view of incentives or motivations to continue to practice digital curation is by definition *strategic* work. It is different to the work of practitioners who must have a detailed understanding of the tools, methods and standards that are applicable to the *task* of curating digital assets. The DCSM should therefore be understood as providing a perspective onto digital curation either for the non-specialist who wishes to be able to engage

² See acknowledgements for attributions of images - <http://thenounproject.com/>

in a more informed way about the topic; or the practitioner who wishes to engage non-specialists in a dialogue about digital curation and the role it must play in sustaining digital assets.



DCSM Figure 2—Job roles and their perspectives on digital curation

DCSM Figure 2 sets out a simple generic categorisation of the different types of stakeholders that have an interest in digital assets and their perspective on what should be done to sustain them and for what purpose.

Practitioners (and their line managers) concentrate on practical issues to do with: the ongoing handling and management of digital assets; the tools and processes required; the management of staff; their capacity; the deployment of skills; and the resources required.

Strategists in senior management roles and sponsors of activity are less unlikely to have (or need) a detailed knowledge of digital curation practice. The assumption is that they need to understand the overall cost of curation and will want to identify the benefits and the value that can be realised from the investments that have been made to create, acquire and sustain the assets and make them available and useable. Their perspective on digital curation may be that it is a method of mitigating risk to the assets but it might also acknowledge that curation can add value over time. Whatever their understanding, it would be unusual for them to concern themselves with curation processes in any detail and they may regard the process as a ‘black box’—a system whereby there is an input (investment); an opaque process (curation); and an output (viable and usable digital assets).

As the purpose of the DCSM is mainly to facilitate discussions about digital curation and sustaining digital assets in non-technical language, it is the strategists (Senior Managers; Funders & Investors) that should ultimately benefit most from direct engagement with the DCSM (see DCSM Figure 3). The non-technical nature of the model may have less to offer the practitioner.



The model will be useful in different ways to organisations at different levels of maturity. Those with well-established existing policies and strategies and a wealth of experience of designing, implementing and/or contracting digital curation services may find the model useful to help validate and check their existing digital curation arrangements. Or it might be useful when planning significant change, developing new services or adopting new partnerships. Organisations at a lower level of maturity may use the model for more fundamental service-wide sustainability planning.

Why Use the Model?

The purpose of the DCSM is to provide a framework for discussion. This allows component parts of a complex set of issues around digital curation and sustainability to be identified and considered methodically. The discussion might be internal; one that is conducted between organisations; or one that is facilitated by an external actor who is using the model as a consultancy tool. The model facilitates three related strategic objectives.

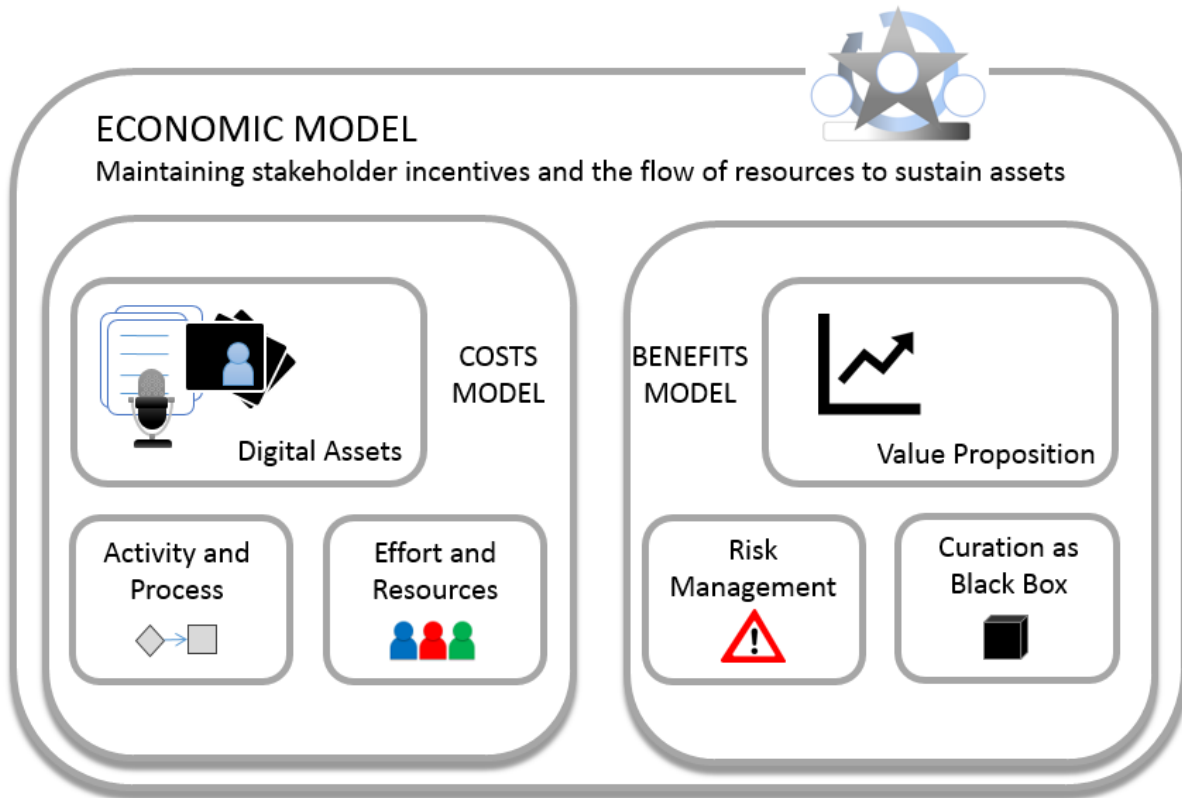
To align understanding

Fostering discussion around the component parts of the model will help different stakeholders within an organisation (or across organisations) align their understanding in relation to the model. Some areas will be harder to get alignment on than others. For instance, knowing whether an organisation has a written policy that guides its digital curation activity is a relatively simple question to answer. However, getting alignment about the importance and value of specific digital assets to an organisation may be much more difficult.

To prepare for business modelling

Aligning understanding provides a firm, common foundation for business modelling. Having a robust understanding of: the organisational context; the incentives for digital curation activities; who the beneficiaries are; and where the investment may come from in future, usefully start to set out the whole topic in ways that aligns with an economic view of digital curation.

Borrowing from the language of economics, if the provision of digital curation capability in an organisation can be characterised as a 'service', then there must be supply-side and demand-side perspectives. The continuation (sustainability) of that service, will rely on an ongoing analysis of its costs in relation to the benefits that it is capable of realising.



DCSM Figure 3—The position of the DCSM within a nested model view

DCSM Figure 3 emphasises that an interest in *economic modelling* will necessarily encompass both costs and benefits modelling. It also broadens the view out to consider all the stakeholders that are variously interested in sustaining assets and where and how the resources to support that activity are likely to be found. It is at this (economic modelling) level that the DCSM most appropriately fits. It is not an economic model in itself as it doesn't methodically and exclusively tackle economic questions in ways that would provide theories and plans for future economic-related actions. However, it does address strategic concepts that will underpin economic planning and provide input for the more applied activity of business planning, which would involve the creation of business cases and the definition of business models.³

To design a sustainability strategy

An objective analysis of business strategy within an organisation will probably involve consideration of how digital assets are managed and exploited, but may not focus on what role digital curation must play. It may, for example, centre on concepts of competition, marketing, customer relations, and so on. One of the purposes of the DCSM is to actively bring to the front discussion of digital curation and to underline reasons why it should feature more prominently in strategy and planning. It emphasises that digital curation is best designed as an ongoing series of activities.

*Digital curation involves maintaining, preserving and adding value to [...] data throughout its lifecycle.*⁴

³ For more information and guidance on these activities, see the 4C project report on Digital Curation Business Modelling – www.4Cproject.eu

⁴ See more at: <http://www.dcc.ac.uk/digital-curation/what-digital-curation#sthash.hOwv42Bx.dpuf>



If curation is the generic engine that preserves and adds value to digital assets—and it is currently uncertain for what period those assets must be curated—the problem becomes one of successfully defining and making the case for sustaining the required investment in digital curation.

How to use the Model?

The model builds on a number of carefully selected concepts that have been subject to detailed scrutiny. The DCSM relies on a structure that derives from the conclusions of the Blue Ribbon Task Force for Sustainable Digital Preservation and Access (BRTF), an influential initiative that analysed digital preservation from an economic perspective.⁵ The BRTF and the subsequent work to develop an Economic Sustainability Reference Model (ESRM)⁶ involved extensive analysis and consultation so there is an expectation that the high-level structure of the DCSM (which inherits the ESRM structure) should be widely applicable. However, the sustainability of digital assets is a large and complex topic so it may not always be possible to simply align the model with local variations of practice and strategy. The recommendation is, therefore, that users regard the model as a jumping off point for discussion rather than a rigid framework.

To facilitate a practical response to the model and to make explicit the implicit questions that the model poses, examples of questions that users might formulate for themselves are included at the end of each section. All the example questions are collated together in DCSM Appendix 2 for convenience. DCSM Appendix 3 sets out some examples of templates that could be used to devise a more structured self-assessment questionnaire. These proposed approaches to applying the model are, again, suggestions rather than instructions. A single generic questionnaire that usefully and accurately represents practice and terminology across many different sectors (such as industry, memory institutions, education, government, commerce, and so on) is unrealistic. The most creative (and productive) way of using the model may be to design a local variant of the self-assessment questionnaire.

The DCSM is designed to be a standalone independent resource that helps organisations to think through issues to do with sustaining digital assets. However, as part of the EC-funded 4C Project work⁷, it also has links with other resources developed by that project and can be used in conjunction with them⁸.

In practical terms, using the model might involve the following steps:

1. Look at the model components and check whether they usefully identify and summarise sustainability issues for your organisation.
2. Work collaboratively with colleagues through the component parts of the model and the sample questions and then design a customised self-assessment questionnaire.
3. Initiate a discussion and get input from all relevant stakeholders (including external partner organisations if applicable) to complete the questionnaire.

⁵ BRTF (2010), *Sustainable Economics for a Digital Planet: Ensuring Long-Term Access to Digital Information*, http://brtf.sdsc.edu/biblio/BRTF_Final_Report.pdf

⁶ For a discussion of the provenance of the DCSM, see the *Acknowledgements* section

⁷ 4C Project (A Collaboration to Clarify the Costs of Curation) www.4Cproject.eu

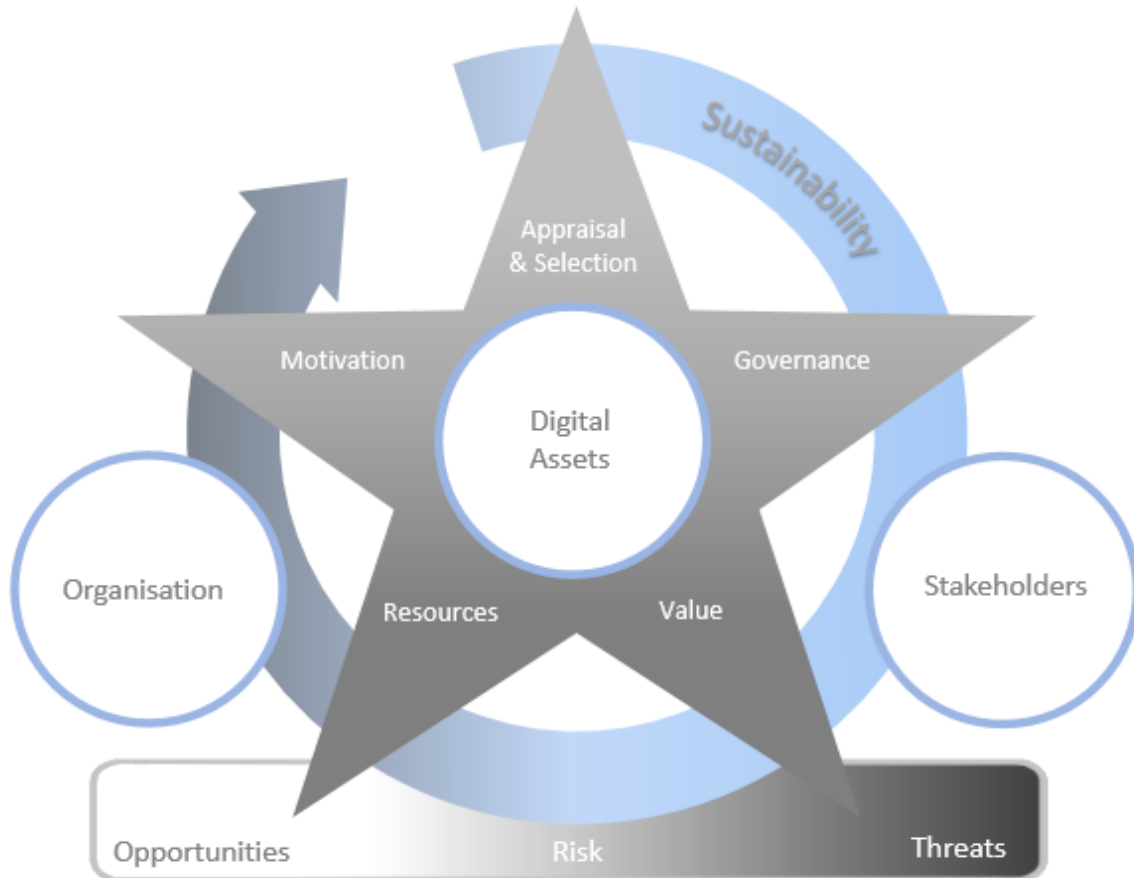
⁸ See the 'Understanding Your Costs' section at www.curationexchange.org



A final step which is not practically supported by the model but which could feasibly be an outcome based on the discussions and their conclusions:

4. Use the conclusions and the any proposed actions as the basis of a sustainability report and/or an action planning document.

The Digital Curation Sustainability Model



DCSM Figure 4—The Digital Curation Sustainability Model

The Structure of the Digital Curation Sustainability Model

The DCSM consists of four sections and when used in combination as starting points for discussion, the outcome should enable the creation of a sustainability strategy. The four areas are set out and explained in more detail below and in the following sections.

<p>Sustainability Context which describes three key areas (Digital Assets; Organisation and Stakeholders). Here it is important that there is a clear understanding and alignment of knowledge and purpose wherever curation is undertaken.</p>	
<p>Investment Lifecycle which encapsulates the core focus of the DCSM on digital curation and makes explicit the need for periodic investment to maintain or increase the value of the digital assets in question</p>	
<p>Sustainability Variables which set out five issues that must be tackled and actions that should be taken to ensure that digital assets are likely to remain well-managed and accessible over time.</p>	
<p>Uncertainties (Risk Management) which acknowledge that no sustainability strategy can anticipate every issue that may arise, either as a threat or an opportunity. Both these types of risks (negative and positive) can be partly mitigated by contingency planning and having risk management strategies in place.</p>	

DCSM Table 1—The DCSM Structure

The Sustainability Context

The environment surrounding any digital curation activity is complex, involving a host of factors interacting to shape the circumstances in which a particular activity must operate. Understanding this context and its implications for sustaining assets can be challenging. It is possible, however, to define three components that are present in all digital curation contexts. A thorough understanding of these components and their properties is a necessary step toward building a successful sustainability strategy.

If there is an insufficient understanding of Digital Assets, Organisation and Stakeholders, it is unlikely that informed investment decisions and realistic planning will be undertaken.



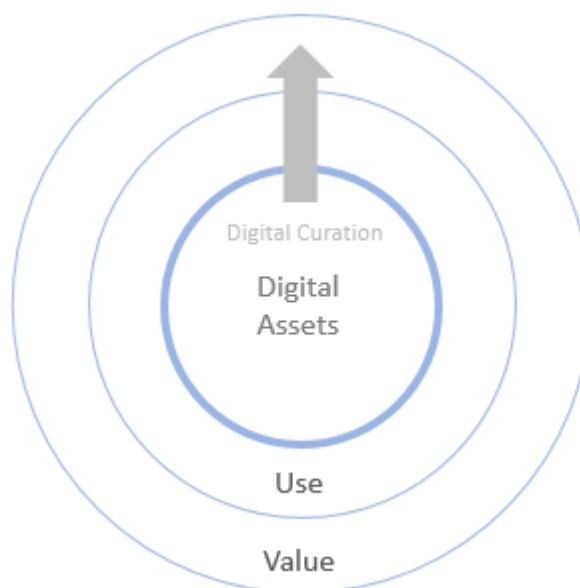
DCSM Figure 5—The Sustainability Context

It is important that context-specific constraints are not ignored as part of sustainability planning, particularly in organisations where digital curation is not the first order of business. There may be challenges or unusual complexities around the nature of the organisation, the assets in question, or some aspect of the stakeholder relationships that affect the actions that can be taken to deliver sustainability. Consideration of the Sustainability Context comes first so that constraints are understood before any unrealistic ideas or interventions are discussed and proposed.

Digital Assets

The model is centrally focused on the concept of the digital asset, which may be a digital object, a record, a dataset, a collection, an archive, a set of web resources, a programme, a computational environment, metadata, system configuration parameters: in fact any digital entity (or set of entities) that potentially may be of value. This concept sits at the heart of the model and there is an assumption that the assets can be designated as having value because either:

- they are used (actual use)
- they retain the potential for being used (potential use)



DCSM Figure 6—Assets at the core of the DCSM and curation realising value through the concept of use



The concept of ‘value’ is so intrinsic to the purpose of sustaining assets that there are few parts of the model where it does not have some relevance. It is also represented in its own right as a *Sustainability Variable* and is dealt with in that section as one of the factors that actors can influence by amending their strategic or tactical approach. The very fact that a digital object is categorised as an ‘asset’ means that it is understood to have value. An object that is not perceived to have value but is demanding of resources is a ‘liability’.

The mechanism that allows the assets to remain actually or potentially useful is digital curation and it is the investment in curation (see *Investment Lifecycle* below) that safeguards the value of the assets over time. The grey arrow in DCSM Figure 6 signifies that digital curation is the active and transforming process that will require effort and resources (investment) to support the mechanism.

Aside from the question of value, assets have attributes or properties that will affect curation strategies, processes and investment decisions. Each class of digital asset exhibits a variety of features that to a greater or lesser extent impact the nature of the curation activity itself. These might be of a technical nature or to do with the required behaviour, appearance or performance of an object. For example the techniques and workflows needed to curate a collection of research data sets will be different from those needed to curate a collection of executable software.

The curation service that has responsibility for assets that are in mixed, complex and/or obscure formats will almost certainly need more resource than a service that is dealing with a similar quantity of ‘simple’ digital objects. Similarly, added resource will be required for a service that is obliged to curate the quality or the detail of the content to a high degree of specificity. As content needs to be migrated across platforms and digital objects need to be interpreted in new computing environments, it is likely that compromises will need to be reached and expectations managed about how effectively certain assets continue to function or what they look or sound like.

Another attribute of digital assets that may have an effect on curation activity is the rights associated with them. This may effect who has access to the objects and what they are allowed to do with them (such as take copies for the purpose of preservation and/or make access copies). There may also be restrictions on timescales that are written into licensing and copyright agreements. Prospects for the sustainability of assets will be improved where the ownership of the assets is clearly and broadly understood.

Along with complexity and accessibility issues, the other issue that will determine the scale of the curation challenge is the number and size of the assets. Very numerous small files may pose certain problems and modest numbers of very large files may pose others.

The following questions are offered as example discussion-starters for this section.

Example questions for Sustainability Context (Digital Assets)

- Can you specify particular digital assets that may be especially challenging to sustain over time?
- Is the amount of digital curation activity that is required readily quantifiable?
- Do the assets have technical attributes that make them difficult to manage?
- Do the assets have any other properties that complicate their management?
- Is it possible to batch format assets when processing them?
- Is the ownership of the assets clearly defined?
- Can digital curators get effective access to the assets?
- If others are looking after copies of the assets, is an adequate agreement in place that assures or insures the safety of the assets?

Organisation

Organisation is a key pillar of the DCSM conceptual framework. It questions to what extent digital curation is embedded into the mission and the objectives of the organisation and to what degree it sees itself as supplying and/or needing digital curation services. Related to this, it poses questions about the structure and the processes that are currently in place within an organisation and where the curation function happens. Whether it is in-house or outsourced it is useful to know if those who are interested in the actual or potential additional value that curation can impart to assets feel they have sufficient influence over processes. It is also useful to know whether they are confident that those processes are optimised to deliver as much value as possible.

More broadly, this section addresses the knowledge, experience and beliefs of the organisation and asks whether there is sufficient understanding of the purpose and the benefit of curating digital assets. A significant number of organisations have not yet understood that digital assets are a business issue and not solely an IT problem. Digital curation requires technical, tactical, strategic and content domain-knowledge input and this (depending on the scale of the operation) may require buy-in from various different parts of the organisation. It is possible that reporting hierarchies, the designation of staff roles, departmental budget allocations, and other issues that may be labelled ‘structural’ could be a barrier to sustainability within an organisation.

The term ‘organisation’ should be very broadly interpreted. The strategic entity responsible for sustaining assets may not formally regard itself as an ‘organisation’. For example, a community initiative may have a devolved sense of responsibility for a designated set of digital resources; or it is feasible that someone is acting unilaterally, either because they are not part of an organisation or because their organisation does not (yet) recognise the concerns that the DCSM addresses.

Example questions for Sustainability Context (Organisation)

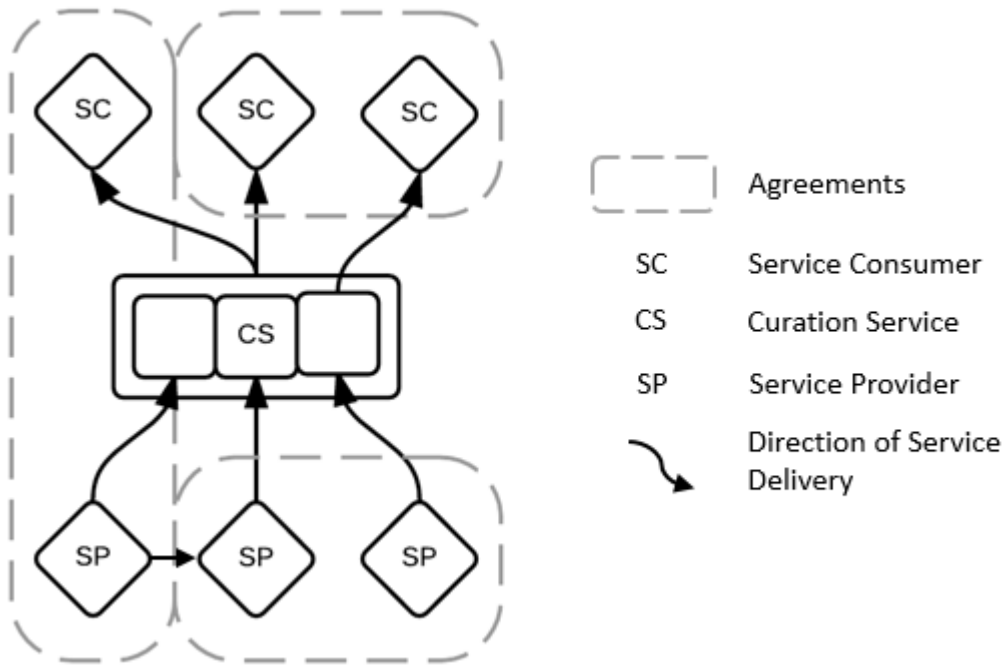
- Are the mission and objectives of the organisation set out clearly?
- Are the mission and objectives understood by those responsible for sustaining the digital assets?
- Is the organisation reliant on sustaining digital assets to achieve its business objectives?
- Is it understood that digital curation is a business function rather than an IT problem?
- Does the organisation have any structural issues that hinder the effectiveness of digital curation?

Stakeholders

The network of stakeholders surrounding a particular organisation can be complex and difficult to characterize. Moreover, these stakeholders can represent a wide range of viewpoints relating to the value of the assets in question. The identification of these stakeholders and—in particular—the distribution of curation roles across them, heavily impacts the prospect for achieving sustainability. In addition the nature of the sustainability strategy best suited for those circumstances will be significantly affected by the stakeholders.

One approach to simplifying the stakeholder environment is to designate all curation activity as providing a *curation service* and to then consider the supply and demand sides for that service. Whilst this might immediately suggest large scale activity where the service consumer was distinct and more or less independent of the service provider, a very broad definition of the concept would include very small operations and even individuals. In essence, any entity that is undertaking curation should always be doing so for a purpose and that purpose should always be specified. The closeness or overlap between

those who write the specification and those who act upon it does not disrupt the fundamental concept of the supply and demand relationship.



DCSM Figure 7—A hypothetical example of a curation service relationship map

In reality, supply and demand entities are often not discrete and service delivery paths can be convoluted. DCSM Figure 7 sets out some potential service relationships that involve various forms of collaborative activity, agreements between suppliers, service component dependencies and a consumer consortium.

Whatever the complexities of certain types of service provision, however, it is of primary importance to identify who currently has the job of curating the assets and on whose behalf they are doing it. From that starting point, a stakeholder map should be drawn up to plot who will have an ongoing interest in sustaining the assets and who has influence in ensuring that this happens (in other words, the resource providers). In fact, setting out all of the stakeholder roles and at what point they are likely to benefit from being part of the curation process could help clarify a sustainability strategy⁹. Some of these roles will be current beneficiaries and some will be future beneficiaries; they may be classifiable in more than one category; and one individual or entity may assume several different roles. Examples might include:

- Data creator
 - Scientist
 - Software developer
 - Artist
- Rights holder
 - Data creator
 - Commercial company
 - Agency
- Curation service provider
 - Archival service

⁹ In the terminology of the Open Archival Information Systems Reference Model (OAIS—ISO 14721) this would be the ‘designated community’



- Memory institution
- Data centre
- Aggregator service
- Commercial company
- Research Assistant

- Curation service consumer
 - Data creator
 - Scientist
 - Researcher
 - Artist
 - Broadcaster
 - Agency
 - Software developer

- Resource provider
 - Research funder
 - Commercial company
 - Memory institution

Some organisations (particularly large publicly-funded memory institutions) have a longstanding mandate to curate assets and it may not be possible to name a specific entity or group they're doing it for. However, if the mandate of the organisation is sound and it has the trust of those who support it, then that mandate stands in for the demand-side of the transaction.

The principal difficulty in trying to understand the stakeholder environment for sustaining digital assets is estimating what value will be realised for which beneficiaries over what timescales. The concept of *value* is examined in more detail as a sustainability variable.

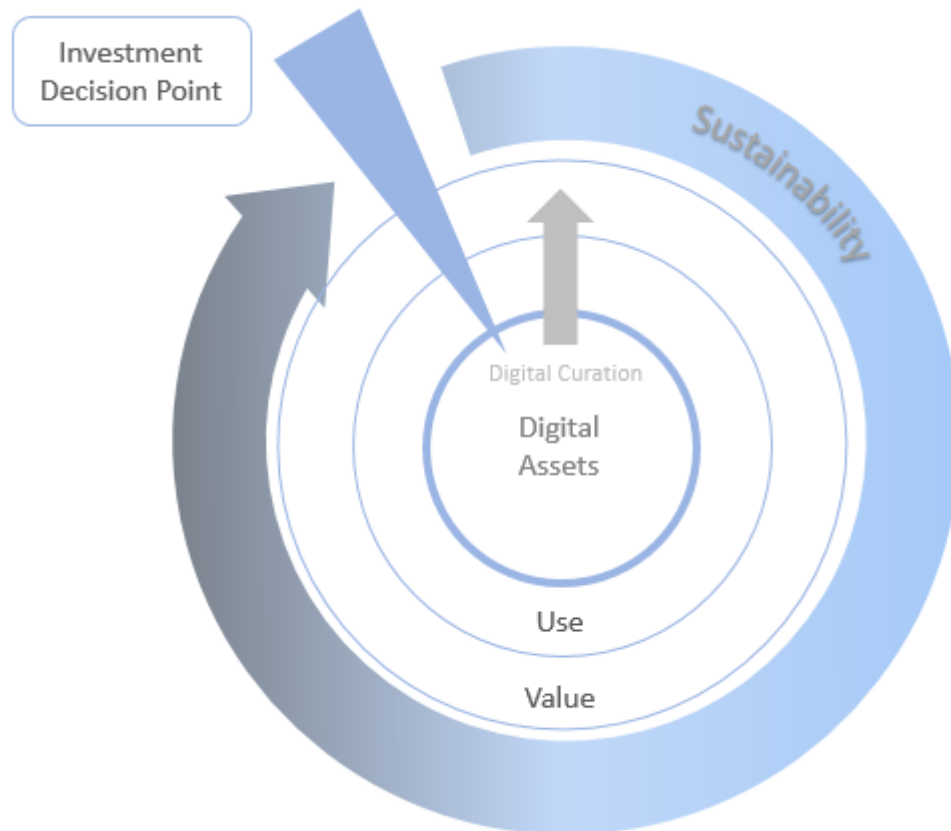
Example questions for Sustainability Context (Stakeholders)

- Is responsibility for providing the curation service clear?
- Is it clear who the curation service consumers are?
- Has a stakeholder map been drawn up?
- Is it clear who has responsibility for the digital assets?
- Is the authority to grant access to the curated digital assets clearly established?
- Is anyone getting free use of the digital assets that should be paying for their curation?

The Investment Lifecycle

The DCSM asserts that the mechanism that realises the value of assets over time (through actual or potential use) is digital curation and it relies on established definitions of the term and the extensive literature on the topic to support that view¹⁰. The concept of value being realised as a product of digital curation is the foundation for understanding what drives the lifecycle of the asset and how the case for sustaining it can be made.

¹⁰ DCC definition (see above) and the 4C Stakeholder Study - <http://www.4cproject.eu/d2-1-stakeholders>



DCSM Figure 8—The Investment Lifecycle, Sustainability Gap and Investment Decision Point

DCSM Figure 8 introduces the concept of sustainability into the model and represents it as an incomplete circle. In practice, the lifecycle of a digital object may play out in a more linear fashion, with assets being created, curated and then deleted according to a retention schedule. In the context of a sustainability discussion, the process is more likely to be a cycle and will, at some stage, require a decision to be made about the nature of the ongoing investment that will be required to sustain the asset—hence the gap in the circle. This ‘trigger event’ may not necessarily be a financial issue (it might be a technical or business problem or something else) but for the purposes of the lifecycle, it will have the effect of being a ‘decision point’. The model assumes that even if the ongoing value of the assets is apparent to all stakeholders and the flow of resources is from a highly dependable source, there will always be scope for unexpected events to occur.

Given the wide range of possible triggers the subsequent action could involve maintaining, increasing, decreasing or withdrawing investment. It may result either in sufficient investment being agreed to plug the ‘sustainability gap’; or could result in a decision being taken that the current and/or prospective future value of the assets no longer justifies curating and sustaining them. Normally speaking, there should be opportunities to anticipate and manage the decision to varying degrees, for example by making sure that evidence of benefit and impact are available to decision-makers, or that stakeholder views are sought. This involves effort and resources should be set aside to actively manage investment decision points through outreach, marketing, promotion, lobbying, advocacy and so on.

Example questions for the Investment Lifecycle

- Can the next investment decision point be identified?
- Is it apparent that digital curation is adding value to the digital assets?
- What information may be required to inform the next investment decision?

- Are resources available to actively manage the investment decision point?

Sustainability Variables

The third element of the model sets out areas where there may be considerable scope to affect the ways that organisations think about, manage and plan strategies around digital assets.



DCSM Figure 9—The five Sustainability Variables

The five components set out in DCSM Figure 9 have very significant overlaps and conceptual links with other parts of the model but the purpose of categorising them as *Sustainability Variables* is to emphasise that these components are the main levers that can be employed to influence prospects for sustainability. Whereas the *Sustainability Context* may largely represent the ‘givens’ that need to be worked with (or worked around), the model proposes that the *variables* should be tackled pro-actively and can be managed so that they optimally support the dual related concepts of sustainable digital curation and sustainable digital assets.

As stated at the outset, the assumption at the core of the DCSM is that in order to assert the sustainability of a digital asset it must be evident that there is ongoing capability to *curate* that asset. This is an important insight because it may not be shared or understood across an organisation. Stakeholders with no particular interest in digital curation may come to the conclusion that ‘the tail is wagging the dog’. Or in other words, that the niche activity of digital curation is attempting to assert too much strategic importance or influence within an organisation. Should this be the case then the DCSM can point to the Sustainability Context and argue that it is clearly understood that curation services must work within the parameters and objectives that sponsoring stakeholders set out. The Sustainability Variables, however, *are* an assertion that digital curation should increasingly become embedded into more senior managerial levels within organisations. As digital assets inevitably become a ‘business function’ rather than an ‘IT problem’, organisations that are unable or unwilling to design a decisive strategic role for digital curation will find themselves trailing after more able organisations.



Value

The concept of *value* and its proof and realisation is the foundation for making any case for sustainability. The DCSM proposes that the value of digital assets can only be realised over time if resources are found to support their curation and this highlights a problem that all curation services have. Curation is not a valuable activity in its own right. It only delivers value through the impact it has on digital assets so it is primarily the assets that must be the focus of the value proposition. However, determining the value of digital assets is often not straightforward.

If access and use of digital assets incur charges or fees (through licensing, subscription, pay-per-use or some other mechanism), this can provide a useful starting point for determining the value proposition. The revenue that the assets are generating can be calculated and some future expectation of revenue may be estimated based on past demand. However, even where it is possible to relate usage of assets to some method of wholly or partly recouping costs, it is unlikely to accurately define the value of those assets. This is particularly the case for organisations that have a public mission and are wholly funded or subsidised to provide access to objects (for example galleries, libraries, archives, museums).

Past demand is not necessarily a good indicator of future demand. In some cases demand itself isn't even a good indication of broadly held views about the value of objects. It is possible, for instance, that assets will be viewed as having cultural or social value by people who don't anticipate using them and aren't currently paying for their curation. (Or who are only paying in indirect ways, such as through taxation or charitable donation). There is an expectation that a functioning society should have access to certain things as a matter of course and it is therefore 'someone's job' to maintain that option.

Another variable is the possibility of aggregated value. Whilst individual assets may not seem useful or significant, when amassed into collections; or time-series sets of data; or data that is integrated and aggregated from different sources, it is possible to derive useful intelligence about overall trends or tendencies.

Determining the value of digital assets is a complex topic and is very dependent on the context in which an organisation operates. To quantify the value, we would ideally identify the total lifecycle cost of the asset, and compare that with the benefits that will accrue from the asset continuing to be accessible and useable. Both sides of the calculation require careful thought and a very good understanding of the Sustainability Context. The outputs of the 4C Project are relevant here, particularly in the area of cost modelling¹¹.

Acquiring a good understanding of the cost of a curation service can be a challenging exercise, not least because it is often difficult to isolate curation costs from those required to sustain organisation-wide systems and infrastructure. There are, however, good reasons for taking the trouble to do so. As well as being the first necessary step to establishing a value proposition for digital assets, it will also be a firm foundation and a necessary component of strategic planning. Cost benchmarks offer organisations the opportunity to think more carefully about their resource allocation. It also enables them to: compare their costs with others (peer comparison); compare the cost of alternative systems (especially third party services); drive down costs by weeding out practices and components that are not cost-effective; and offer realistically-priced services to others (revenue generation).

¹¹ For advice and guidance on approaches to cost modelling, see the 4C Project Cost Concept Model and Costs Framework, available from: <http://www.curationexchange.org/understand-your-costs>



Organisations may find it difficult to accurately define the value of the assets they are curating. Many types of organisation are compelled by their mission or by law to keep data and whilst it may be very unlikely that this data will ever be used, not keeping it represents an unacceptable risk to the organisation. Whilst value is realised by avoiding the cost of loss (reputational loss, financial penalties, loss of license to operate), the distinction between *asset* and *liability* is blurred.

The value proposition will also be difficult to establish for objects where it is impossible to predict either the likelihood or the type of use that may occur at some point in the future (this may be particularly relevant for research data). Where there is no *actual* value (through current use) and where there is uncertain *potential* value (because the nature of future use is difficult to anticipate), the focus of value may need to shift from the object to the curation service. The service will do the necessary ongoing work to retain the option for the object to demonstrate its value; and by doing so it relieves other services or individuals from the effort and expense of doing so.

Although value as a concept is complex, there are some practical ways of attempting to quantify it and/or undertake some form of qualitative value analysis. The most direct method is to concentrate on investment and use. This looks at the amount invested into the asset or service and offsets that against the amount spent by users to exploit the opportunities they offer. Another method is to try and establish the 'contingent value'. This relies on what people state they would either be willing to pay for the asset/service; or willing to receive to forego the asset/service. A third method is to estimate efficiency gains and time savings that will be achieved because of the asset/service. Qualitative methods focused chiefly on surveying stakeholders (including the designated community) can also be employed.

Example questions for Sustainability Variables (Value)

- What is the cost of the digital curation service?
- Is it possible to estimate the lifecycle costs of the assets?
- Is there broad agreement about the type of the benefits that accrue from curating assets?
- Is there broad agreement about the amount of benefit that accrues from curating assets?
- Do the benefits justify the required expenditure?
- Have all steps been taken to enhance the value of assets?
- What steps have been taken to quantify the value of the assets?
- What steps have been taken to qualify the value of the assets?

Motivation

This variable is closely associated with the Stakeholders component in the Sustainability Context section. Having gained a good understanding of the stakeholder network and the dynamics between its participants, the more active control within a sustainability strategy is the influence that can be brought to bear on the motivations of stakeholders, either to invest in digital curation or to declare their preference that others do so.

Focusing first on the assets, analysis can be done to check whether they are well-aligned with the mission of the organisation and that they complement and support the business functions and drivers. If this is apparent, then case study and advocacy material can be produced to demonstrate the role that digital assets play within the organisation. This material is likely to play an important role when an investment decision point occurs (see *The Investment Lifecycle* section above). If it is not apparent that the assets are well-aligned with the organisational drivers, then some rationalisation needs to occur, either to explain and defend the rationale for continuing to sustain the assets, or to investigate the most appropriate way of handing off the assets to another entity (see also the *Appraisal and Selection* section below).



The other focus of motivation is the curation service and ensuring that stakeholders have the appropriate incentives to continue to support the process of managing and adding value to the assets over time. Both those with responsibility for the curation itself and those providing the resources to support it must be content that the business case for curation is robust and aligned with current organisational objectives. They must also be happy that it contributes to future strategy as well. If the curation business case is not constantly evolving to respond to the needs of the organisation, it is unlikely to be able to contribute at the desired strategic level.

The actions in this section are about motivations and incentives to sustain digital assets. The preparatory work is to check and ensure that the assets and services are delivering the sort of value that is expected of them. Having done that, the task is then to undertake outreach and development amongst stakeholders to communicate the reasons why it is important to continue to curate and to set out the advantages and new opportunities that the assets will continue to deliver.

Example questions for Sustainability Variables (Motivation)

- Do the incentives for sustaining the assets align with organisational drivers?
- Have resources providers declared their motivations for continuing to invest in sustaining the assets?
- Is information available that sets out how the digital assets contribute to business objectives?
- Is there an up to date and effective business case for digital curation?
- Are there effective channels of communication to stakeholders for maintaining support for curation?

Governance

The governance of an ‘entity’ is the mechanism that creates, maintains and steers policy and monitors its implementation. It often consists of a group of designated individuals who have been assigned responsibility for adjusting and balancing accountabilities and whose primary duty is to enhance the prosperity and viability of the entity that is the focus of the group’s terms of reference¹².

There is a conceptual overlap between ‘Governance’ and the Sustainability Context component ‘Organisation’. The point of listing Governance as a variable is to highlight that this mechanism is the specific part of the organisation that it is important to try and influence. Positioning digital curation as a strategic business function will mean that it must come to the attention of (and be steered by) those with responsibility for governance.

One of the principal ways that governance can be shaped is by ensuring that individuals with the necessary knowledge and opinions have influence over or input into governance discussions. This can happen in various ways.

- ensuring that the relevant people can find useful information that is in the right format and at the right level of detail for them
- actively briefing them and providing them with input for critical discussions
- taking pro-active steps to ensure that individuals with an interest in digital curation are members of the governance group

¹² This definition partly derives from www.businessdictionary.com. The full definition is included in appendix 1



- influencing the wider stakeholder community (via outreach and engagement) to lobby the governance group in relation to the value of digital assets and the role of digital curation

The objective of all of this activity would be to have a positive and tangible impact on the quality of strategic decision-making within the organisation. The point is not that digital assets are often critical to the day-to-day functioning of most organisations—that is a given (particularly in the context of financial, personnel and inventory-type records management functions). The more significant aim is that they can and should be regarded, at the highest level of the business, as resources that can generate value and if they are managed within a sympathetic policy framework, are curated effectively and exploited creatively.

Example questions for Sustainability Variables (Governance)

- Is the organisation under an obligation to sustain the assets (for example through funder requirements, project conditions, customer expectations)?
- Are the governance arrangements clear for taking responsibility and approving sustainability strategies?
- Is there a written policy that mandates a way of sustaining the assets?
- Is there a written strategy that sets out how the assets will be sustained?
- Are roles and responsibilities for sustaining the assets clearly allocated?
- Are roles and responsibilities for sustaining the assets appropriately allocated?
- Have benchmarks and metrics been assigned to evaluate the outcome of curation activity and its impact on sustainability?

Resources

Curation activities, like any other activity, require sufficient resources to achieve long-term goals. This will often involve developing mechanisms to transfer funding and other resources from those who are willing to pay for digital curation (usually the beneficiaries) to those who are willing to provide curation services. There is a variety of market and non-market mechanisms for doing this, such as pricing models, compulsory fees or taxes, volunteer efforts, and donations. Whatever mechanism(s) is chosen, it must support an ongoing flow of resources such that long-term curation goals can be achieved.

But it is not enough to simply make resources available for curation. These resources should be used as efficiently and effectively as possible and this is where the sustainability variable comes into play. It does not mean cutting corners but rather getting the most value out of the resources allocated to curation. One example would be to take advantage of economies of scale by spreading costs over higher volumes of curation activity. Another would be to attempt to take advantage of economies of scope by spreading costs over different yet related services (for example, locating curation and end-user access services on the same repository platform). In conjunction with a strategy to drive down costs across all processes and across the whole asset lifecycle by means of methodical cost modelling and cost comparison (see *Value* section above), evidence can be presented to support the view that resources are being employed as intelligently as possible.

In addition to financial resources, adequate levels of knowledge and expertise in the workforce is also critical for sustaining curation. Hiring and retaining staff with the correct mix of skills and experience is not simply a financial issue. Staff development, welfare and job satisfaction are also critical components of a sustainability strategy and must be factored into staff resourcing requirements. The staff employed must also have access to tools and infrastructure that are appropriate (and ideally optimised) for the task they are employed to do.



Example questions for Sustainability Variables (Resources)

- Are functioning agreements in place to transfer funds and/or other resources from those who are willing to pay to those who are able and willing to curate?
- Is the mechanism for payment or transfer of other resources arranged such that it is effective, robust and reliable (for example pricing, fees, philanthropic donations, effort)?
- Are curation activities organised and managed to make the most efficient use of the funds or resources received?
- Can sufficient human resource with adequate capability be employed to ensure effective curation takes place?
- Are the appropriate tools and infrastructure available to allow effective curation to take place?

Appraisal and Selection

One of the most immediate actions that can be implemented as part of a sustainability action plan is to undertake an appraisal and selection process. Working on the principle that there is almost always insufficient resources to curate and sustain all desired assets, a prioritisation of assets will help to alleviate the pressure on resources. In simple terms this means proactively selecting digital assets for curation that are likely to promise the greatest value through use over time; and conversely, de-selecting liabilities when the value of them no longer justifies the cost of their ongoing curation.

As stated above (see *Value* section) it can be challenging to establish the value of digital assets and although it may require significant time and effort it is a fundamental sustainability action. Value judgements underpin appraisal and selection actions and the pursuance of those actions are important for both strategic and practical reasons.

Without an appraisal and selection process we are implicitly deciding to : a) ‘keep everything’ and be prepared to scale up storage requirements whenever staff looking after the infrastructure demand more capacity; and b) assume that some materials will become subject to neglect through dis-use; will in time become *actually* unusable; and will (in their unusable state) be disposable.

This is a denial of responsibility for digital assets. Buying more storage whenever staff request it; and hoping that digital liabilities simply disappear over time, does not comply with definitions of digital curation which all call for *active* management. In fact it doesn’t comply with any definition of management and certainly doesn’t add weight to the argument that digital curation should contribute more widely and be more influential across the organisation and be more embedded into the mind-set of senior managers.

The practical reason why a ‘keep everything’ policy is inadvisable is the amount of overhead and noise it introduces into the repository when trying to find and access objects. Whilst big data and analytical methods require access to large unstructured stores of data, many other information environments are predicated on digital objects being well described and curated and this becomes more challenging as the scale increases. One practical response is to curate at ‘collection level’ rather than ‘item level’ and to similarly appraise and select at this level.

Curation practitioners will increasingly need to work at very large scales and curation research must tackle and solve issues to do with the automation (or more likely the semi-automation) of selection and appraisal methods. In practice this will require advances in automated metadata creation; the development of decision support tools; and the algorithmic assignment of value criteria.



Example questions for Sustainability Variables (Appraisal and Selection)

- Is it understood that the best use of resources involves making choices based on value judgements and selecting material for curation?
- Is it possible to de-select and transfer or dispose of assets that are deemed no longer worth sustaining?
- Is selection and appraisal included as part of an active curation strategy in the organisation?
- Is the selection of materials based on an agreed value framework?
- Is active planning taking place for dealing with curation at scale?

Uncertainties (Risk Management)

No sustainability strategy can anticipate everything and unexpected issues, both threats and opportunities, may arise. Broadly speaking this acknowledges that there must be an acknowledgement of *uncertainty* as part of the sustainability strategy. The standard way of responding to uncertainty is to rely on risk management processes, for which there is a very extensive body of literature, standards and practice. The principal international standard reference for risk management is ISO 31000 and it sets out the following description of how it can help organisations.

Using ISO 31000 can help organizations increase the likelihood of achieving objectives, improve the identification of opportunities and threats and effectively allocate and use resources for risk treatment¹³.

The standard contains all the definitions and guidance required so it is not necessary for the model to reiterate it. For convenience, however, the usual risk management responses to uncertainty are set out in DCSM Figure 10 below.



DCSM Figure 10—The usual risk management responses to uncertainties

The DCSM can build on this by emphasising the need to build in flexibility within a sustainability strategy to provide the ability to respond to an unexpected event. In practice this means building in contingency to plans, budgets and activities, examples of which might be: leaving some unallocated time available within a work or project plan; ensuring that there is some useful redundancy (overlap) between staff with

¹³ ISO 31000 - <http://www.iso.org/iso/home/standards/iso31000.htm>



critical knowledge and experience; or investing time in apparently non-productive activities such as research or partnership building. Researching emerging solutions and making alliances with peer organisations might pay particular dividends when responding to the emergence of disruptive technologies or innovative practice, both of which could conceivably be a threat or an opportunity.

There is a cost to building in contingency of this sort within a sustainability strategy and the acceptance of those costs will largely depend on the Sustainability Context. If the curation service operates within a highly dynamic environment where significant threats and opportunities arise regularly, arguments in favour of contingency planning may be easier to propose.

Example questions for Uncertainties (Risk Management)

- Is a risk management process, ideally based on a formal framework (such as ISO 31000) used?

If a formal framework is not used ...

- Are the digital assets subject to ad hoc risk assessment measures (especially to identify vulnerabilities)?
- Are curation services subject to regular risk assessment measures (especially to identify vulnerabilities)?
- Does the organisation design contingency measures into its activities?
- Based on past experience is it estimable how regularly unexpected issues may arise or uncertain events occur?

What Next?

The DCSM is a resource that is designed to start conversations and structure thinking around the complex areas of digital curation, digital assets and sustainability. It is not designed to produce an off-the-peg sustainability strategy that will be applicable to all organisations in all sectors. The onus is on the user of the model to take away what is useful to them and to then design their own sustainability strategy that suits the context in which they are operating.

The good news is that in addition to the DCSM—which is a well-considered and extensive examination of sustainability issues, there are additional complementary resources available which address the following related topics (some of which have already been mentioned in the text above):

The Curation Costs Exchange

A trustworthy and sustainable community resource for depositing and accessing curation costs data and related information. Its purpose is to make the sharing and comparison of data as easy as possible.

<http://curationexchange.org>

The 4C Project Roadmap—A Shared Path Towards Sustainability

A community roadmap document that outlines the steps that various stakeholder groups should take over the period 2015-2020 in order to maximise the efficiency of digital curation and to ensure sustainability.

<http://4cproject.eu/roadmap>

**A Cost Concept Model and Gateway Specification (2014)**

A framework that allows current and future cost models to be compared and benchmarked against a comprehensive set of cost concepts. The model and the associated gateway specification are designed to support future cost modelling activities.

<http://4cproject.eu/d3-2-ccm>

An Evaluation of Costs Models and a Needs & Gap Analysis (2013)

An analysis of existing research related to the economics of digital curation and how well current cost and benefit models meet stakeholders' needs for calculating and comparing financial information.

<http://4cproject.eu/d3-1>

A Summary of Current Cost Models (2013)

A summary and description of 10 openly available cost models.

<http://4cproject.eu/summary-of-cost-models>

A Report on the Indirect Economic Determinants of Digital Curation (2013)

A description of the indirect factors and concepts that organisations need to be aware of when clarifying the costs of curation.

<http://4cproject.eu/d4-1-ied>

A Report on Quality & Trustworthiness as an Indirect Economic Determinant (2014)

A case study report on the overhead, cost, intellectual input and the eventual benefits that may accrue of undergoing audit and certification procedures to become a 'trusted digital repository' or similar.

<http://4cproject.eu/d4-3-quality-andtrustworthiness>

A report on Risk as an Indirect Economic Determinant (2014)

A report on the role of risk and risk assessment in relation to digital curation and its impact on costs.

<http://4cproject.eu/d4-4-report-on-risk-benefit-impact-and-value>

From Costs to Business Models for Digital Curation (2015)

An examination of potential business models, an analysis of the types of services needed, the ways that these can be provided, and options for fee structures.

<http://4cproject.eu/d4-5-from-costs-to-business-models>

Baseline Study of Stakeholders & Stakeholder Initiatives (2013)

A review of relevant work on the economics of digital curation and the results of a stakeholder survey on current practice and stakeholder needs.

<http://4cproject.eu/d2-1-stakeholders>



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A Collaboration to Clarify the Costs of Curation

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The overall structure of this model uses many components set out by *Brian Lavoie* (OCLC) and *Chris Rusbridge* (Chris Rusbridge Consulting) who conceived of and designed the original blueprint for this work, based on their experience of participating in the Blue Ribbon Task Force for Sustainable Digital Preservation and Access (2008-10).

The Digital Curation Sustainability Model (DCSM) is a forked instance of the Economic Sustainability Reference Model (ESRM) that was first set out by Lavoie and Rusbridge in 2011, and further developed and enhanced by Lavoie and Grindley (as an early output of the 4C Project) in 2013. The most recent version of the ESRM is available at: <http://www.4cproject.eu/ms9-draft-esrm>

Particular thanks and credit is due to *Brian Lavoie* and *OCLC Research* for collaborating with the 4C Project. (<http://www.oclc.org/research.html>)

The icons in DCSM Figure 1 are sourced from The Noun Project—<http://thenounproject.com/>

- 'Gears' created by Cris Dobbins from the Noun Project
- 'Thinking' created by Jens Tärning from the Noun Project
- 'Tools' created by Haridass from the Noun Project
- 'Hour-Glass' created by Laura Beggs from the Noun Project

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DCSM Appendix 1—Selected Definitions

Digital Asset

Something of value owned by the enterprise. An asset is an actual thing (tangible or intangible) owned by the enterprise, rather than the accounting sense of “asset”—the monetary value of the thing. (*In this instance the asset is digital in nature*).

OMG Business Motivation Model
<http://www.omg.org/spec/BMM/>

Digital Curation

Digital curation involves maintaining, preserving and adding value to digital content throughout its entire lifecycle. The active management of digital material reduces threats to its long-term value and mitigates the risk of digital obsolescence. As well as reducing duplication of effort in digital object creation, curation enhances the long-term value of existing content by making it available for further use in a wide variety of contexts

The Digital Curation Centre
<http://www.dcc.ac.uk/digital-curation/what-digital-curation>

Governance

Establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members (with the associated accountability), and their primary duty of enhancing the prosperity and viability of the organization.

The Business Dictionary
<http://www.businessdictionary.com/definition/governance.html#ixzz3P6gUriB4>

Sustainability

The following three definitions all give a useful perspective onto the concept of sustainability ...

Sustainable economics for digital preservation is not just about finding more funds. It is about building an economic activity firmly rooted in a compelling value proposition, clear incentives to act, and well-defined preservation roles and responsibilities

Blue Ribbon Task Force for Sustainable Digital Preservation and Access
brtf.sdsc.edu/biblio/BRTF_Final_Report.pdf

Having a mechanism in place for generating, or gaining access to, the economic resources necessary to keep the intellectual property or the service available on an ongoing basis

Guthrie, K., Griffiths, R., Maron, N. Sustainability and revenue models for online academic resources: an Ithaka report (pdf), JISC 2008
http://sca.jiscinvolve.org/wp/files/2008/06/sca_ithaka_sustainability_report-final.pdf

What contributes to the ability of digital preservation systems to continue their existence into the future

APARSEN Project
<http://www.alliancepermanentaccess.org/index.php/aparsen/aparsen-workshops/workshop-on-sustainability-and-the-aparsen-network-of-excellence/>



Risk

The effect of uncertainty on objectives. An effect is a deviation from the expected — positive and/or negative.

ISO Guide 73:2009, definition 1.1

<https://www.iso.org/obp/ui/#iso:std:iso:guide:73:ed-1:v1:en>

Uncertainty

The state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequence, or likelihood.

ISO Guide 73:2009, definition 1.1

<https://www.iso.org/obp/ui/#iso:std:iso:guide:73:ed-1:v1:en>



DCSM Appendix 2—Example Questions

All the example questions in the model text collated in one list

- Sustainability Context (Digital Assets)
- Can you specify particular digital assets that may be especially challenging to sustain over time?
- Is the amount of digital curation activity that is required easily quantifiable?
- Do the assets have technical attributes that make them difficult to manage?
- Do the assets have any other properties that complicate their management?
- Is it possible to batch format assets when processing them?
- Is the ownership of the assets clearly defined?
- Can digital curators get effective access to the assets?
- If others are looking after copies of the assets, is an adequate agreement in place to assure the safety of the assets?

Sustainability Context (Organisation)

- Are the mission and objectives of the organisation set out clearly?
- Are the mission and objectives understood by those responsible for sustaining the digital assets?
- Is the organisation reliant on sustaining digital assets to achieve its business objectives?
- Is it understood that digital curation is a business function rather than an IT problem?
- Does the organisation have any structural issues that hinder the effectiveness of digital curation?

Sustainability context (Stakeholders)

- Is responsibility for providing the curation service clear?
- Is it clear who the curation service consumers are?
- Has a stakeholder map been drawn up?
- Is it clear who has responsibility for the digital assets?
- Is the authority to grant access to the curated digital assets clearly established?
- Is anyone getting free use of the digital assets that should be paying for their curation?

The Investment Lifecycle

- Can the next investment decision point be identified?
- Is it apparent that digital curation is adding value to the digital assets?
- What information may be required to inform the next investment decision?
- Are resources available to actively manage the investment decision point?

Sustainability Variables (Value)

- What is the cost of the digital curation service?
- Is it possible to estimate the lifecycle costs of the assets?
- Is there broad agreement about the type of the benefits that accrue from curating assets?
- Is there broad agreement about the amount of benefit that accrues from curating assets?
- Do the benefits justify the required expenditure?
- Have all steps been taken to enhance the value of assets?
- What steps have been taken to quantify the value of the assets?



- What steps have been taken to qualify the value of the assets?

Sustainability Variables (Motivation)

- Do the incentives for sustaining the assets align with organisational drivers?
- Have resources providers declared their motivations for continuing to invest in sustaining the assets?
- Is information available that sets out how the digital assets contribute to business objectives?
- Is there an up to date and effective business case for digital curation?
- Are there effective channels of communication to stakeholders for maintaining support for curation?

Sustainability Variables (Governance)

- Is the organisation under an obligation to sustain the assets (for example through funder requirements, project conditions, customer expectations)?
- Are the governance arrangements clear for taking responsibility and approving sustainability strategies?
- Is there a written policy that mandates a way of sustaining the assets?
- Is there a written strategy that sets out how the assets will be sustained?
- Are roles and responsibilities for sustaining the assets clearly allocated?
- Are roles and responsibilities for sustaining the assets appropriately allocated?
- Have benchmarks and metrics been assigned to evaluate the outcome of curation activity and its impact on sustainability?

Sustainability Variables (Resources)

- Are functioning agreements in place to transfer funds and/or other resources from those who are willing to pay to those who are able and willing to curate?
- Is the mechanism for payment or transfer of other resources arranged such that it is effective, robust and reliable (for example pricing, fees, philanthropic donations, effort)?
- Are curation activities organised and managed to make the most efficient use of the funds or resources received?
- Can sufficient human resource with adequate capability be employed to ensure effective curation takes place?
- Are the appropriate tools and infrastructure available to allow effective curation to take place?

Sustainability Variables (Appraisal and Selection)

- Is it understood that the best use of resources involves making choices based on value judgements and selecting material for curation?
- Is it possible to de-select and transfer or dispose of assets that are deemed no longer worth sustaining?
- Is selection and appraisal included as part of an active curation strategy in the organisation?
- Is the selection of materials based on an agreed value framework?
- Is active planning occurring for dealing with curation at scale?

Uncertainties (Risk Management)

- Are the digital assets subject to regular risk assessment measures?
- Are curation services subject to regular risk assessment measures?



- Is a formal risk framework (such as ISO 31000) used?
- Does the organisation design contingency measures into its activities?
- Based on past experience is it estimable how regularly unexpected issues may arise or uncertain events occur?



DCSM Appendix 3—Example Questionnaire Formats

The following are some suggested ways of setting out a self-assessment questionnaire

Table 1 –To record details of the respondent to the questionnaire

Name	
Affiliation	
Department / Group / Section	
Role	
Date	
Which digital assets* are the specific focus of this sustainability assessment exercise?	

* Digital assets is the term used throughout this exercise to refer to all digital information/materials/objects/data that will require digital curation over time to ensure their sustainability

DCSM Table 2—Respondent details

**Table 2—Questionnaire and Action Format**

Includes a sample answer for question 1 in red

Sustainability Context (Digital Assets)

#	Question	Answer	Action (if applicable)
01	Can you specify particular digital assets that may be especially challenging to sustain over time?	<i>Yes—we have a collection of videogames and videogame consoles from the late 1980's and 1990's, some of which are very rare and rely on legacy technical environments which ceased to be supported a very long time ago!</i>	<i>Make sure that the scope and the extent of the problem is understood across the organisation. Action—Write a briefing paper.</i>
02	Is the amount of digital curation activity that is required easily quantifiable?		
03	Do the assets have technical attributes that make them difficult to manage?		
04	Do the assets have any other properties that complicate their management?		
	Etc. etc.		

DCSM Table 3—Q&A format

**Table 3—Explanation of issue levels—for use with Table 4**

Level	Explanation
1	Not an issue
2	A minor issue
3	An issue
4	A major issue

*DCSM Table 4—Issue levels***Note on recording dates**

The Current situation can be dated from the date of the form (if table 1 or similar used).

Future state and actions to be taken should be recorded in YYYY:MM format

**Table 4—Questionnaire with Time Component**

Includes a sample answer for question 20 in red

#	Question	Current Issue Level	Response and action (if appropriate)	Take Action By yyyy:mm	Adjusted Issue Level
The Investment Cycle					
20	Can the next investment decision point be identified?	3	There is some lack of clarity about when the next funding review will take place and whether funds allocated for the department's curation activities can be spent beyond July 2015 Action—write to Head of Finance and ask for clarity	2015:03	1
21	Is it apparent that digital curation is adding value to the digital assets?				
	Etc. etc.				

DCSM Table 5—Questionnaire with time component