# Collaboration to Clarify the Cost of Curation



# D4.2—Assessment of Community Validation of the Economic Sustainability Reference Model

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# Executive Summary

The creation of the Economic Sustainability Reference Model (ESRM) pre-dated the 4C project and was conceptually very influential in the formulation of the project. The purpose of including it as an explicit strand of project work was to further refine the model and to do so in response to an extensive community evaluation of its suitability and utility.

A series of engagement activities was designed to showcase the ESRM model and to gather feedback about it from different stakeholder groups. Internal 4C consortium discussions also took place to shape and refine the model. Input was also sought from the 4C Advisory Board. The ESRM was presented on at least 27 different occasions to a total audience of between 600-800 people and was discussed at various focus group and workshop sessions where more detailed input was gathered.

The headline points made by the community in response to the ESRM were:

- The purpose of the model needs to be clearer and more practical
- More user guidance is required
- The model doesn't map well onto all working domains
- The terminology and definitions need more attention
- Senior managers are unlikely to engage with the model without mediation
- There is not enough acknowledgement of organisational context
- There is a problem with the way that the concept of 'value' is articulated in the model
- It is not obvious how the ESRM joins up with other resources
- There are some things missing or not visible enough in the model

The detailed feedback and the general community preference to make it more useful signalled the need (and the demand for) a model that shifted focus from the economics of sustainability towards the more practical issues of sustaining digital assets and sustaining the digital curation services that sustain those assets. With this in mind a decision was taken to 'fork' development of the ESRM and to create a new model called the Digital Curation Sustainability Model (DCSM). The DCSM is neither an 'economic' model nor a 'reference' model and is sufficiently different to the ESRM to warrant its existence as a separate (though closely related) entity.

The current purpose (as of February 2015) of the DCSM is to complement and enhance the advice and guidance available to the community and to provide those with responsibility for digital assets and curation services (practitioners) with a systematic way of considering and discussing sustainability issues with senior managers and funders/investors (strategists). The DCSM takes over from the ESRM as the principal output of the 4C project task on *sustainability* and will be hosted and maintained on the Curation Costs Exchange (CCEx) community platform.

The ESRM work has proved to be a very valuable framework and mechanism for engagement with the community and also a useful vehicle for discussion within the 4C project consortium about the way that different modelling activities (costs, benefits, economic and business) all relate and overlap with each other and share components.

# 1 Introduction

The purpose of the work outlined in this document closely aligns with the principal purpose of the 4C project as set out in the abstract of the Description of Work (DoW).

*"The main objective of the 4C project is, therefore, to ensure that where existing work is relevant, that stakeholders realise and understand how to employ those resources. But the additional aim of the work is to closely examine how they might be made more fit-for-purpose, relevant and useable by a wide range of organisations operating at different scales in both the public and the private sector."*[1]

The existing work in this instance refers to a resource called the 'Economic Sustainability Reference Model' (ESRM), an idea that was developed between 2010 – 2012 by Brian Lavoie (OCLC) and Chris Rusbridge (Chris Rusbridge Consulting) with support and funding from OCLC Research and Jisc. A fuller description of the provenance and the early development of the model is available in an early 4C project milestone report.[2]

The inclusion of the ESRM into the scope of the 4C work acknowledges that, whilst the starting point of the project was the costs of digital curation, it was understood from the outset that there is little point focusing on costs without also understanding a range of related issues, one of which is the concept of *sustainability*[3]. What has become clear is that the broad notion of sustainability can be used as the hook to better understand the relationship between a number of other issues, some of which have been addressed by other 4C Project outputs. They include concepts such as *benefits*, *value*, *risk*, *motivation*, and *resources*, all of which need to be understood, quantified, qualified or managed in order to design effective, affordable and sustainable digital curation services.

The work outlined in this document appropriately addresses the aims set out in the DoW and the eventual outcome—from the point of view of the project at least—has been very positive. But the outcome of the task does require some explanation, mainly around the naming of models. The purpose of this deliverable (an Assessment of Community Validation of the Economic

## Key DoW Quotes

Task 4.2—Develop and trial an Economic Sustainability Reference Model

**The Task**

The objective of the Economic Sustainability Reference Model (for digital curation/ preservation) is to: support the design of strategy; to influence and standardise terminology; and to assist with the declaration of roles and responsibilities in relation to curation and preservation. The model will be collaboratively further developed, trialled and assessed as an early project deliverable, and then redeveloped throughout the project to comprehensively gauge its fitness for purpose and utility for the wider community.

**The Deliverable**

Assessment of Community Validation of the Economic Sustainability Reference Model: The report will comprehensively gauge the ESRM's fitness for purpose and utility for the wider community

[1] The 4C Project Description of Work (DoW)—EC project no. 600471

[2] MS9—Draft Economic Sustainability Reference Model - http://4cproject.eu/ms9-draft-esrm (accessed 30/01/15)

[3] Sustainability—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 (4C glossary— http://www.4cproject.eu/community-resources/glossary/full-glossary)

Sustainability Reference Model) is to pick up the narrative around community engagement from the point at which the 4C Project first released an updated version of the ESRM (September 2013). It was at this point that we started to invite public comment and input into its further refinement and development. The expectation in the original DoW was as follows:

1. An updated version of the ESRM is released for comment as an early milestone;
2. Opinions and input are solicited from the community on an ongoing basis throughout the rest of the project's duration;
3. Enhancements and changes to the model are made from time to time in response to community input;
4. An updated version of the model is released at the end of the project (January 2015) and the community is invited to use the model and continue its development in accordance with its perceived level of value.

What happened in practice, both as a result of the community engagement methodology set out above and from the thinking that emerged from the project, was that the model we ended up defining has a somewhat different focus from the original ESRM and consequently bears a different title. Task 4.2 of the 4C project work has, therefore, ended up delivering a resource that we have labelled the 'Digital Curation Sustainability Model' (DCSM) (included Appendix A.1).

This is not simply an alternative title that tries to more accurately describe the ESRM model, it is a separate model. Whilst a lot of the very high level structure is the same (and the 'star' graphic logo is used in common—although with variations), there are some quite significant differences between the ESRM (September 2013) and the DCSM (February 2015). It is, therefore, appropriate to regard the DCSM as a 'forked' version of the ESRM rather than a resource that supersedes and renders the ESRM obsolete. Further explanation of this 'forking' of models is outlined in Section 2.3.

Lastly by way of introduction, the purpose of this deliverable is *not* primarily to introduce and provide guidance for using the DCSM (although the latest version of the model [February 2015] is set out in the appendices of this document and should be self-explanatory). The objective is to "*gauge the ESRM's fitness for purpose and utility for the wider community*". So it is more a description of the level of community engagement that the project achieved and the nature and scope of the feedback that the ESRM model elicited. The main text will, therefore, set out the input that we received from the community in relation to the ESRM and detail the effect and influence that input had in on the final format of the DCSM as presented in the appendices. The DCSM is now the major and final output of 4C Task 4.2 but the ESRM will also remain available to and useable by the community, through the 4C website.[4]

[4] http://4cproject.eu/ms9-draft-esrm and http://www.4cproject.eu/esrm-summary

# 2 ESRM and DCSM

As noted in the introduction, whilst the 4C project set out to further develop and promote the Economic Sustainability Reference Model (ESRM), the final outcome of Task 4.2 has been the creation of a resource called the Digital Curation Sustainability Model (DCSM). The creation of this alternatively named model was partially in response to community reaction to the ESRM; but was also (and equally importantly) linked to extensive thought and related model development going on within the 4C project consortium.

## 2.1 Origins of the ESRM

There are striking similarities and also significant differences between the two models. The ESRM originated from the final report of the Blue Ribbon Task Force for Sustainable Digital Preservation and Access (BRTF)[1]. This provenance comes through clearly in the text of the ESRM as presented to the community from September 2013 onwards and the language that it employs and the concepts that it sets out are very much a distillation of an economic perspective on digital preservation.

The BRTF work and the reports that it produced are widely cited, have been influential in the digital preservation and curation community and were an important catalyst for the original development of the proposal that resulted in the 4C Project. What became clear in the course of 4C community engagement activities, however, was that the ESRM was unlikely to influence its declared target audience (senior managers, funders and investors) especially without mediation from those closer to day to day digital curation issues. It was expressed in economic terms and presented as a lengthy textual narrative. A comprehensive account of the feedback received from the community is set out in Section 3 of this document.

## 2.2 Using the ESRM for Community Engagement

The 4C Project work plan was designed around early use of the model as an engagement mechanism. To facilitate this, a graphical representing the model was developed—see Figure 1—and a self-assessment questionnaire created—derived from the text of the model. Both were used to aid presentation and enable engagement with the model's content in a workshop or focus group context.

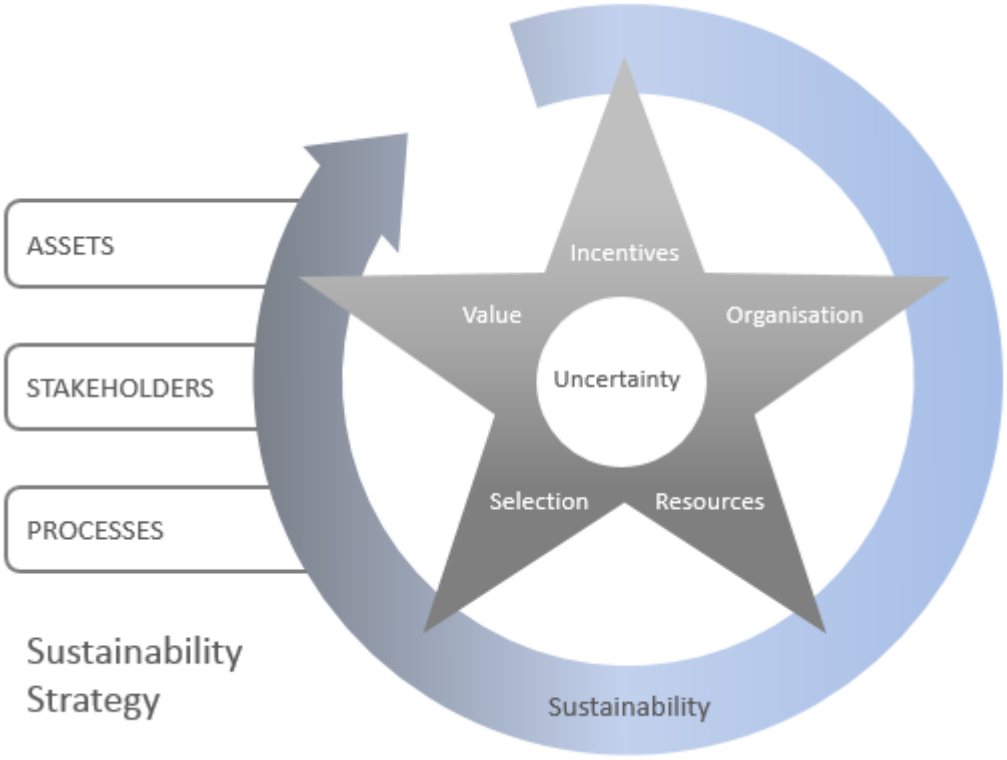



*Figure 1—The ESRM Annotated Star Model Graphic*

Given the constraints of the presentation format this was felt to be a necessary measure to enable discussion. However, by providing an alternative way of accessing the intellectual content of the model (through a slide deck presentation and via the questionnaire), it may have contributed to an observed tendency of stakeholders to not engage with the main body of the ESRM text (or at least not offer much by way of substantive commentary on it).

## 2.3 The Forking of the Models

The decision to rebrand and rewrite the sustainability model as the DCSM rather than continue to focus on the ESRM was taken late in the project. It is important to note that, whilst we feel that the DCSM is a better complement to some of the other 4C outputs[5] and it contains more by way of directive action for practitioners, the ESRM remains a valid and useful resource. It is a unique attempt to align economic concepts with digital preservation sustainability issues and to do so in a comparatively concise and accessible format. For this reason, we propose that both variants of the model have valuable components and content that will be of future use to practitioners and strategists.

[5] Most notably the Costs Framework developed as an important component of deliverable D3.2—Cost Concept Model and Gateway Specification (http://www.4cproject.eu/d3-2-ccm-grs) and D5.1—Draft 4C Roadmap (http://www.4cproject.eu/d5-1-draft-roadmap)

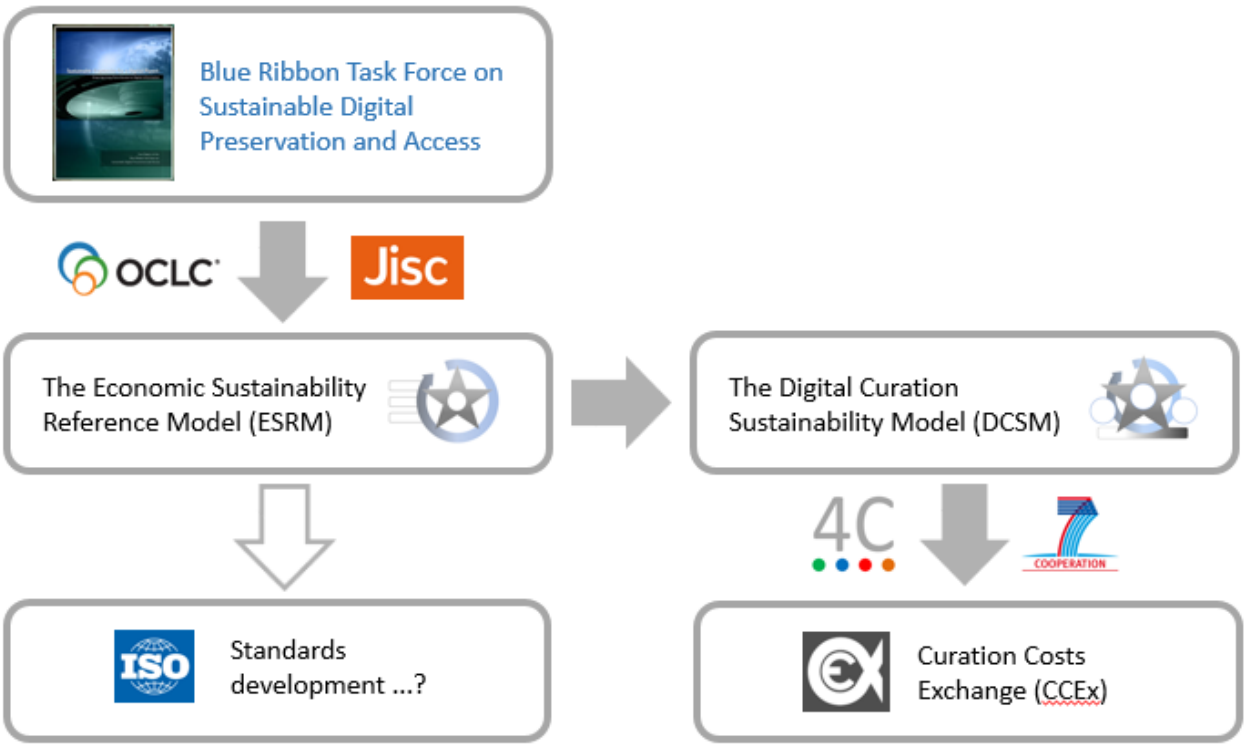



*Figure 2—The Forking of the Models*

The graphical representation above (Figure 2) shows the models forking; their shared origins in the work deriving from the BRTF; and their potential (or actual channels) for development and dissemination. In the case of the DCSM, it is an output of the 4C Project and it references other 4C outputs in its structure and terminology. Its dissemination and sustainability path will be through the Curation Costs Exchange[6] (CCEx) which is a community platform developed by the 4C Project to act as a public hub and a place to share costs and costs-related information after the project's funded period.

The ESRM remains a collaborative piece of work that was originally supported by OCLC and Jisc; was further developed during the early stages of the 4C project—in particular by Brian Lavoie (OCLC); and which remains a valuable re-formulation of some of the thinking that came out of the BRTF. The non-filled arrow pointing down to the box with a question mark against the notion of standards development is meant to suggest one potential future path for the ESRM. It is quite possible that, with a different process and approach to community engagement and with further investment focused particularly on the objective of doing *economic modelling*, the ESRM could become the basis of a standard reference model.

In contrast, the DCSM is neither an 'economic' nor a 'reference' model. It focuses on the related two challenges of sustaining digital curation services and sustaining digital assets. There are no current plans to further develop the DCSM model in the direction of becoming a formal or de facto standard. Its current purpose (as of February 2015) is to complement and enhance the advice and guidance available to the community and to provide those with responsibility for digital assets and curation services with a way of methodically considering and discussing sustainability issues.

[6] 4C Project—the Curation Costs Exchange - http://www.curationexchange.org/

# 3 Community Engagement

As mentioned above, the community engagement part of Task 4.2 really began in September 2013 with a workshop and focus group at the iPRES 2013 conference in Lisbon. A detailed and comprehensive account of all 4C engagement activities is available in another project output, D2.3—Final Stakeholder Report.[7]

These sections focus specifically on the scope and level of community engagement with the ESRM. At the mid-term project review, we were urged to make sure we engaged practitioners facing real digital curation challenges in their workplaces. Much of the engagement that occurred in the course of attempting to validate and gauge levels of endorsement for the ESRM addresses this.

## 3.1 List of ESRM Engagement and Development Opportunities

The following meetings, events and fora all provided opportunities to present, examine, discuss or develop the ESRM. The first list represents the internal project meetings at which the model was discussed. These were critically important opportunities to get expert input from individuals within the project consortium, some of whom are also practitioners faced with daily digital curation issues and/or people with experience in designing and using a range of tools and models.

1. 4C Project Kick off Meeting—Lisbon (March 2013)
2. WP4 meeting—London (June 2013)
3. 4C Project Meeting—Frankfurt (July 2013)
4. 4C Project and Advisory Board meetings—The Hague (January 2014)
5. 4C Project Review and Rehearsal meetings—Frankfurt (March 2014)
6. 4C Project and Advisory Board meetings—Edinburgh (July 2014)
7. 4C ESRM Working Group—Copenhagen (November 2014)
8. 4C Project Meeting—Vienna (December 2014)

The second, longer list represents external opportunities to present and elicit feedback on the ESRM, either in a dedicated session or (more often) as part of a larger 4C-related engagement opportunity where the ESRM was among a number of 4C resources that were showcased, promoted and discussed.

1. APARSEN Costs Webinar—Online (June 2013)
2. Jisc Sustainability programme meeting—London (July 2013)
3. iPRES 2013 Workshop—Lisbon (September 2013)
4. KB Meeting—The Hague (October 2013)
5. PASIG Webinar—Online (October 2013)
6. ANADP Conference—Barcelona (November 2013)
7. 4C Webinar—Online (November 2013)
8. Institute of Historical Research, Sustainability Workshop—London (November 2013)
9. UNESCO Roadmap Meeting—The Hague (December 2013)
10. 4C Industry Focus Group—London (December 2013)
11. IDCC 2014 Workshop—San Francisco (February 2014)
12. Jisc Digital Festival—Birmingham (March 2014)
13. Nestor Working Group—Frankfurt (March 2014)
14. State Electronic Records Initiative—Council of State Archives Webinar 1—Online (March 2014)

[7] 4C Project—Final Stakeholder Report - http://www.4cproject.eu/community-resources

15. ADA Summer School—Split, Croatia (July 2014)
16. iPRES 2014 Workshop—Melbourne (October 2014)
17. State Electronic Records Initiative—Council of State Archives Webinar 2—Online (October 2014)
18. RLUK Conference—Birmingham (November 2014)
19. 4C/DPC Conference—London (November 2014)

This represents a lot of exposure to a large collective audience of different stakeholders—in the region of 600-800 people who have been actively shown the model and asked for comment. Unsurprisingly, the occasions where there was more focused engagement with small groups were the most practical/useful opportunities for gathering input. This was especially the case when there was a dedicated time for discussion about the model (see Section 3.2).

As mentioned above, one of the engagement methods used was to encourage people to look at and comment on—and ideally fill out—the self-assessment questionnaire that is available in Appendix 1 of MS9—A Draft Economic Sustainability Reference Model[8]. On on-line interactive version has been available on the 4C Project website since September 2013. This exercise was carried out on four occasions in the course of workshop or focus group sessions. On each occasion the exercise generated some useful and detailed comments on the nature of the questions being asked, their relationship to the model, and the overall purpose and utility of the model. 27 questionnaires were fully or partially filled out. An online version of the ESRM self-assessment questionnaire[9] disappointingly elicited no useful input from the community. Some possible reasons for this are outlined below.

## 3.2 Synthesis of Input

The amount of input and commentary that was received about the ESRM in the course of the consultation period was fairly modest—particularly given the number and diversity of types of occasions on which the model was shown to people. There are, however, factors that may help to explain this tendency towards reticence on the part of the community.

### 3.2.1 Possible Factors Inhibiting Engagement

Before getting into the detail about the amount and type of input the ESRM elicited, some acknowledgement is essential of the unique and quite experimental nature of the model in the first place. As a component of the 4C work, the ESRM sat firmly in the area of the Enhancement Work Package (WP4) and was considered, at the time the 4C proposal was written, an excellent way incorporating and connecting the work done on sustainability and economics (the BRTF work) with work in other areas—principally ‘costs’, but also ‘risk’ and ‘trust’ and various other concepts.

Whilst this connection *has* proved to be useful and productive, pursuing the work in the format of a model and trying to investigate community appetite for progressing it (or something like it) towards standardisation is a very ambitious. It is possible that the work on the ESRM was trying to cover too much ground too fast and was ‘ahead of its time’. Many organisations may not yet even be able to *identify* their knowledge requirements around the economics of digital curation. This was certainly borne out by some commentators who were unsure how the model was relevant to their organisational context.

[8] 4C project—A Draft Economic Sustainability Reference Model - http://4cproject.eu/ms9-draft-esrm

[9] 4C project—Online version of the ESRM Self-Assessment Exercise - http://4cproject.eu/community-resources/stakeholder-participation/esrm-self-assesment-public

Another possible inhibiting factor (which may also indicate premature ambition) is the proposal within the model that it should be applicable across a wide variety of working domains, including education, industry, research, government, commerce, etc. This may be inhibiting rather than enabling because the model—particularly when presented in the guise of the self-assessment questionnaire—does not appear flexible enough to accommodate the widely different approaches, conventions, terminology and/or practice of the different domains. The issue ultimately may be one of time and investment. The complex and ambitious set of ESRM concepts really require a much more elaborate framework of action over a longer timescale than was available in the 4C Project to do them justice.

### 3.2.2 Overview of Input

Having begun the description of community input on a rather downbeat (though realistic) note, there is also evidence that the ESRM was received positively by the community; that it makes a unique and useful contribution to the literature on digital curation; and that there are multiple use cases for it and ways that it can join up with other resources and be of practical benefit.

For example:

- An early piece of feedback from managers at the National Library of the Netherlands: "*This could be a really useful strategy exercise for us to do across the organisation*".
- One of the self-assessment questionnaires featured the comment: "[It is] *a good framework for priming organisations about the issues and what to think about*."
- A member of the Nestor Costs Group said: "*Not every organisation needs every preservation service. Choices need to be made and the ESRM might be able to help them make those strategic choices*."

Multiple other remarks made verbally, via Twitter or relayed anecdotally reveal that the Model made a positive impression on people and that there was engagement with its purpose and positive curiosity about its potential value. It is also particularly encouraging that the model is being looked at and evaluated from an academic perspective. It is being used for graduate level teaching by people unconnected to the project. This fact emerged from two separate conversations with members of faculty at the University of British Columbia and the University of Toronto.

In general, however, the input throughout the engagement period might be characterised as:

- Occasionally positive;
- Often passive in that people engaged with the questionnaire or with component definitions but just ignored and did not comment on the parts that confused them or weren't relevant to them
- Often constructively critical—which is unsurprising bearing in mind that most instances of engagement were framed as opportunities to critique and improve the model
- Very occasionally strongly negative

The critical responses were quite often questioning in nature (e.g. *I don't understand x, what does y mean?;* or *why does x belong in section z?*).

Although the responses and notes on the returned questionnaire forms can sometimes be attributed to individuals, mostly the forms are anonymous. The overall record of community input is quite a patchwork of sources and rather impressionistic. Much of the feedback was mostly verbal or informal (for example tweets). Other input was often recorded from notes written down in the course of discussion so they are not strict quotations but rather interpretations of opinions or comments. Appendices A.2 and A.3 feature the detailed engagement notes and it will be immediately apparent that they are relatively unstructured.

The general approach taken is not to attempt to attribute views to particular individuals but to just relate comments to the broad context in which they were expressed.

### 3.2.3 Summary of Detailed Input

The detailed and sometimes fragmentary and inconsistent notes from the discussions around the model are set out in appendices A.2 and A.3. They are a mixture of reported opinion, summary and developmental notes, and are divided into community input in Appendix A.2; and project and 4C Advisory Board input in Appendix A.3.

Some of the more important themes that either recurred as points raised or were expressed most strongly and most plausibly by commentators are summarised below. No distinction is made in this summary between comments raised by the community, by members of the 4C project team or by members of the 4C Advisory Board.

**"The purpose of the model needs to be clearer and more practical"**

There were a range of reactions to the model but one that emerged on a number of occasions was to ask what the next step would be after using it. Some suggested building services on top of the questionnaire component such as: a recommender platform for digital curation services; an alerting service for sustainability threats; or a report builder. But it was clear that some users would benefit from more explicit instructions or guidance about why the model helps with sustainability planning and what it might be possible to do with the ideas that emerged after engagement with it.

Similarly, questions were asked about whether the user was benefiting from responding to the model or whether the 4C Project was attempting to benefit by gathering sector intelligence. This profoundly missed the point of the exercise but was an interesting perception nonetheless.

Another point raised was the need to acknowledge that 'perfect sustainability' is an unrealistic concept. The existence of a 'model' might imply that perfect adherence to it could lead to perfection. It was suggested that the model needs to present itself more as a tool for repeated use and to emphasise its practical rather than theoretical value.

**"More user guidance is required"**

The model provoked a lot of questions not only about its purpose but also about its component parts. In particular how users should go about trying to map their local ways of working and their own terminologies onto the language and categories set out in the ESRM. Some users found the structure of the questionnaire problematic and did not understand some of the questions.

**"The model doesn't map well onto all working domains"**

Some comments indicated that the ESRM seems 'repository-centric', meaning that the model appears to be designed around quite a specific type of managed information environment. Also, it was suggested that the Sustainability Lifecycle component appears to address a pattern of public grant-funded type activity and some additional explanation would be useful to make it more relevant to industry and business.

There were different expectations around language and some fundamental domain translation problems around some words, most notably 'curation' which is not a term that is necessarily used across industry (and definitely not in the pharmaceutical domain). There was a suggestion that tailored versions of the model for small and large organisations and for different domains and accounting practices and for various regions or countries might be helpful. Whilst this undermines the whole purpose of trying to

define a generic model, it is a useful indicator that either some users have trouble seeing the problem that the ESRM sets out as a generic issue; or that the ESRM is insufficiently generic in its approach.

**"The terminology and definitions need more attention"**

Unsurprisingly, this is the area that prompted most questions and is where users find themselves trying to work out their alignment (or mis-alignment) with the model. Some fundamental questions were asked about the nature of the resource. Why is it called a 'reference model'; why is it called an 'economic model' if it doesn't help the user to tackle questions specifically related to the economics of sustaining assets?

Both of these are important questions but they say a lot about the engagement process and the focus of the majority of people who attended the 4C workshop and focus group events. Mostly practitioners, their stated preference was often for action rather than theory. The economics-related messages contained within the main body of the original ESRM text were easily lost when discussions took place based upon the condensed presentational material.

More specifically, there were questions about the focus of the model and what type of sustainability was at its centre. Is the purpose of the model to sustain the 'economics', the 'investment', the 'value', the 'digital assets', the 'curation services', some of these things, or all of these things? Even more specifically, some of the language needs tightening up. References to 'collections' are not universally relevant and even the distinction between 'digital assets' and 'digital liabilities' is not recognised by everyone. Some of the attempts to quantify various values using the notion of 'sufficiency' will result in unhelpfully subjective responses.

Others questioned the overlap between sections of the model and asked for clarification about why, for instance, 'organisation' was categorised as a 'sustainability condition' and why 'processes'—which were surely integral to an organisation—were described as a 'key entity'. More explanation is required about the criteria for categories in the components of the model.

**"Senior managers are unlikely to engage with the model without mediation"**

This thought was expressed by various stakeholder who questioned the time it would take for senior managers to engage with the model text and to understand the references to digital curation. There was a feeling that the model would inevitably either be picked up in the first instance by practitioners; or its first use would be delegated by senior managers who would want to hear some insights before spending time engaging with it. Either way, the model must first be seen to be useful by practitioners, who would then need to work with senior managers to realise value from it.

**"There is not enough acknowledgement of organisational context"**

This theme is one that emerges across the whole spectrum of work that the 4C Project has conducted over the last two years. The organisational context within which stakeholders work and the variety of local procedures, policies, terminologies, technologies and legislative apparatus makes it extraordinarily difficult to convince people that their problems are (usually) not unique. This is as true for the ESRM as it is for defining costs models, risk models, business models or any other model that attempts to define practice in a generic way.

Suggestions from stakeholders on this theme focused particularly on including concepts into the ESRM about levels of organisational maturity and the scale at which organisations were working; as well as the quality of curation processes that were required. It was also suggested that more effective organisational profiling information was required as supporting documentation for any output from the model (for example a sustainability report or action plan). Also the role of the person engaging with the model—

such as practitioner, strategist, funder, and so on—was an important determinant on the outcome of any engagement.

**The Value Problem**

Probably the most contentious and problematic single conceptual component in the model is 'value'. Value is a fundamental building block for sustainability but it can be determined in many different ways and can be attached to many other entities and concepts. It is potentially a highly personal judgement and is enormously dependent on organisational context, the stakeholder environment and how those stakeholders interact with, or what they expect from, the assets in question.

There were many questions about how the ESRM dealt with the concept of value and even a suggestion that if an organisation was already comfortable with the criteria it was using to judge the value of its digital assets and its curation services, then using the ESRM was a redundant exercise. In general, it was felt that 'value' as defined in the ESRM needed to allow for different types of value. Not only actual value—a demonstrable 'return on investment'—but also intangible value, potential value, cultural value and various other perspectives including the value achieved by avoiding the cost of loss. It was also suggested that the term should be defined in relation the notion of 'benefits' which would allow the relationship to be explored between 'value' and the modelling of costs and benefits.

**"Where and how does the ESRM join up with other resources?"**

At various times, questions were posed about what foundations the ESRM builds on, what validation does it have, where does it join up with other tools or standards, and how does it link strategically to policy initiatives? Some of this is more or less apparent depending on how far down into the text of the ESRM the user is prepared to go. At a base level, the ESRM builds on the BRTF work, which gathered together a large group of experts in economics and in digital curation/preservation to arrive at a set of broad conclusions. However, other than a stated ambition to provide a candidate model that could potentially become a standard model for sustainability planning (in the same way that the OAIS model (ISO 14721) has become a standard model for preservation planning), the ESRM does not currently explicitly declare or depend on links with other resources.

**"There are some things missing or not as visible as they ought to be in the model"**

There was surprisingly little discussion amongst community users to try and dismantle, rebuild, re-order or rename the fundamental components of the model. In contrast, this urge came through more strongly in 4C consortium discussions and amongst advisory board members. Even so, there appears to be a general consensus that the approach taken to designing the component parts and the way that they relate to each other is both plausible and useful.

That said, three concepts were mentioned by users that did not appear to have sufficient exposure, either because they did not have their own discrete named place in the model, or because there was too little focus on them in the explanatory text. The first of these is the activity of 'outreach and marketing'. Quite a few users emphasised this as being critical to the sustainability of their digital curation activities. The second was the whole area of skills and skills development which is not really visible in the model. The third is the concept of 'innovation' and what a disruptive effect it can have on the lifecycle, the processes and the assets within an organisation. Arguably the last of these can be included into 'uncertainties'. However, for some organisations, there is an expectation that innovation is part of maintaining competitive advantage. From that perspective, it is not so much an 'uncertainty' but part of their strategy.

# 4 Issues Addressed

The point of going out to the community and asking their opinion about the ESRM was to try and integrate the useful input received back into the model to make it a better and more relevant resource. As explained earlier, the decision the 4C Project took towards the end of the community engagement period was that there was good reason to devise a new sustainability model in order to try and address the stakeholder issues that emerged. Happily though, it also afforded an opportunity to design a model that drew upon and linked to other 4C work, in particular work on costs and benefits modelling.

The Digital Curation Sustainability Model (DCSM) is the resulting model and its debt to the ESRM is quite clear from the structure that they have in common and the fact that almost all of the high level components are the same or similar. There are some important differences though and some significant shifts in terminology. One key change at this high level is the swapping out of 'processes' as one of the key entities and its replacement with 'organisation', which transfers over from being a 'sustainability condition'. Another key shift is the change of language in reference to the Key Entities and the Sustainability Conditions. The DCSM swaps those terms for Sustainability Context and Sustainability Variables respectively. The DCSM graphic representation is in Figure 3 below.

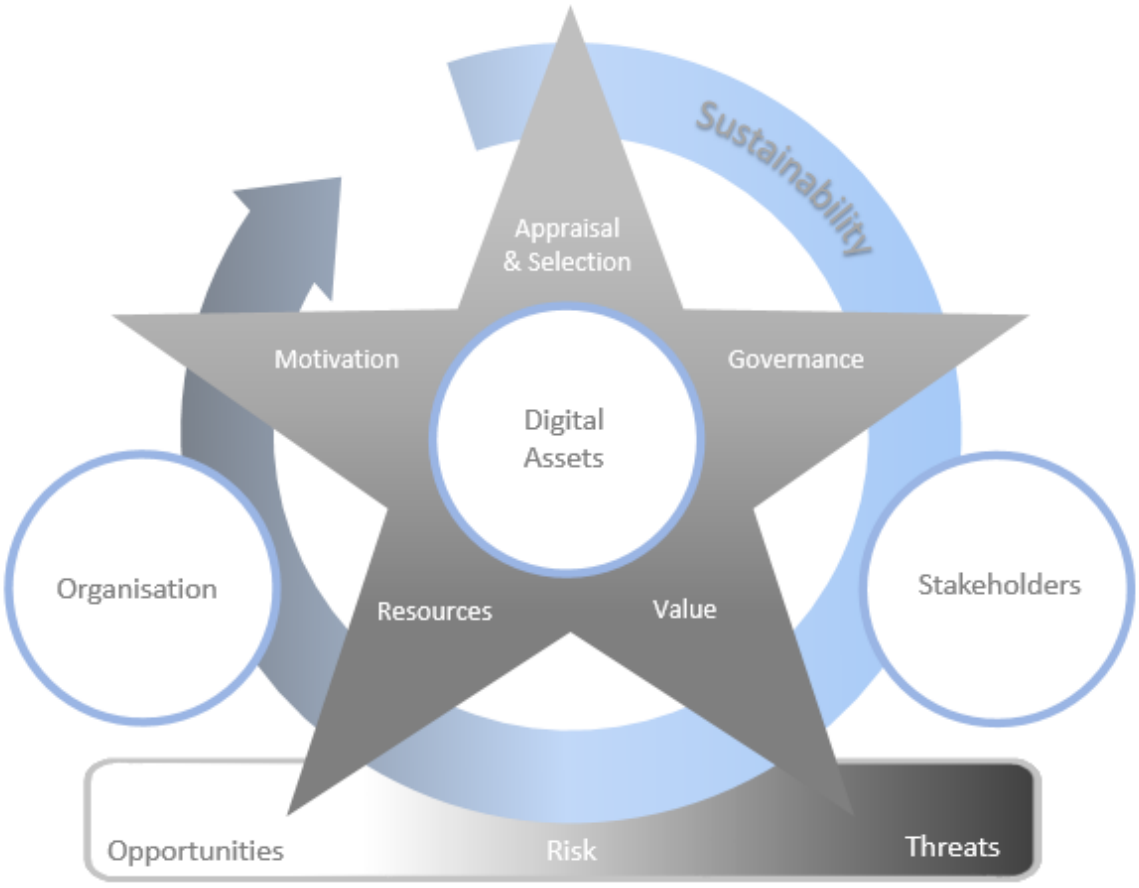



*Figure 3—The Digital Curation Sustainability Model*

The following section sets out in a bit more detail how the DCSM attempts to address many of the issues that emerged from the community consultation around the ESRM.

## 4.1 Issue and Response

| Issue (ESRM) | Response (DCSM) |
|---|---|
| **General Feedback** | |
| The ESRM as presented by the 4C Project only has a weak connection with economics and economic modelling. It should therefore be called something that more accurately reflects its content and concerns. | The final version of the Model as an output of the 4C Project will be a forked version of what was previously called the Economic Sustainability Reference Model (ESRM). The status of the ESRM text is currently *pending review* and the new forked version of the model is called the Digital Curation Sustainability Model (DCSM). It has been developed to take account of the input from the public consultation and the knowledge emerging from the 4C Project. The DCSM is a version of the ESRM but has a different narrative, introduces alternative graphical elements into the main body of the model, and changes some of the component headings. |
| The ESRM text is long and dense and is unlikely to be read by managers who are its intended audience. | The text has been almost entirely re-written. It is still quite long but it now acknowledges that management engagement is likely to be through practitioner mediation and the text is now more focused on practical action. |
| The ESRM text needs to engage the user straight away and move briskly through its structure. | Care has been taken to try and ensure that sentence construction and language in the DCSM is accessible and concise. The model includes graphics to try and enliven the text. The sections have also been re-ordered to try and make the sequence more coherent and methodical for the reader. |
| There is too much pre-amble and the model doesn't need to declare so much of its provenance. It needs to be a practical rather than theoretical resource. | The shift to DCMS removes the dependency on the economic basis of the ESRM and its reliance on the BRTF work and helps the focus to shift towards practical guidance. |
| There should be some cross-referencing to other models and standards. | The DCSM aligns with other 4C project modelling activity that has links with other standards (such as. OAIS, TRAC, DSA) and cross domain approaches (such as Business Model Canvas, ISO 31000). |
| Its purpose as a 'reference model' rather than simply a model is not apparent. | The DCSM is not a 'reference' model. Its principal purpose is to start discussions rather than define best practice. |

| Issue (ESRM) | Response (DCSM) |
|---|---|
| **The Self-Assessment Questionnaire (SAQ)** | |
| The wording and meaning of the SAQ is unclear and/or confusing in various places. | The self-assessment questionnaire as a formal appendix of the model has been deprecated in favour of 'example questions' that are meant to assist the user with formulating their own questions. This is an acknowledgement of the difficulty of devising relevant and understandable questions across a diversity of work domains. The original questions have been scrutinised and amended. |
| The structure of the SAQ should factor in the dependencies between the questions. | The formal structure of the SAQ has been replaced with a more informal list of 'example questions'. There is no longer an expectation that the user will try to methodically work through a set of questions laid out in a table. |
| The 'issue levels' are difficult to use and the level 5 (unresolvable) category is unnecessary. | The structure and mechanism of the SAQ has been left up to the user of the model. The example table that describes the use of 'issue levels' excludes the level 5 (unresolvable) category. |
| **Definitions & Terminology** | |
| There is insufficient definition of some of the key terms, for example curation, sustainability, value, efficiency. | Some of the key terms are set out with formal definitions in DCSM Appendix 1. Some questions that were likely to prompt entirely subjective responses have been removed. A section on 'value' has been inserted to flesh out and better define the concept in relation to the DCSM. |
| More breadth is required in the definitions to take account of sector differences. | Various acknowledgements of sector differences and the impact they have on modelling are made throughout the text. |
| Some of the language (especially the word 'curation') is not relevant (and is therefore off-putting) to some sectors. | Particular acknowledgement has been made in the text to the input received from the 'Industry focus group' where it was established that the term 'curation' is not universally used to denote job roles. Some changes to component headings have been made to try and make terms more relevant. (for example selection and *appraisal*; *motivation* instead of incentive). |

| Issue (ESRM) | Response (DCSM) |
|---|---|
| References to economic terminology are an unnecessary distraction in some areas. | The DCSM does not refer to the BRTF work in the same way as the ESRM and terms such as 'derived demand', 'free rider', and 'depreciable durable asset' are not present in the DCSM model text. |
| **Why use the Model?** | |
| It is not clear to some people what the outcome of engaging with Model is (for example 'why am I doing this … what's in it for me?'). | The section on 'why use the model' sets out three clear reasons for using the model.<br>1. To align understanding<br>2. To prepare for business modelling<br>3. For sustainability planning<br><br>'How to use the model' also suggests ways of using the outcome . |
| It is very ambitious to try and specify a generic model (and a related SAQ) that is genuinely cross-domain relevant. | The DCSM restates its purpose not as a 'reference' model, but as a less ambitious attempt to facilitate discussion and provide suggestions for ways forward. It also makes clear acknowledgement of the diversity of practice across domains and the challenges of being universally relevant. |
| There should be some output or related service that delivers some more tangible benefit from engaging with the Model. | Designing or building services is not within the remit or scope of the 4C project work. Some suggestions are made in the text for ways of taking forward the information that emerges from engagement with the model, but it is made clear in the text that the user will need to take the initiative to further realise benefits. |
| **Who is the Model for?** | |
| It is difficult for operational staff to answer some of the strategic questions that are implicit in the Model. | One of the principal reasons for forking the models was to accommodate new text that would be of increased relevance and utility to operational staff. The DCSM has an enhanced focus on describing practical actions that improve prospects for sustainable assets and services. |
| It is currently difficult for managers to engage with the Model. | The changed structure, the inclusion of graphical elements, the increased focus on practical implementation, and the explicit declaration that engagement with the model may best be achieved through discussion with operational staff is all designed to foster management engagement. |

| Issue (ESRM) | Response (DCSM) |
|---|---|
| The Model is largely redundant for organisations that have mature processes and a clear and agreed value proposition for their digital assets. | There is an acknowledgement in the text that organisations who are operating at a high level of maturity will use the DCSM in a different way to less-mature organisations. The model can be used for updating strategy as well as devising it and maintaining prospects for sustainability is an ongoing task. The DCSM should have something to offer all organisations. |
| There is no guidance to indicate what sort of information management environment the Model is relevant for. | The feedback suggested that the ESRM was 'repository-centric'. There is nothing in the DCSM to indicate that the model is anything other than agnostic about the type of platform or system that digital assets might be held in, or indeed their format. The definition of 'digital assets' in the Sustainability Context section is very broad. |
| The Model appears to target a specific type of repository (open, public sector, grant-funded) and other types (dark archives, business data) aren't a very good fit. | The question of dark archives not being a good fit because they do not realise value through use is countered by the concept of *actual value* and *potential value*. The data in dark archives is there because it *might* be used, so the stated value mechanism is still valid. The DCSM makes an acknowledgement of the concerns of business data and records and references ideas about the 'cost of loss' and legislative compulsion. But at some level, the DCSM has to aim to be generic and there may be a limit to how much it can be all things to all sectors. |
| **How to use the Model?** | |
| The text is difficult to engage with on its own and having the SAQ in an appendix or as a separate paper exercise isolates it from the explanatory text. | The DCSM integrates example questions in with the main body of the text. The appendices now serve a different function and the model text has been almost completely rewritten. |
| The SAQ is difficult to fill out, takes quite a long time and needs a practitioner and a strategist to do it. | The onus is now on the user to design their own questionnaire and customise it to their own requirements. It is acknowledged that the model is best tackled through collaboration between a practitioner and a strategist. |
| Choosing a level of granularity to answer the questions is difficult. | The DCSM puts more emphasis on choosing the right approach for the user's sustainability context. |

| Issue (ESRM) | Response (DCSM) |
|---|---|
| More guidance is needed about answering the questions. | There is no longer a prescribed form of questionnaire. |
| All of the sections should have related questions. | Example questions are offered for all sections. |
| All of the sections should have a change over time column. | This is now left up to the user to include in their customised questionnaire if they feel it would be useful. |
| There should be different versions of the Model for different stakeholder groups. | There is an acknowledgment in the text that different domains have different requirements, but there is a limit to how flexible a generic model can be. Customising the questionnaire may help to address this issue. |
| **The Structure** | |
| The model should be amended where necessary to accommodate different components and should not be dictated by the current graphical layout. | The 4 high level components appear to have been accepted as a useful framework (they were not identified at any point as problematic). Splitting the Sustainability Context into 3 components and the Sustainability Variables into 5 components remains valid and the graphic has been updated to ensure that assets feature in the middle of the model (to reflect their central conceptual importance) and the risk section is separately displayed. |
| **The Economic Lifecycle** | **The Investment Lifecycle** |
| The lifecycle does not seem to represent commercial funding or budgetary cycles which may be prone to quarterly review. | It is difficult for a generic model to accommodate all domain variations, but the cycle purposefully depicts a trigger point in the simplest possible way (a gap in a circle) to allow users to interpret the nature and frequency of the gap as broadly as necessary. |
| Some archives have a remit to store assets forever and there is no endpoint. | The text makes it clear that the decision point and trigger for considering how to cross the sustainability gap can be a number of different things—including technical issues. Even if an archive has a perpetual remit and a steady and reliable flow of funding, it is unlikely to never encounter technical sustainability issues or problems around understanding legacy assets. |

| Issue (ESRM) | Response (DCSM) |
|---|---|
| **The Key Entities** | **Sustainability Context** |
| Because assets are heterogeneous, it doesn't necessarily mean they are chaotic to manage (question 3 in the SAQ) | This text has been removed. |
| Assets should be referred to as 'digital assets' so as to avoid confusion with physical assets | Assets are referred to as 'digital assets' in most areas of the text |
| **The Sustainability Conditions** | **Sustainability Variables** |
| Value must be defined by the organisational context and its objectives. | The concept of 'value' has been flagged up in various places in the DCSM as the critical underpinning component of sustainability. The text as a whole features much more focus on 'context'—including the re-naming of Key Entities to 'Sustainability Context'. |
| The concept of 'sufficient value' is too vague and subjective to be useful (question 13 in the SAQ). | The subjective phrases in the example questions have been removed. |
| 'Efficient use of resources' is too vague and subjective to be a useful gauge (question 22 in the SAQ). | See above. |
| 'Selection' questions (questions 25-28 in the SAQ) need re-drafting. | Questions have been redrafted. |
| **Uncertainty Factors (Risk Management)** | **Uncertainties (Risk Management)** |
| There is a very large body of well-established literature on risk and the ESRM doesn't need to duplicate any of it. | The risk section has been reduced to some bare essentials about risk response and focuses on practical examples of risk mitigation and planning for uncertainty in the context of the sustaining curation assets and services. |

*Table 1—ESRM issues vs. DCSM responses*

# 5 Conclusions

The purpose of this report has been to give an account of the engagement, input gathering and evaluation activities that have occurred in relation to the ESRM. It should be apparent from the amount of opportunities that were arranged and the nature and scope of the feedback received that this was a substantive attempt to try and embed the ESRM as a resource worthy of wide community attention and a model that could be built upon in future to assist with sustainability planning.

Whilst the level and degree of seriousness about community engagement on the part of the 4C Project is (hopefully) evident in the report, the more interesting conclusions arise from the nature of the input itself and its impact on the future development of the model. It has become clear throughout the consultation that the current version of the ESRM[10] has not prompted a readily-identifiable and pro-active set of potential users. ;. On the other hand, the ESRM has been a very useful engagement mechanism for the project (and also a useful conceptual object in relation to other modelling activity).

As a take-away from this work, it may be tempting to conclude, therefore, that the ESRM is unlikely to make much more headway with the community. That may be a mistaken conclusion. The ESRM text deals uniquely with sustainability from an economics perspective. However, it was not possible to present this aspect effectively, concisely and relevantly to the stakeholders who signed up for the focus group and workshop meetings organised by the 4C Project. What happened in practice was that the attention of attendees (mostly self-identifying as 'practitioners' rather than 'strategists') was effectively diverted from the ESRM text onto the self-assessment questionnaire, which was itself derived from the text of the ESRM, but at the same time isolated from the (BRTF-driven) economics context. In due course, the ESRM will either find an audience and a development path or it will not—and there is some evidence to suggest that the model may yet find a role, perhaps as a teaching tool, or as an input to a future standard, or as a general strategic reference resource. The more significant outcome of this work from the 4C Project point of view is the opportunity that has arisen to fork the model and to create the Digital Curation Sustainability Model (see Appendix A.1).

The re-focusing of the ESRM and rewriting its text as the DCSM has allowed us to take the community input about the ESRM and to design something that is more focused on the sustainability discussion that needs to take place *between the practitioner and the strategist.* It has also enabled us to focus more closely on the dual elements of what is at the heart of the sustainability question from a practical perspective, namely: how to sustain the digital assets; and how to sustain the digital curation services (that sustain the assets). In addition it has allowed us to look at the sustainability model in relation to the other work of the 4C project and to align it with the costs and benefits modelling work (the 'Costs Framework') that has been done as part of work package 3. The identification of the 'curation service' component of every curation environment and the critical importance of the '[organisational/sustainability] context' are central concepts within that framework and they have been very influential in the formulation of the DCSM.

Having defined a new sustainability model, the question then arises, how valid is the DCSM and what are the prospects for wide community adoption and endorsement? Given that the funded period of the 4C

[10] A Draft Economic Sustainability Reference Model - http://4cproject.eu/ms9-draft-esrm

Project work is now at an end, these questions will not be tackled as part of this work but will continue in the context of community activity around the Curation Costs Exchange.[11]

The general picture that has emerged after two years of work is very much a confirmation of the idea that the community has come a long way since 2008 when the Blue Ribbon Task Force for Sustainable Digital Preservation and Access first defined its terms of reference and began looking in depth at the economics of digital preservation. The community that chose to come together and engage with the 4C Project did not want to talk about economics; did not want to wrestle with theory; did not really want to rearrange model components; and did not believe that senior managers or funders and investors would want to do this either. One telling comment made at the industry focus group was that the scope of the ESRM was "*in some ways too big and in some ways too small*".

It is probably fair to say that the preference of the majority of the community was for a resource that is practical, useable, compact and customisable. Whether the DCSM is any or all of those things or not (yet) remains to be seen but it has certainly been developed directly in response to user input and it is the ESRM work that has made gathering that input possible. The ESRM task has made a valuable contribution to the 4C project work and has made a novel and potentially important contribution to understanding sustainability issues and joining them up with issues relating to the costs, benefits and value of digital curation.

[11] Curation Costs Exchange – http://www.curationexchange.org

# References

[1] BRTF-SDPA. (2010). *Sustainable Economics for a Digital Planet: Ensuring Long-Term Access to Digital Information*. (A. Smith Rumsey, Ed.). San Diego. Retrieved from http://brtf.sdsc.edu/biblio/BRTF_Final_Report.pdf

# Appendices

## A.1 Appendix 1—The Digital Curation Sustainability Model

# The Digital Curation Sustainability Model

## Introduction

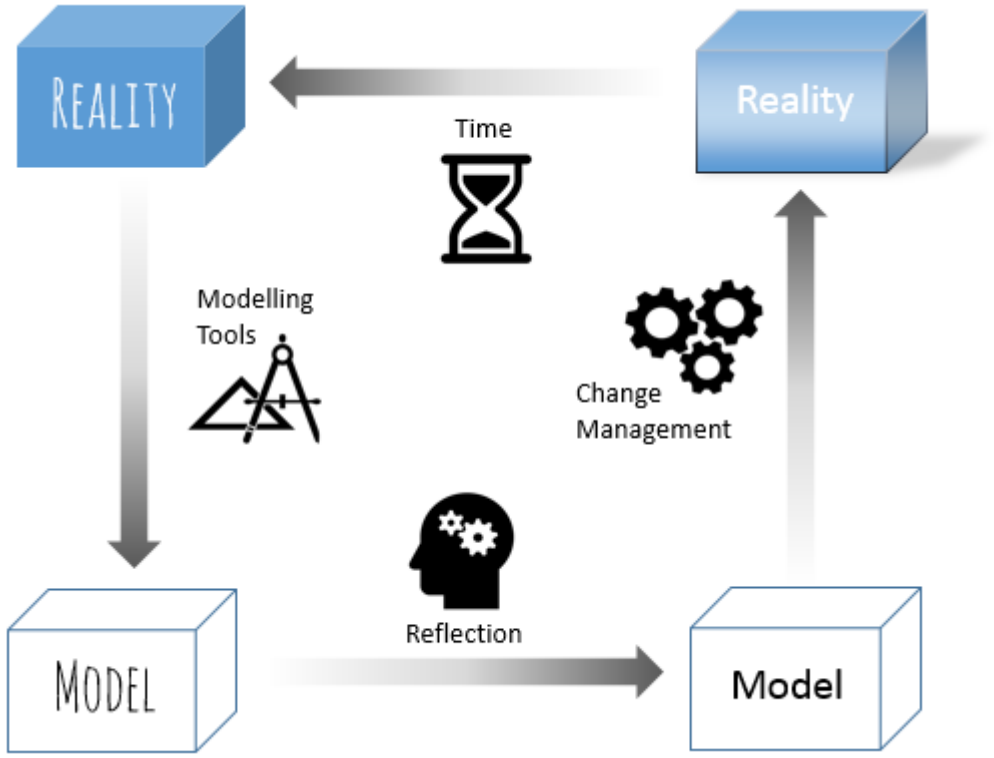
The purpose of the Digital Curation Sustainability Model (DCSM) is to highlight the key concepts, relationships and decision points for planning how to sustain digital assets into the future. The core assumption is that *digital curation* is the principal active means to achieve this and that understanding 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 resources* [12]

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.



[12] 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 practice*[13]

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

[13] 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 mangers) 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.

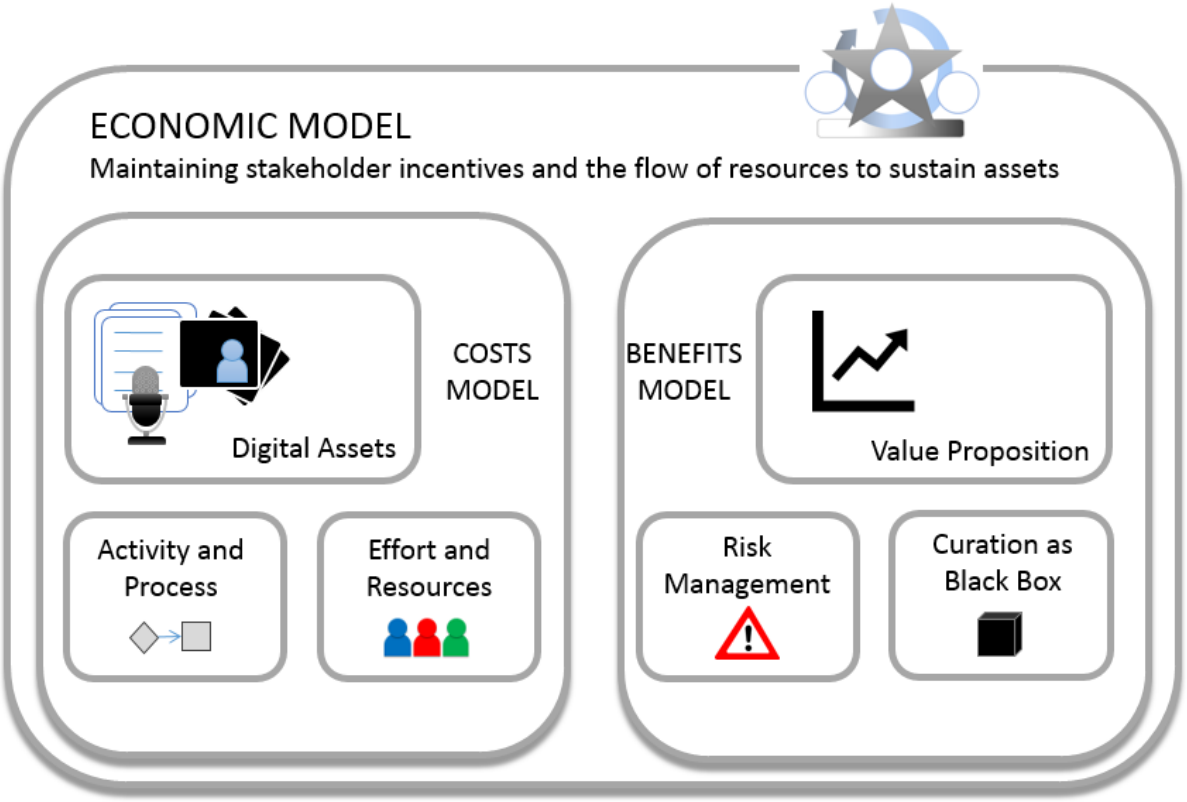
## To align understanding

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.[14]

## 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 around 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.*[15]

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

[15] 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.[16] The BRTF and the subsequent work to develop an Economic Sustainability Reference Model (ESRM)[17] 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 work[18], it also has links with other resources developed by that project and can be used in conjunction with them[19].

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.

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

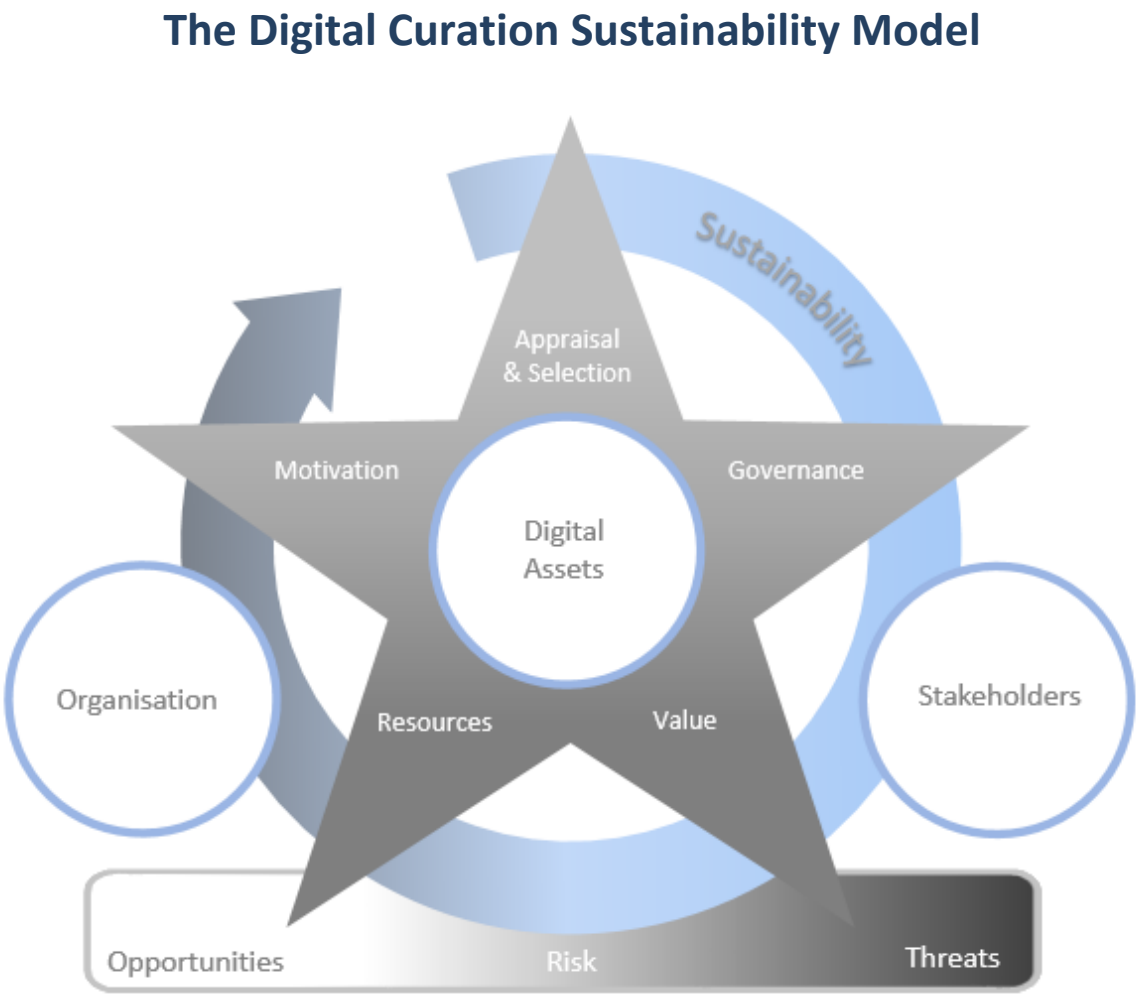
[17] For a discussion of the provenance of the DCSM, see the *Acknowledgements* section x.x

[18] 4C Project (A Collaboration to Clarify the Costs of Curation) www.4Cproject.eu

[19] 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:

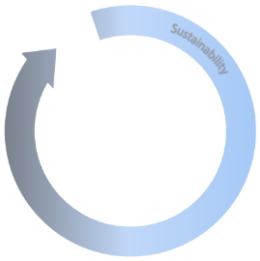
4. Use the conclusions and the any proposed actions as the basis of a sustainability report and/or an action planning document.




*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.

| | |
|---|---|
| ***The 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. |  |
| ***The 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 |  |
| ***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. |  |
| ***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. |  |

*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.

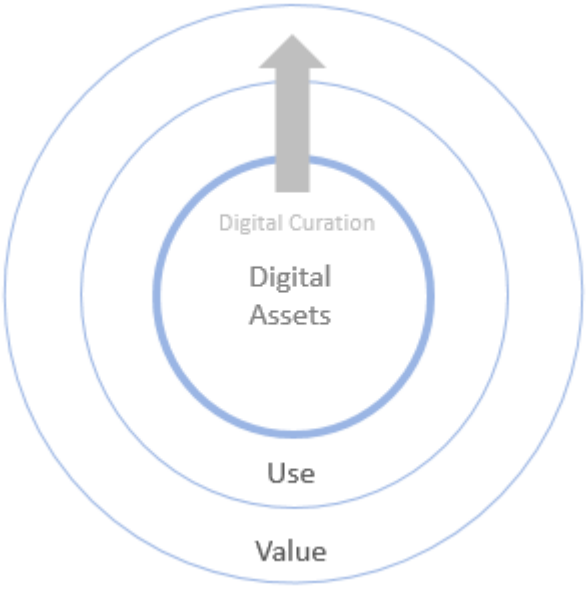

*DCSM Figure 5—The Sustainability Context*

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. I 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)

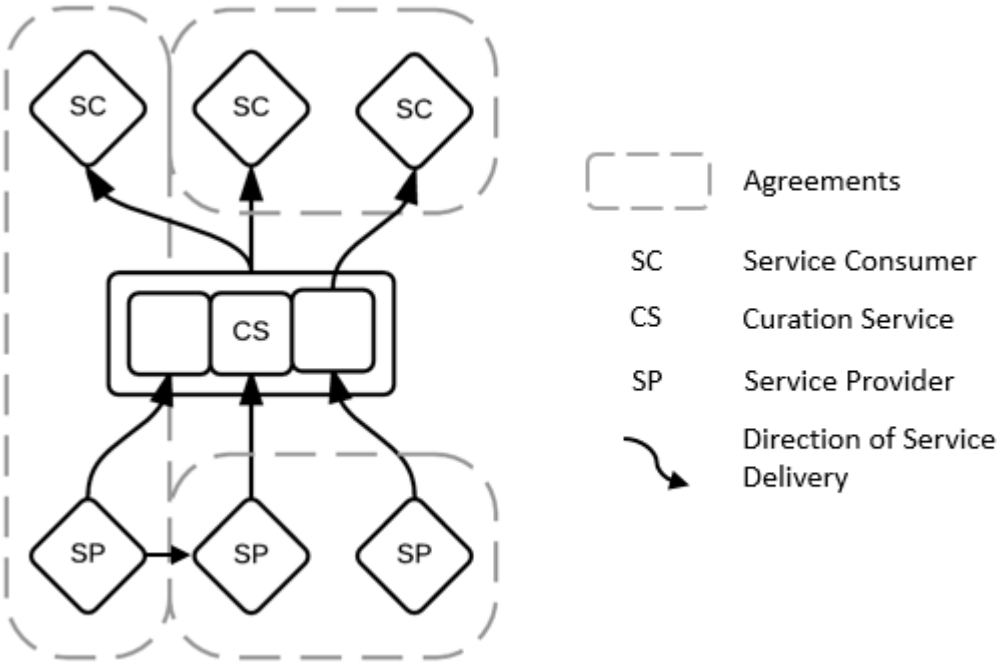
- Are the mission and objectives of the organisation set out clearly?
- Are the mission and objectives understood by those responsible for sustaining the digital assets?
- Is the organisation reliant on sustaining digital assets to achieve its business objectives?
- Is it understood that digital curation 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 7sets 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 strategy[20]. 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

[20] 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.

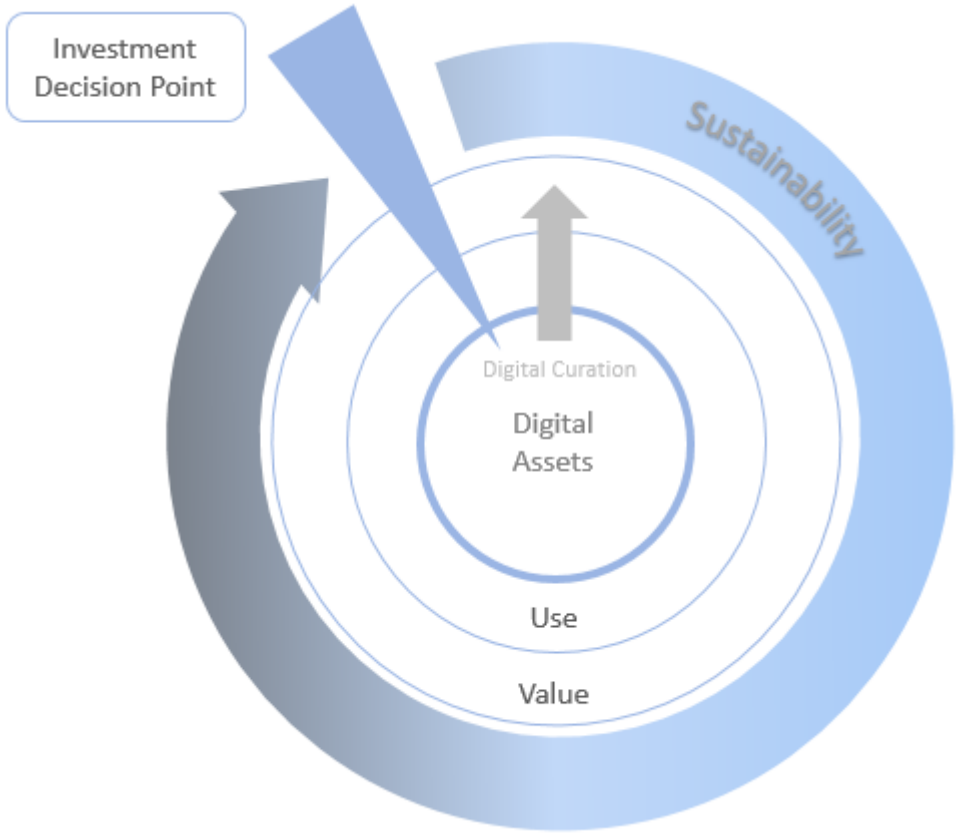
### Example questions for Sustainability Context (Stakeholders)

- 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 view[21]. 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.

[21] 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 modelling[22].

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).

[22] 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 approprite 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 reference[23].

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

[23] 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 treatment*[24].

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 DSCM 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

[24] 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

# Authorship and Acknowledgements

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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 1are 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

# 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? | *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!* | *Make sure that the scope and the extent of the problem is understood across the organisation. Action—Write a briefing paper.* |
| 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<br>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*

# A.2 Appendix 2–Community Input on the ESRM

**Jisc Sustainability 16/11 Programme meeting**

- Alerts to take action as a result of using the model would be useful
- Something similar to TIDSR (Toolkit for the Impact of Digitised Scholarly Resources) for sustainability would be useful
- Sustainability (as a term) needs to be unpacked and defined

**IPRES 2013 Workshop**

- How does my organisation benefit from knowing about the IED's and the ESRM?
- Need to acknowledge that the question may not apply or that in public organisations the degree of control we may have to change things is very limited
- There are open questions that need tightening in the questionnaire
- Is it necessary to have 'issue level'?
- Managers won't sit down and do this on their own, it will require mediated engagement and more likely be an interview or a discussion
- The Model will be useful if it sharpens and focuses all the wisdom
- The purpose section needs to be clearer
- There is a lot of conceptual overlap between 'Organisation' and 'Processes'

**KB Meeting**

- Using the Model and the sustainability questionnaire looks like it could be a useful management exercise

**Feedback included on the Self-Assessment Questionnaire forms**

This includes forms collected after group activity at the IPRES 2013 workshop and the IDCC 2014 workshop plus a few additional miscellaneous forms.

- Because assets are heterogeneous—it doesn't necessarily make them chaotic and difficult to process (q.3)
- 'Sufficient value' is too difficult to answer. Value needs defining in the context of the *organisation* (q.13)
- The language used in the questions needs tightening up
- The references throughout should be to '*digital* assets' so as not to confuse with physical assets
- *Efficient* use of resources (q.22) is too densely loaded and q.23 and q.24 are not clear enough in their meaning
- Q.25 (Selection) needs re-writing
- Q.26 (Selection) contains a problematic reference to *value*. It is hard to establish the value proposition
- How is it possible to know whether there is 'sufficient flexibility' in the curation processes (q. 15, q.16)
- Value is a difficult question (q.18)
- 'Sufficient human resource' is too open a question (q.23)
- What is 'added value'?
- Outreach is a necessary (and missing) part of the model
- The stakeholder map needs to be re-drawn on a regular basis
- Do processes refer to practice/process *and* policy level? This is not clear
- How can we judge how 'efficient' we are being?

- 'Are functioning agreements in place to transfer funds' (Q.20) is a TRAC question. Might also refer to whether there is an exit strategy in place
- For mature archives, the questions are mostly irrelevant
- Answering 40 questions in the space of 20-30 minutes is not possible
- Extra questions at the start could include—organisation size, type, function of organisation, number of assets, employees engaged in curation
- The temporal change over time aspect should be extended to all the questions
- The structure of the questionnaire is difficult as some of the questions have dependencies (e.g. if no-one in organisation has accepted responsibility, then you can't do organisation questions)
- Further queries about the notion of 'value' and 'efficiency'
- The ESRM could be used as a teaching resource
- Some of the questions are badly phrased, difficult to understand by non-specialists and non-native English speakers
- There is no specific reference to the problem of proprietary formats
- It is important to know where the archive/DP function sits within the organisation
- There are differences in approaches between archival practice and records keeping and it is not clear what is being addressed
- The purpose and objectives of dark archives are not addressed by the questions
- Some respondents just use the number scores and some just write answers
- The MS9 version splits into 2 halves, the first half (key entities) can be answered by practitioners, the second half (sustainability conclusions), needs some strategic insight and some executive agency in order to give meaningful answers. This is not always possible
- What can we do with these responses? What is the purpose of the Model?
- It seems as if the Model is making assumptions about the nature of the organisation ("This is rather confusing to fill out")
- Choosing the level of granularity to answer the questions is difficult.
- For people who have decided the value criteria of their assets already, the whole exercise is possibly redundant
- Do the issues levels relate to the question or the respondent's situation
- "You are gathering this for your research purposes; what do I get back for providing the data?"
- The Model would make a good consultancy resource for going into an organisation and doing a type of audit or review
- Outreach is an important component in sustaining the assets
- The issue level response options are very difficult to apply to the questions (do they mean this is a problem—or that this is important?)
- The notion of '*demanding*' access is not liked by various respondents

**Industry Focus Group Meeting**

- Return on investment is only one kind of benefit, another is compliance to legal obligations, or avoiding the cost of loss (financial loss (fines), reputational loss, loss of licence to operate)
- The term 'curation' was not widely used in the business context. Words like continuity and lifecycle were perhaps more common
- The ESRM lifecycle is very 'repository-centric' and the decision points identified would be too late for the aerospace industry. Tools are considered upfront when the sustainability criteria are already known. Cost of changing tools half way through a project too expensive
- Pharma data is 'inspection-ready' from the moment of creation so it is unlikely that the data needs added value through curation. There is a kind of top-down pressure in some industries that skews the notions of sustainability

- Archives can have their own lifecycle which is different to an asset lifecycle. Some organisations archive things forever and there is no endpoint (BBC, British Library)
- There is a difference between expecting to sustain the archive and expecting to sustain the data through migration between various services over time that manage the data on your behalf. These two approaches represent different costs
- The data can be both a liability and an asset, it is hard to tell what it is when it costs you money to keep but you'll get fined if you don't. It would be an asset if you could make more money from it than it costs to keep it. In general, it's easier to build a strong business case emphasising positive outcomes
- The checklist should contain a section on uncertainties
- More guidance required around the questionnaire
- Some manipulation was required to make certain concepts fit with the ESRM context. Value (again) was problematic. There can also be threat in having to keep the asset from the point of view of litigation.
- Value also depends on quality
- Cost and value seem to be used interchangeably and that is wrong. The value section needs to allow for different kinds of value
- Practitioners would be willing to engage with the assessment as long as the results for their customers/users were clear. So it needs to be more focused as a type of self-assessment/audit process that allowed for organisations being at different stages of 'the process' (organisational maturity)
- Assets—manageable formats is contextually dependent—you can make the assets available in the format that you want. Many organisations end up with orphan works, orphan software. The homogeneity of formats is not necessarily a problem for larger organisations which work at big enough scale to batch process most formats
- Stakeholders—'curation role' not necessarily used in industry (definitely not in pharma). 'Curation' and 'ecosystem' together was a metaphor too far (museum/ecology)
- Who you are as a respondent is going to influence the way you go about the self-assessment
- Processes—emerging tech influences curation and vice-versa. Adoption has to be done with confidence—it's a big risk. If curation can't adapt—is it curation?
- Resources—there is a lot of work involved (and hard-to-justify investment required) in securing resources. Not just financial resources but also intellectual resources, skills, expertise. The human capital component deserves a separate question. The cost of getting correctly skilled people is significant—particularly for small businesses
- Selection—agreed that this is one of the most difficult aspects of digital curation. You never know when you have enough information to make a decision. Could be a question asking whether users know what the cost of selection is. Does it outweigh the cost of not making a selection?
- Organisation—policy is what—procedure is how. Questions should be the former rather than the latter. This area should deal with the question of reliability.
- Incentives—There is a difference across types of organisation. Some archives do what they have been established to do and aren't particularly user-facing. Commercial companies sustain data for known business reasons. There may be quite a divergence of reaction to this question
- General—it is not sufficiently that the Model requests that you will need to split things up into collections, it might be that things have to be split into cases, so that types of assets get dealt with and sustained in different ways: e-prints; sound, web archives. Maybe this is a type of collection but is probably thought of differently across different domains
- It was felt that in some ways the scope of the ESRM was too great, and in others too small. It is too complex for SME's. The complexity is acceptable for bigger businesses but in places it uses the wrong language

- More breadth needed in the definitions
- Tailored versions for small and large and different domains and accounting practices and country-specific?
- If the ESRM could emulate OAIS then it would be a good start and it would provide a *coherent story*.

**Nestor Costs Group**

- Not every organisation needs every preservation service. Choices need to be made and the ESRM might be able to help them make those strategic choices
- What results are possible from the Model? What are the outputs?
- Could the results of using the Model map onto a service recommender?

# A.3 Appendix 3—Internal 4C Discussion and Input on the ESRM

**4C Project Consortium (& Advisory Board) Input**

- It is important to be able to get an early understanding of the purpose and point of the model
- Perhaps split value up into 'intellectual' and 'commercial' value (use and re-use)
- Refer out to other resources (e.g. maturity models)
- Get rid of the 'and' statements within the questionnaire (i.e. normalise the questions)
- The questions may need to be answered by more than one person (operational and managerial?)
- There are a lot of models around—we will need to be careful to describe what this is (a meta-model?) and make sure it has a place and a function
- Regard the Model as a speculative piece of work and use it as an early community engagement mechanism
- There needs to be some connection between the 4C Project outputs (ESRM/DCSM, CCM, IED's, CCEx)
- How might the Model be validated?
- Organisation and Resources are conceptually overlapping and confusing
- The Model will need a lot of promotion to attract usage
- Need to check how industry understanding and usage of the Model is different to public sector organisations
- There are also links between the Model and the 4C Roadmap
- Focus of DCSM is less about the development of specific solutions and more about building framework, infrastructure, and adopting flexible approaches with emphasis on continuous maintenance and development
- DCSM may be able to help most with the 'cyclic data' produced at 'community' levels and maintained by 'regional' scale libraries and data archives and centres
- The Model should seek to help address the objectives set out in the 'Digital Agenda for Europe'
- The Model may need to take account of some other key pieces of literature on sustainability
- The nomenclature of 'reference model' is not important, the lack of clarity around the use of 'economic sustainability' is a much more significant obstacle to explaining the Model
- The focus of the user of the Model will be on their position vis-à-vis the assets they have particular responsibility for and their concerns will probably be practical, local and constrained in terms of available resources
- The Model should not foster a notion of some theoretical state of equilibrium where global sustainable curation is possible
- How would a user recognise that they had achieved economic sustainability?
- Most practitioners don't want or need to spend much time wondering about strategic directions and the value of their assets, they need to get on and do effective digital curation
- The 'margin of error' in the Model, or the amount of deviation from best practice that may be acceptable within an organisation is not apparent. Some deviation is realistically always going to be the result of any sustainability analysis / assessment / audit
- There may be some useful preparatory questions that can be posed and answered, e.g. how long is the current planning cycle; are the assets in my care likely to increase or decrease; staff numbers; likelihood of increased budget; how much does curation currently cost; how big is my preservation problem …?
- The concept of associating 'value' as an intrinsic property of a digital asset is problematic. It is unusual to find a domain where the monetary value of the digital object can be weighed against the cost of preserving it. The value of an object may not be apparent for a very long time and may never be apparent. In which case, there is no measureable value proposition (actual value). As

long as the object is curated, however, a theoretical value proposition can be said to exist (potential value)

- It is very difficult to make a business case for curation based on a perception that a digital asset will have value at some point in the future
- Unless there is a compulsion / obligation to curate, it will be necessary to articulate some more immediate benefits to resource providers in order to sustain curation services. The most obvious benefit is that if a curation service takes responsibility for a digital asset that currently has potential rather than actual value, it relieves others of the responsibility (and expense) of doing so. The value (of the asset) remains potential but the benefit (cost avoidance) is actual.
- There is some useful distinction to be made between value and benefit but it needs unpacking and explaining and more work is required to ensure that the implications of the definitions are valid to the wider community
- It would be useful to be able to unpack the concepts that link through the 4C Project outputs via the Curation Costs Exchange platform
- Sustainability planning (the five sustainability conditions) can feature in the Costing Framework which also features Organisational context (which maps with the Key Entities section); Risks / Uncertainties (which maps onto that section of the Model); and alongside 'curation objectives and strategies'; which ties in with the Curation Cost Model and concepts relating to Indirect Economic Determinants.

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- The Model has very little in common with the scope, function, purpose or detail of the OAIS model and it is not clear why the ESRM/DCSM should try and claim affinity with it or to similarly establish itself as a 'reference' model
- The OAIS model has many supporters but also has its detractors and there are pros and cons of trying to reference it to somehow validate the Model
- There are no economic hypotheses in the Model and it is unlikely to help financial officers within institutions to undertake financial planning (or to monitor income and expenditure which is more likely to be their principal role)
- It may, however, help to articulate and define roles and responsibilities and to align understanding within organisations about how digital curation needs to be a strategic rather than just an operational concern. The Model should therefore be re-named (The Digital Curation Sustainability Model—DCSM)
- The Economic lifecycle graphical component pointing to the potential sustainability gap is effective but the incomplete circle might more effectively be re-named the 'Investment Lifecycle' to emphasise the exact nature of what is at stake and the fundamental requirement (investment) that underpins the concept of sustainability
- Some of the rest of the structure of Model might usefully be amended.
- The initial focus on 'digital curation' at the heart of the model should be replaced by a focus on 'digital asset' and curation should indicate that it is the mechanism that pushes across the circles from asset into use, into value, into sustainability
- The Key Entity 'Process' should be exchanged for the more encompassing term 'Organisation' which would map better with the 4C cost and benefit model and the work being done in relation to the 4C Cost Concept Model where the 'Organisational Context' defines the same three elements
- 'Processes' can then be subsumed into 'Organisation' and the Sustainability Condition component that was previously labelled 'Organisation' can be rebranded to address the concept of 'Governance'. This is a component that is mutable and sits well amongst components that can be viewed through a digital curation lens

- ‘Incentives’ as a concept does not translate easily outside of the English language. ‘Motivation’ is a more universally understood word
- ‘Selection’ is not adequately descriptive or active enough in terms of the digital curation (and records/data management) processes it seeks to reference. ‘Appraisal’ is a term that is more commonly used in the domain
- The Model should be clear at the outset what type of organisation (at what stage of organisational maturity) is going to find it most useful. We shouldn’t try and reach stakeholders who don’t need to have the discussion
- The DCSM can be considered a pre-business planning resource. It is attempting to design a discussion for organisations that are either starting to work out their curation business model and their business arguments; or need to change entrenched practice. It is a ‘conversation-starter’
- References to an ecosystem should be avoided
- Some of the organisations 4C has talked to are much more interested in understanding their own costs rather than comparing their costs with others. It would be good to establish a stronger connection between the DCSM and how it might contribute to or lead towards effective cost modelling
- The sustainability components need concise and accessible descriptions
- Sustainability can usefully sit within a chain of actions, all of which are addressed by various parts of the 4C Project outputs (e.g. costs analysis, cost/benefit modelling, business modelling)
- It may be useful to strengthen the organisational profiling part of the Model, in order to flesh out the organisational maturity aspect of the discussion
- The final iteration of the Model comes at the end of the project and it is very late to use the DCSM to tie all the 4C concepts together
- There is also insufficient time to produce versions of the DCSM that can sit on the Curation Costs Exchange Platform (CCEx) that will satisfy emerging user requirements for more dynamic iterations of the Model and the self-assessment questionnaire
- The 4C Project has adequately scrutinised and referenced other models and standards and it is counter-productive for the DCS Model to compare, validate and record itself against other resources as part of the text of the Model
- Progress through the Model should begin with the Lifecycle, then prioritise the organisational context (Key Entities) as this is the key linking component with the rest of the 4C work
- The ‘Benefits’ piece in all of this could usefully be a discrete project