



Melody M. Madrid

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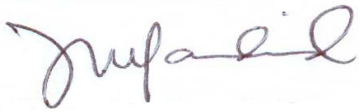
“A Study of Digital Curator Competences: A  
survey of experts”

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## The Declaration

I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has previously been conferred upon me.

A handwritten signature in dark ink, appearing to read "Melody M. Madrid". The signature is written in a cursive style with a large initial "M" and a long, sweeping underline.

Melody M. Madrid

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Lord, *maraming maraming salamat po...*

## **Abstract**

The aim of this research was to define competences for digital curators, and to validate a Delphi process in the context of Library, Archives, Museum curriculum development. The objective for the study was to obtain consensus regarding competence statements for Library, Archives and Museum digital curators.

The Delphi method, a research technique, typically used to develop a consensus of opinion for topic areas in which there is little previously documented knowledge, was used in specifying the digital curator competences in LAM context. Three rounds of questionnaires with controlled feedback with space for comments and/or suggestions were sent to panel members. Five point Likert scale was employed in the questionnaire. Consensus was determined when a competence statement received a mode higher than 3, an average mean more than 3.5, and a standard deviation smaller than 1.0.

Response rates for rounds I, II and III were: 70% (n=16), 87.5% (n=14), and 94% (n=15) respectively. Of the 18 digital curator competences listed in the first round questionnaire, 13 (70%) achieved consensus as being necessary digital curator competences required of advanced level digital curator. Other inputs of respondents like comments and suggestions were also analyzed. An additional 23 digital curator competence statements were also suggested by the panel in round I and further developed in subsequent rounds. In round II, 12 (30%) competence statements achieved consensus. The final round and editing of competence statements led to 20 statements that describe what a well-prepared digital curator trained to participate in digital curation work should be able to do.

**Keywords:** Digital Curation, Digital Curators, Competences, Delphi Method

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# Chapter 1

## INTRODUCTION

### 1.1 Motivation

The researcher's interest in digital curation competences stem from her background in her work in the National Library of the Philippines and her professional involvement in Philippine eLibrary Project. Both of which, is working on integrating various significant library resources of Philippine national, government, and public libraries, government higher education libraries, and research centers in a single portal. Their collection ranges from digitized objects of books about colorful Philippine history and culture in Pre-Spanish era to present day born-digital research papers of Filipino scholars and online resources or subscription to electronic databases. In collaboration with partner institutions, Philippine eLibrary also develops training courses in the field of digital libraries and other related work for library and information specialist in the Philippines.

In the Philippines, digital objects are being prioritized because of its limitless potentials. These objects are increasingly produced to secure the information needs of all Filipinos and to help preserve the precious Philippine rare manuscripts and other materials. While staying in Europe, the researcher saw and experience how digital libraries and other institutions are creating huge amount of projects supporting new methods and technologies for digitization and retrieval of various kinds of contents, from different institutions across Europe, in different languages.

But European libraries and other institutions acknowledges that there is a downside of this rapid pace of technological change, and that is the threat to long-term accessibility of digital objects. Therefore various research studies and collaboration projects for digital preservation and curation are being done to ensure preservation and availability of digital resources over time.

This prompted the researcher to be interested on this topic. How could these concerns, tools and methods for long-term access and preservation for digital objects be introduced in libraries, archives and museums (LAM) in developing countries? How can LAM professionals in the Philippines be competent in doing such an important job? This prompted the researcher to read literature on competences for digital curators in LAM context. This was the inspiration for this research into digital curation.

## 1.2 Background and context

The development of digital technologies has dramatically changed the way people create, access, share and store data. It had produced significant sets of data that promotes rapid improvements across many subject fields. These sets of data come in many different forms, for example, “the measurements recorded by environmental monitoring satellites, the products of collisions between fundamental particles, the sequences of entire genomes, the results of social science surveys and interviews, the annotated images of ancient Greek inscriptions or the annotated videos of innovative dance routines” (JISC, 2009:1). These data can be useful in other parts of the world now or can be a wealthy source of information for future researchers.

Libraries, archives, museums (LAM) is at the center of this digital innovation. LAM provides platform that allows the use of digital technologies in improving access of complex objects and enriching the experience users get from cultural resources. However, technological developments in LAM context bring not only new opportunities; they come also with corresponding challenges.

One of the challenges brought by digital innovation is that of digital curation, this is because if data are not properly curated and kept in well-managed data centers, they really do not have the potential to be accessible and reusable either now or in the future and that makes the very existence of LAM useless because it makes research a failure (Maidment-Otlet and Redfearn, 2010). Digital curation summarizes the different activities involved in making digital objects valuable for present day or long-term use, this includes activities such as selection, documentation, management, storage, conservation, security, preservation, and provision of access (Harvey, 2010).

One of the fundamental and important factors of the digital curation that assures its given quality of practice are those individuals who manages digital assets like librarians, archivists, data scientists, data curators, data librarians, digital librarians, data archivist, however, to be practical and also for the sake of uniformity throughout this thesis, the term digital curator is adapted.

Now is an important time to possess knowledgeable and skilled digital curators who will manage digital assets, but as Forster, Director at European Commission’s Directorate General for Information Society and Media, observed that while there is a demand for knowledge and skilled people to perform digital curation, “the profession of a ‘digital curator’ has not yet been defined and it might be worthwhile to do it” (Forster, 2008:7).

Digital curation and preservation experts mostly from European member states and United States agree with Forster that there is a need to identify the digital curation profession and this can be done by identifying the sets of skills and competences for digital curators. They acted positively to initiatively seek the recognition or even the validation of informal and non-formal learning and the professional figure of the digital

curators. They meet, set projects and workshops to be able to come-up with established frameworks of standards for digital curators, dealing with the basic skills and competencies such as curriculum development, training, education and tutorial support (Pryor and Donnelly, 2009; Harvey, 2010; Pomeranz, et al., 2009; Ball, Day and Patel, 2008).

These efforts are based on the idea that workers need to be educated and be evaluated on the knowledge and skills and attitudes required for successful performance in the workforce (Le Deist and Winterton, 2005). This is grounded on claims that competency-based training improves the education and training sector's responsiveness to the society and produce reliable outcome (Robinsons, 2005; and Hoffman, 1999). This approach has been applied in the field of library and information science in the USA (Weech, 2010; Weech, 2010) and more recently in Europe, which taught that the agreed competence statement will improve mobility flow in and out of Europe and advance the Bologna Process (Tanmaro, 2005; Tammaro, 2006; Tammaro, 2010).

However, currently there is no consensus on the core competences (Hank. 2009) required for digital curators working in LAM context. Existing digital curation curricula have been developed through informal consensus or local efforts. Therefore the aim of this research was to define competences for digital curators, and to validate the competences for the context of LAM curriculum development.

### **1.3 Statement of the Problem**

Currently, there is no accepted and professionally official route to acquiring knowledge and skills for digital curators and few people therefore have them (Forster, 2008; Yakel, 2007). Bridging this skills and knowledge gap is perhaps the most significant challenge of all. Beagrie (2006: 13) suggests that major effort should be invested in “developing persistent information infrastructure for digital materials and into developing the digital curation skills of researchers and information professionals” because “without this, current investment in digitization and digital content will only secure short-term rather than lasting benefits.”

The identification of set of competences for digital curators working in LAM sector would be useful both in terms of their basic qualification that will lead to becoming digital curator as well as in terms of digital curators' continuing professional development.

## **1.4 Research Questions**

The question to be answered in research will be:

What competences are necessary for digital curators working in Library, Archives, and Museum context?

## **1.5 Aims and Objectives of the Study**

The problem driving this study was the lack of recognized and validated digital competences to be included in digital curation education programs. Therefore, the aim of this research was to define competences for digital curators, and to validate the competences in the context of library, archives and museum curriculum development. The objective for the study was to obtain consensus regarding competence statements for library, archives and museum digital curators.

## **1.6 Significance of the Study**

The professional education needs of digital curators lack clear definition (Forster, 2008; Pryor and Donnelly, 2009). This study will help in bringing clarity to the most important competences that digital curators should have. It will also focus on the most important competences for digital curators through the perceptions of a panel of experts. Moreover, this study will be a help in the design of a professional education and training system for digital curators that keep pace with demands that have and continue to undergo significant change from the past professional development requirements.

## **1.7 Limitations of the Study**

Given the limited time and financial resources, this study was restricted to a small sample of key informants from memory institutions in Europe committed to digital preservation;

This study was limited by the responses contributed by the participants involved in the study, which is composed of international set of digital curation and preservation administrators, researchers and lecturers;

The development of digital curation is still in infancy stage and the process can be strongly felt from US and European institutions, therefore the scope of this study was limited to perceptions of the key informants and most experts with a European digital curation and preservation orientation and thus, the results of the study reflect a European perspective. The findings may not be generalized outside its original selected key informants and panelists.

## **1.8 Definitions of Terms**

Competence – a cluster of related knowledge, skills and attitudes that reflects a major part of one’s job (a role or responsibility), that correlates with performance on the job. That can be measured against well-accepted standards, and that can be improved via training and development (Lucia and Lepsinger, 1999).

Data – any information in binary form. This includes Digital objects and Databases (Digital Curation Centre, accessed 2010).

Databases – structured collections of records or data stored in a computer system (Digital Curation Centre, accessed 2010).

Digital objects – simple digital objects (discrete digital items such as text files, image files or sound files, along with their related identifiers and metadata) or complex digital objects (discrete digital objects made by combining a number of other digital objects, such as websites (Digital Curation Centre, accessed 2010).

Digital curation – maintaining and adding value to a trusted body of digital research data for current and future use; it encompasses for the active management throughout the research lifecycle (Digital Curation Centre, accessed 2010).

Digital curator – people who have a main role of managing or “looking after” data, have job titles that include archivist, librarian, data librarian, annotator, and data curator (adapted from Harvey, 2010).

## **1.9 Outline of the Thesis**

The whole thesis consists of five chapters. The first chapter gives the motivation, background and context, statement of the problem, followed by the research questions, aims and objectives of the study, significance of the study, limitations of the study, and then the definitions of terms, and outline of the thesis.

The second chapter of this thesis provides a review or background of the study. Literature from the fields of digital curation, digital preservation and data management yielded relevant information. This review of literature covers four main areas which include digital curation, competence, digital curation competences and skills, and finally the digital curation in Library, Archive and Museum (LAM) education context.

The third chapter describes the research design, justification on use of Delphi study, panel selection, instrumentation, data collection and data analysis conducted.

The fourth chapter presents the results of the three rounds of study in chronological order. The fifth chapter presents the conclusion, implications and recommendations of the study. The last parts of this thesis present the references, and also various appendices.

## **Chapter 2**

### **LITERATURE REVIEW**

The aim of this research was to define competences for digital curators, and to validate the competences in the context of library, archives and museum curriculum development. The objective of the study was to obtain consensus regarding competence statements for library, archives and museum digital curators.

This chapter reviews literature on studies on Digital curation and the required competences for digital curators, on the domain of “Digital curation” in library, archives and museum (LAM) sector, and LAM education. A simple search technique with such words or phrases as “Digital curation”, “Competences”, “Competencies”, “Digital curation and competences”, “Digital curation and competencies”, “Digital curation and LAM”, “Digital curation and LAM education and training”, were used to select peer reviewed articles from EBSCO Host databases, Emerald Management Xtra, and Science Direct databases. In addition, some articles and conference proceedings were retrieved from International Journal of Digital Curation, E-LIS, DLib, Digital Curation Centre (DCC) and World Wide Web. The book Digital Curation: A how-to-do-it manual written by Dr. Ross Harvey has been particularly helpful in this study.

The topic digital curation can be considered still in infancy stage (Beagrie, 2006), there is a very little literature available, thus the review cannot be considered exhaustive. Many of the articles, especially on competencies and/or competences were obtained by examining the references of the initial search results. Furthermore, many articles and project reports about digital curation and preservation project reports were consulted from Joint Information Systems Committee (JISC) website (<http://www.jisc.uk/>). Networked Digital Library of Theses and Dissertations (NDLTD) website (<http://www.ndltd.org/>) were also visited to check for some related few theses and dissertations.

This chapter is set out in four sections. First, an overview of “Digital curation” is presented. Secondly, a discussion on what “Digital curation competences” is provided, followed by the main topic of this literature review: “Competence”. The fourth section discusses the research studies on “Digital Curation Competence and Skills”, then lastly, the section about “Digital curation competences in Library, Archive and Museum (LAM) context and education”.

#### **2.1 An Overview of Digital Curation**

Digital curation is a relatively new domain emerged as a result of overall changes in creation, distribution and use of data. Several authors from Library and Information Science, Archival and Records Management, Computer Science fields have discussed the development and the nature of the concept of Digital curation in general, for example Beagrie (2006), Yakel (2007), Williams (2009), Ray (2009), Duranti (2006), Harvey (2010), Cunningham (2008) and MacDonald and Lird (2003).

The term “digital curation” which is becoming an umbrella term with “data curation”, “digital preservation”, “electronic records management”, and “digital archiving” (Yakel, 2007; Ray 2009; Beagrie, 2006) became popular yet controversial. One of the controversy is whether “digital curation” is an upgraded version of “digital preservation” or “digital

archiving” (Harvey, 2010; Cunningham, 2008). It was coined by MacDonald and Lord (2003:5) as “actions involved in caring for digital data beyond its original use, from digital preservation”. Marilyn Deegan and Simon Tanner’s (2007:153) Digital Preservation book, one of Digital Futures Series, claimed that digital curation was miscommonly used but in simple words, it is just about “an action that brings added value to a body of digital information”.

Although the concept of digital curation is still young, what it can do has been eyed as very beneficial not only in short term period but in long-term period too, it is observable on how the term is described. For one, it has been described as implemented set of processes that makes digital research data available overtime. Digital Curation Centre (DCC) in United Kingdom defines it as “maintaining and adding value to a trusted body of digital research data for current and future use, it encompasses the active management throughout the research lifecycle (Digital Curation Centre, accessed 2011)”.

Another definition of digital curation frequently cited was given by Digital Curation Curriculum (DigCCurr) project which is based in University of North Carolina at Chapel Hill in United States:

“Our cultural heritage, modern scientific scientific knowledge, and everyday commerce and government depend upon the preservation of reliable and authentic electronic records and digital objects. While digital data holds the promise of ubiquitous access, the inherent fragility and evanescence of media and files, the rapid obsolescence of software and hardware, the need for well-constructed file systems and metadata, and the intricacies of intellectual property rights place all these materials at risk and offer little hope of longevity for information that is not intentionally preserved. A decade of work in digital preservation and access has resulted in an emerging and complex life-cycle constellation of strategies, technological approaches, and activities now termed ‘digital curation’.” (DigCCurr, accessed 2011).

The effort to specifically define what digital curation is being done not just in order to explain its difference from digital preservation or data curation modes of service. Close study of the descriptors used in each definition identifies a number of consistencies, suggesting that there is a developing consensus internationally about how digital curation is as a field of practice.

Consistently describing the field of digital curation is important, but if the definitions is very broad, it losses its focus and can be interpreted in many different ways. There is a need to be able to describe digital curation clearly and simply data curation, so that people can quickly understand what digital curation can offer, that is uniquely from digital preservation or data curation, etc. There is a need to be careful so people would know how unique digital curation is in what it do – otherwise there is no point to show that digital curation has a separate identity.

Given that, for this study, Harvey's Digital curation definition is adopted, in his book he explained digital curation is "concerned with actively managing data for as long as it continues to be scholarly, scientific, research, administrative, and/or personal interest with the aims of supporting reproducibility, reuse of, and adding value to that data, managing it from its point of creation until it is determined not to be useful, and ensuring its long-term accessibility, preservation, authenticity and integrity" (Harvey, 2010:8).

With that definition in mind, Harvey (2010:8) described the set of activities or practices that involved in digital curation: it is a "more inclusive concept than either *digital archiving* or *digital preservation*"; it includes sets of processes for digital objects "*over their lifecycle*"; it "stresses adding value to data sets and digital objects"; it concerns "a wide range of stakeholders cutting across disciplinary boundaries"; it is also about "risk management"; it involves "good data management practices" and lastly, it is "concerned with and applicable to a wide range of digital objects".

Some of the well known samples of projects on the field of digital preservation and curation in LAM context are funded by European Union, this includes: CASPAR (<http://www.casparpreserves.eu/>); DELOS (<http://www.delos.info/>); Digital Preservation Europe (DPE) (<http://www.digitalpreservationeurope.eu/>); ERPANET (<http://www.erpanet.org/>); PLANETS (<http://www.planets-project.eu/>); SHAMAN (<http://www.shaman.ip.eu/shaman/>).

Effective performance of digital curation requires new skill sets. Professional from e-sciences and humanities field embarked in considerable researches to identify and map these skills sets or required competences.

## 2.2 Competence

To understand better the concept of digital curation competence and the various ways in which digital curation and preservation experts have developed this concept to date, it is helpful to briefly explore the nature of competence as defined by researchers from a variety of other perspectives and then discussion was placed on digital curation competence in context.

Relevant literature shows that the term "competence" was used interchangeably with "competency", in addition, it is used in different ways and in various subject areas thus has been subjected to multiple interpretations (Le Deist and Winterton, 2005; Robinsons, 2005; Hoffman, 1999), because of this, the concept of competence was eagerly accepted as criticized. Le Deist and Winterton (2005:29) defined competence as "aspects of the job which an individual can perform", while competency refers to a "person's behavior underpinning competent performance".

Competence is used to describe "task-oriented outcomes", while competency are reserved for "person-oriented variables that people bring with them to the job, i.e. their inputs" (Martin and Staines, 1994:24). Hoffman (1999:276) categorized the way competencies were defined: (1) as an "observable performances or the outputs of learning processes", (2) as a "standard or quality of outcome", and (3) referred to "the underlying attributes of a person such as their knowledge, skills and abilities".

There is now a considerable literature debating the merits and limitations of the agreeing to a set of competences for a specific profession (Le Deist and Winterton, 2005, Robinsons, 2005; and Hoffman, 1999). Despite the debates, competences are a widely accepted tool for a workforce development for information professionals (Weech, 2010; Tamaro, 2006, Tamaro, 2010; Myburgh, 2010, Virkus, 2006; Thomas and Patel, 2008).

Competences have many uses that can be related to improving one's performance level. For one, it can be used as a standard for guiding the training and education of the workers to upgrade the quality of their performances, then "when a person has developed all the competences necessary for a certain job, he or she gets a qualification" (Mamaqi, Miguel and Olave, 2010:1509).

There are two ways to develop competences, through top-down and bottom-up approach (Robinson, 2005). With top-down approach, the researcher uses a ready list or standards of competences to assess competences while with the bottom-up approach, the researcher is creating the list on his own, especially made for his specific study.

Competences can be written in analytical or holistic way (Le Deist and Winterton, 2005; Hoffman, 1999). In analytical way, competencies are categorized as knowledge, skills, or personal attributes, mostly they used key word or phrases to describe the characteristics. While in holistic way, it is written as a statement and categorized according to the themes of the competences gathered.

Since digital curator has to combine knowledge, skills, attitude and understanding in performing their important tasks, this study used the term "competences" which is viewed as characteristic of the task or job which an individual can do (Le Deist and Winterton, 2005). And because this study is aiming to define competence for digital curator for educational reason, it is better to write competences using the bottom-up approach and to be written in holistic way.

### **2.3 Digital Curation Competence and Skills**

In *The Institutional Repositories: Staff and Skills Set*, Robinson (2009) described the knowledge and skills needed by the repository managers and administrators and grouped it into nine categories: management, software, metadata, storage and preservation, content, advocacy, training and support, liaison (internal) and liaison (external), and current awareness and professional development. The list is done for job posting purposes and list was completed through the contributions of partners and members.

Cunningham (2008), through his paper *Digital curation/digital archiving: a view from National Archives of Australia*, enumerated the important skills and knowledge for their field. Kim, Addom, and Stanton (2011) studied not only the knowledge, skills, and abilities needed for eScience professionals, but also the work scope, the worker, and workplace. While in research data management domain Pryor and Donnelly (2009) specified their required core skills; something unique for their study is that they recognized data managers; data creators; data librarians; and data scientist and the different skills they need.

## **2.4 Digital Curation Competencies in LAM education context**

Within LAM education convergence context, DigCCurr, an IMLS Project based at the School of Information and Library Science, University of North Carolina at Chapel Hill, is considered the most complete list of the knowledge and competencies needed in digital curation (Harvey, 2010), this includes: High-Level Categories of Digital Curation Functions (Lee, 2008) and a Matrix of Digital Curation Knowledge and Competencies (Lee, 2009).

None of the reviewed studies employed Delphi method which is the approach for the current study.

## **2.5 Conclusion**

This chapter reviewed some relevant literature on Digital curation, its benefits, the activities involved, sample projects in LAM sector, competence and lastly studies about skills and competencies related to digital curation or archiving. The review acknowledged the related issues but the review is not comprehensive because of time constraint.

## Chapter 3

# METHODOLOGY

The aim of this research was to define competences for digital curators, and to validate the competences in the context of library, archives and museum curriculum development. The objective of the study was to obtain consensus regarding competence statements for library, archives and museum digital curators.

### 3.1 Research Design

The methodological approach chosen to develop this research was qualitative, explained by Creswell (2009:4) as “a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem”. The researcher used a modified Delphi study to identify competences necessary for educating LAM digital curators. Delphi study was first used by RAND Corporation researchers Helmer and Rescher. Its purpose was “to obtain the most reliable consensus of opinion of a group of experts... by a series of intensive questionnaires interspersed with controlled opinion feedback” (Dalkey and Helmer, 1963:458 in Pickard, 2007:125).

The traditional Delphi study starts the study by using open-ended questions to obtain the opinion of experts about certain topic or some aspects of it (Hsu and Sandford, 2007; Ruhland, 1993). But there are recent studies that acquired the option of replacing the traditional open-ended questionnaire with a structured one, thus a modified version of the Delphi study (Hsu and Sanford, 2007; Murry and Hammons, 1995).

Due to limited time and resources, and to make use of the result of previous related studies, the researcher used the modified Delphi study where some of the first round statements of competences are based on a comprehensive review of the literature and interview of key informants in the subject area (Pickard, 2007, Okoli and Pawlowski, 2004). This was helpful in providing candidate competences the digital curator should possess. Interviews with key informants were conducted to support the relevant literature consulted and to provide a clear background of digital curator competence.

The Delphi questionnaire in this study, acquired both qualitative and quantitative data sets to deepen insights into the topic. It was used to further collect information from a purposive sample called a panel of experts (Hsu and Sandford, 2007; Ruhland, 1993; Murry and Hammons, 1995). In this paper they may also be called members of the panel, experts, panelists, respondents, or participants. This panel of experts can be organized even if they are in various locations. The researcher used the modified Delphi study to reach consensus from a panel of experts regarding LAM digital curator competences.

Prior the Delphi survey, the researcher reviewed the literature about the related tasks, required skills and competences for digital curation. Then, through purposeful sampling technique, important individuals were invited to participate in a qualitative key informant interview, a letter of information and invitation (see Appendix A) were sent to them (see Appendix B). Based on the information about digital preservation and curation gathered from the literature, semi-structured interviews were conducted. Two key informants were interviewed face-to-face, and another one was interviewed through SKYPE. During the conversation, field notes were taken and the interviews were audio recorded for verbatim

transcription and analysis. Data collected were used to further develop the candidate statement for the Delphi survey.

To understand better the topics discussed, the researcher conducted a qualitative data analysis using a constant comparative method (Pickard, 2007). After all transcripts are coded, transcripts were analyzed and categorization scheme were developed. Specifically, the researcher was interested of developing candidate competence statement for the Delphi survey. Based on the key informants' opinion and review of relevant literature, the candidate list for Round I of competences for LAM digital curators were produced.

To analyze the opinions from qualitative questionnaires generated through Delphi studies, statistics should be calculated. Hsu and Sandford (2007:4) indicated that "major statistics used in Delphi studies are measures of central tendency (means, median, and mode) and level of dispersion (standard deviation and inter-quartile range) in order to present information concerning the collective judgments of respondents". Miller (2006, in Hsu and Sandford, 2007) denoted that to determine a consensus on a topic, certain percentage of the votes should fall within a described range.

This study adapted descriptive analysis for average means, modes, and standard deviations. Le Wen and Shih (2008:793) recommend that "if an item from the surveys of the group received a mode higher than 3, an average mean more than 3.5, and a standard deviation smaller than 1.0, it was considered that a consensus was reached on that item".

### **3.2 Justification on use of Delphi study**

The researcher chose the Delphi method for this study for four reasons. First, the topic Digital curation is still in infancy stage. There are not enough studies available therefore the best way to create information is to start it with the most available kind of information, which is the experience and opinions of the experts which can be done through Delphi study. In addition, the research problem of finding the necessary competences for educating LAM digital curators needs a method where group decisions are useful, therefore, use of consensus method like the Delphi method would be most recommended (Hasson and Keeney, 2011).

Third reason, since the sample population of this research came from different yet interconnected professions, all related with digital curation and preservation, the use of Delphi method is the method to use because with Delphi method, every respondent can equally voice out their opinions and anonymity of responses adds another advantage for this study (Mullen, 2003).

Fourth, in Delphi study researchers may use interview but usually uses questionnaire to get the information from respondents (Mullen, 2003). The questionnaire can serve as a written evidence or trail of the decisions of the experts (Pickard, 2007).

### 3.3 Panel Selection

According to Thangaratinam and Redman (2005:120), “there are no hard and fast rules” on the size of the panel, “...representation is assessed by the qualities of the expert panel than its numbers”. But they also cited Linstone (1978, in Thangaratinam and Redman, 2005:120) who suggested that “a suitable minimum panel size is seven”. This study had a panel consist of more than thirteen members.

In spite of limited time and resource, the researcher and the adviser developed a list of credible and respectable Delphi panelists. The researcher followed Hsu and Sandford’s (2007:2) suggestion in establishing the panelists’ qualifications which is done by “thorough review of publications in the literature”, the identification of positional leaders”, “and/or verifying those who have firsthand relationships with a target issue”.

Letter of invitation (see Appendix C) were sent to candidate members of the panel. The panel is consist of a number of experts chosen based on their experience and knowledge and the following criteria:

1. Familiarity with digital curation and preservation
2. Conducts research, lectures, or practice digital curation activities
3. Has a deep interest in the role of digital curation in LAM context

### 3.4 Instrumentation

A modified Delphi technique was used to gather feedback in this study. This process involved three rounds of questionnaires – each round lasting two weeks. Each of the three rounds should not take more than 30 minutes to complete. After each round, all participants received the anonymous responses received from the group, and had the opportunity to expand on each idea. The final and third questionnaire was a rating of the ideas expressed by the group to identify general consensus. There was no matching of names of the respondents with the data they provided.

#### Validity

In order to consider the validity issue of this research, Round I questionnaire was tested by an advisory panel (see Appendix D) from Parma University of considered knowledgeable about digital curation, preservation and research method. The panel reviewed the instrument to check its clarity and content and advised the researcher on ways to improve the questionnaire.

#### Reliability

Pickard (2007:21) stated that reliability is concerned that research results obtained through instruments are stable “over time and across locations”. In ensuring reliability issue of studies like this study used the Delphi technique, it deals with expert’s opinion which believed to change every round, Dalkey (1969:6) stated:

“For the analyst using expert opinion within a study, reliability can be considered to play somewhat the same role as reproducibility in experimental investigations. It is clearly desirable for a study that another analyst using the same approach (and different experts) arrive at similar results... In general, one would expect in that area of opinion, group responses would be more reliable than individual opinions, in

the simple sense that two groups (of equally competent experts) would be more likely to evidence similar answers to a set of related questions than would two individuals. This ‘similarity’ can be measured by the correlation between the answers of the two groups over a set of questions.”

The first round questionnaire had three parts. The first part consisted of the draft definition of digital curator, and eighteen candidate competence statements created from a review of the literature and interview of key informants. This part of the questionnaire involved scoring the relevance of a draft series of competences using a 5-point Likert scale with free-text boxes to comment, question, and/or modify any draft statement. The second part of the questionnaire involved an open-ended question asking the panel to suggest additional competences they think is not yet included on the draft series of competences. The third part involved questions about their demographic information such as age, country of residence and institution of the panel. The panel of experts indicated their level of agreement for each competence regarding whether it is desirable for LAM digital curators to demonstrate the competence over the next five to ten years. The panel of experts indicated their level of agreement for each competence based on a five point Likert-type scale where: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

Round II instrument was developed based on the result of the Round I instrument. The researcher provided the experts with summaries of competences that achieved consensus during Round I. Round II instrument listed the competences that did not received consensus on the previous round. This gave the panel of experts another opportunity to reach consensus on those items. Additional competences suggested by the experts during Round I was also included on the Round II instrument.

In the final round, the researcher developed the Round III instrument based on the result of the Round II instrument, listed competence statements were to be answered by: agree/disagree. The researcher provided the experts with summaries of competences that achieved consensus during Round II along with individual responses and was given the final opportunity to comment on those items.

### **3.5 Data Collection**

The study was collected from April 4, 2011 to May 13, 2011. Three rounds were used to gain consensus from the panel. The first Delphi survey round to validate the candidate items and to solicit additional digital curation competences, while second and third Delphi surveys designed to score items with a view of reaching consensus. Each round lasted two weeks, allowing the participants to have enough time to respond to each round.

#### **Round I**

During the first round, the researcher emailed to the panel of experts (see Appendix E) a pre-notice email reminder (see Appendix F), the informed Consent letter (see Appendix G) and the link for the online questionnaire using Google Docs Survey Tools or Google Forms (see Appendix H) and, and. Round I took place from April 4, 2011 to April 15, 2011. The researcher emailed a reminder (see Appendix I) to late or non-respondents

before and after the response deadline to encourage participation and increase response rates.

#### Round II

In the second round, the researcher emailed the panel the results of Round I and the Round II questionnaire in MS Word format including the competences that did not reach consensus (see Appendix J). This questionnaire addressed the same panel. Pre-notice email was sent through email (see Appendix K). A cover letter and the questionnaire in MS Word format were sent (see Appendix L & M) The experts were asked to score the relevance of a series of competence statements using a 5-point Likert scale with a free-text option to comment, question, suggest and modify any statement. Round II took place from April 18, 2011 to April 29, 2011. Email was again sent to remain the non- or late respondents (see Appendix N).

#### Round III

In the third and final round, questionnaire was addressed to the same panel (see Appendix O and P) email reminder were again sent (see Appendix Q). The experts received the questionnaire in MS Word and were asked to indicate whether they agree or disagree with 20 competence statements and 1 definition statement. Participants were encouraged to consider re-writing all statements, in a fashion in which they could agree. This provided additional clarity from the group and allowed consensus to be reached. Round III took place from May 2, 2011 to May 13, 2011.

### **3.6 Data Analysis**

#### Round I

In Round I, the researcher tabulated the gathered data using MS Excel. Mean, mode, and standard deviation were computed for each statement. Consensus were determined when a competence statement received an average mean more than 3.5, a mode higher than 3, and a standard deviation lesser than 1. Each competence statement was revised based on the suggestions and comments of the panel. Responses to the open-ended questions were analyzed qualitatively, then were edited and used to construct the second questionnaire (Pickard, 2007; Thangaratinam and Redman, 2005). The researcher made a table (see Appendix) of the statements that reached an overall consensus, this includes – one definition statement and thirteen competence statements. The competence statements were ranked according to mean score, from largest to smallest value and reported it to the panel in Round II. The researcher also compiled the competence statements that did not reach consensus during Round I, together with the additional competences, were included in the Round II questionnaire.

#### Round II

In Round II, again, the researcher used MS Excel to tabulate the gathered data. Consensus was determined per competence statement. Competence statements were edited based on the suggestions and comments of the panel. Responses to the open-ended questions were analyzed, sorted, categorized and searched for common themes. (Pickard, 2007; Thangaratinam and Redman, 2005). Competence statements that reached consensus in Round I and II were organized together to be presented for Round III instrument.

### Round III

In Round III, competence statements that received higher approval from the panel are modified to reflect both the original statement and the consensus modified suggestion. This final draft was circulated to the expert panel for comments, and substantive changes were suggested and made.

### **3.7 Conclusion**

The aim of this research was to define competences for digital curators, and to validate a Delphi process in the context of Library, Archives and Museum curriculum development. The researcher used a modified Delphi study to collect feedback from a panel of experts. Data collection was completed by means of Google Documents Forms on Round I and through emailed questionnaire in MS Word format on Round II and III.

## Chapter 4

# FINDINGS

The aim this research was to define competences for digital curators, and to validate a Delphi process in the context of Library, Archives, Museum curriculum development. The objective for the study was to obtain consensus regarding competence statements for Library, Archives and Museum digital curators.

The results of the Delphi study are presented chronologically in this chapter. Each step of the Delphi study was conducted based on the procedure described in Chapter 3. No significant variations to the Delphi study occurred during the execution of the study. This chapter begins with an overview of the study participants.

A total of 21 questions were asked of 16 consenting respondents on the Delphi Round I. The last item includes the 4 questions related to basic demographics and descriptive information to profile the group. Table 1-4 describe the results of these questions.

### 4.1 Participants

This section provides a description of the sample 16 experts who participated in round I of the Delphi process. It provides demographic information including age, country, profession and characteristics of the organization of affiliation.

The participants were selected using the criteria and procedures detailed in Chapter 3. The panelists' age distribution is provided in Table 1. Most of the participants were over 55 years old. There was not any panelist below 25. Twenty-five percent (25%) of the panelists' age ranges from 26 to 40 and another twenty-five percent (25%) were from 41 to 55.

Table 1.  
Distribution of Panelists Ages

Age	Number	Percentage
25 years or less	0	0
26 – 40 years	4	25%
41 – 55 years	4	25%
Over 55 years	8	50%
<b>TOTAL</b>	<b>16</b>	<b>100%</b>

Table 2.  
Country of Residence

Country	Number	Percentage
Australia	1	6%
Canada	1	6%
Germany	2	13%
Greece	2	13%
Italy	2	13%
Lithuania	1	6%
Netherlands	2	13%
New Zealand	1	6%
Sweden	1	6%
United Kingdom	1	6%
United States of America	2	13%
<b>TOTAL</b>	<b>16</b>	<b>100%</b>

Table 2 presents information relating to the country of residence of the panelist involved in this study. Most of them are from Europe. As shown in Table 3, majority of the respondents (63%) works either as professor, lecturer and/or researcher.

Table 3.  
Profession

Profession	Number	Percentage
Archivist	1	6%
Digital Preservation Manager	1	6%
Information and data scientist	1	6%
Professor / Lecturer/ Researcher	10	63%
Grants administrator/archivist	1	6%
Project Manager	1	6%
Social Scientist, Information specialist	1	6%
<b>TOTAL</b>	<b>16</b>	<b>100%</b>

Table 4.  
 Characteristics of the organization of affiliation

Organization	Number	Percentage
Research Center	2	13%
University	9	56%
Library	3	19%
Archive	2	13%
Museum	0	0
TOTAL	16	100%

Table 4 shows that among the 16 participants, 2 or 13% are working in a Research Center, 9 or 56% are working in a University setting, and 3 or 19% are affiliated with Libraries. As shown in table 4, no participants came from the field of Museum.

From the initial sample frame (n=23), 20 experts agreed to participate in Round I (representing a participation rate of 87% of initial invitees). However, 16 only returned the survey form (70% participation rate of initial invitees), 14 participated in Round II (87.5% of Round I participants) and 15 (94% of Round 1 participants) in Round III. Some non-respondents provided no feedback on their failure to reply despite their initial agreement, and email reminders during each round, while some send an apologies, reason stated for not responding was an overload work schedule. The panel composition was homogenous in the sense that panelists were Digital preservation and/or curation leaders in practice and /or education and training in their respective countries.

## 4.2 Round I

During the first round, experts were asked to score the relevance of a candidate list of competences using a 5-point Likert scale with free-text boxes and an open-ended question to comment, question, and/or modify any draft statement. The draft definition of digital curator, and eighteen candidate competence statements were created based from a review of the literature and interview of key informants. The quantitative data were analyzed using descriptive statistics and responses were qualitatively analyzed by sorting, categorizing and searching for common themes. In Round I, see Table 5, 13 Competence Statements reached consensus plus the definition statement. Sixteen experts responded on this round. Five competence statements did not reached consensus were added to the Round II questionnaire.

Table 5  
Competence statement Round I

COMPETENCE STATEMENT	MEAN	MODE	STANDARD DEVIATION
1. Digital curators are the people who organize and manage digital objects to ensure preservation, longevity, integrity, accessibility and reusability of data.	4.4375	5	0.81394103
2. Applies proper metadata standards, access controls and authentication procedures to ensure long-term preservation, and use of data.	4.5	5	0.632455532
3. Uses knowledge of storage activities, infrastructure and requirements to plan and execute proper data storage and recovery procedures.	3.875	4	0.885061203
<b>4. Analyzes data structure and determine appropriate support it needs.</b>	<b>3.625</b>	<b>3</b>	<b>0.718795288</b>
<b>5. Establishes and provides on-going support of hardware and software architecture and tools in order to ensure continued archiving system.</b>	<b>3.1875</b>	<b>4</b>	<b>0.981070844</b>
6. Preserves and store digital objects, using appropriate methods and tools and complying with relevant standards and requirements.	4.25	5	0.856348839
<b>7. Ensures data are processed and delivered in the secured repository.</b>	<b>4.125</b>	<b>5</b>	<b>1.204159458</b>
8. Employs appropriate quality assurance standards and procedures to ensure delivery and retrieval of digital objects that meet organization/user's needs.	4.375	5	0.718795288
<b>9. Implements policies and legal requirements to ensure that data retains longevity, integrity and accessibility.</b>	<b>4.4375</b>	<b>5</b>	<b>1.093541647</b>
10. Uses methods and tools that support interoperability among users in different locations.	3.6875	4	0.946484724
11. Understands planning, monitoring, and control of projects.	4.125	4	0.885061203
<b>12. Understands and practices contract management.</b>	<b>3.4375</b>	<b>4</b>	<b>0.81394103</b>
13. Analyzes project cost and assess project quality and communicate its meanings to stakeholders.	3.625	4	0.885061203
14. Develops own digital curation practice, policies, and services and its impact on that of the stakeholders.	3.875	4	0.718795288
15. Promotes awareness to stakeholders related to digital curation needs and development	4.0625	5	0.997914492
16. Establishes and maintains collaborative relationship with data creators and users/reusers.	4.375	5	0.806225775
17. Provides tools and support to allow use and reuse of data.	4.3125	5	0.704154339
18. Observes data protection legislation to ensure data use and reuse.	4.3125	5	0.793200269
19. Diagnose and resolve problems to ensure continuous accessibility of data.	4.3125	5	0.793200269

Note.  $n=16$  for each item. Percentages may not sum to 100 due to rounding.

Note: Bolded statements – did not reached consensus

### 4.3 Round II

Round II instrument was developed based on the result of the Round I instrument. The researcher provided the experts with summaries of competences that achieved consensus during Round I. Round II instrument listed the competences that did not received consensus on the previous round, see Table 6. This gave the panel of experts another opportunity to reach consensus on those items. Additional competences suggested by the experts during Round I, see Table 7, they were also included on the Round II instrument. In this round, 5 ( fr Round 1, edited) plus 23 new statements suggested by the panel were presented to the experts, and 1 competence statement from the candidate original list from Round 1 reached consensus, in addition, 11 from the list of suggested by the panel. A total of 13 statements reached the consensus. Fourteen experts responded on this round.

Table 6  
Competence Statement that did not reached consensus in Round I

LIST OF COMPETENCE STATEMENT THAT DID NOT REACHED CONSENSUS IN ROUND I	MEAN	M O D E	STANDARD DEVIATION
1. Knowledge of data structure of different digital objects and ability to determine appropriate support it needs	3.714285714	4	0.825420306
2. Knowledge of hardware and software architectures and tools to ensure collaboration with IT professionals in managing continued archiving system.	3.428571429	4	0.851630627
<b>3. Ability to ensure that the delivery and the repository of digital objects in a Trusted Digital Repository meet security requirements.</b>	<b>3.357142857</b>	<b>2</b>	<b>1.150728389</b>
<b>4. Ability to define a policy and legal requirements, in collaboration with legal advisers and administrators; then to implement and monitor it with coordination with different section of the institution to ensure digital object's authenticity, integrity and accuracy.</b>	<b>4</b>	<b>4</b>	<b>1.358732441</b>
<b>5. Understands contract management related to digital preservation services.</b>	<b>3.071428571</b>	<b>4</b>	<b>1.268814451</b>

Table 7  
List of Additional Competence Statement Suggested by the Experts

LIST OF ADDITIONAL COMPETENCE STATEMENT SUGGESTED BY THE EXPERTS			
(1)Have a high level IT understanding to really understand the digital material (complex objects, websites) to identify risks;	3.642857143	4	0.633323694
<b>(2)Ability to perform information quality assessment</b>	<b>3.285714286</b>	<b>3</b>	<b>0.611249846</b>
(3)Ability to collaborate with international partners – on things related to digital curator	4.285714286	5	0.994490316
<b>(4)Knowledge on semantic interoperability to access and retrieve heterogeneous data</b>	<b>3.785714286</b>	<b>3</b>	<b>0.801783726</b>
(5)Ability to ensure the provenance of the preserved data	4.285714286	5	0.913873533
<b>(6)Ability to develop, maintain and preserve language resources ( e.g. vocabularies, authorities)</b>	<b>3.571428571</b>	<b>3</b>	<b>1.016349858</b>
(7)Ability to communicate with other information professionals, e.g. computer scientists, IT specialists	4.071428571	5	0.997248963
(8)Knowledge of information architecture	3.642857143	4	0.841897386
(9)Ability to select and appraise digital documents for preservation (e. g. establishing significant properties, policies for the establishing the preservation period etc.)	4.642857143	5	0.633323694
<b>(10)Knowledge of economics of digital preservation which would include competencies enabling effective and efficient management of digital preservation initiatives (e. g. using outsourcing, collaboration, automation and human labour decreasing methods etc.)</b>	<b>3.714285714</b>	<b>4</b>	<b>1.138728807</b>
(11)Ability to monitor the obsolescence and development of file formats, hardware and software (e.g. constructing or usage of such tools as e.g. PRONOM registry)	4.285714286	5	0.994490316
(12)Understanding of the context of creation of the digital objects	4.5	5	0.518874522
<b>(13)Knowledge of the different origin and types of digital objects and that they may need to be treated differently.</b>	<b>3.785714286</b>	<b>5</b>	<b>1.251372872</b>
(14)Understanding the different preservation strategies.	4.285714286	5	0.994490316
<b>(15)Ability to write grant applications for funding.</b>	<b>2.555555556</b>	<b>3</b>	<b>1.130388331</b>
<b>(16)Ability to set up and run servers, a deep understanding of file types, scripting ability.</b>	<b>2.5</b>	<b>2</b>	<b>0.940539943</b>
<b>(17)Collaboration skills and program management skills</b>	<b>3.357142857</b>	<b>3</b>	<b>0.928782732</b>
(18)Knowledge of relevant digital curation standards, best	4.571428571	5	0.755928946

practices, and workflows.			
<b>(19)Have digital forensics competences.</b>	<b>2.857142857</b>	<b>4</b>	<b>1.231455852</b>
<b>(20)Ability to identify the nature of the entities they need to protect (whether documents, records, publications, information systems, artefacts) and act accordingly, as the ""curation"" needed for each is very specific.</b>	<b>3.5</b>	<b>4</b>	<b>1.2860195</b>
<b>(21)Ability to develop metadata standards.</b>	<b>3.142857143</b>	<b>4</b>	<b>1.350620533</b>
<b>(22)Knowledge of the risks of his digital material and ability to communicate these risks to the stakeholders</b>	<b>3.785714286</b>	<b>4</b>	<b>1.050902281</b>
(23)Ability to know the user needs to define the significant properties	3.785714286	4	0.801783726

*Note.*  $n=14$  for each item. Percentages may not sum to 100 due to rounding.

Note: Bolded statements – did not reached consensus

#### 4.4 Round III

In Round III, questionnaire was sent to the experts. They were asked to indicate whether they agree or disagree with 20 competence statements and 1 definition statement. Participants were encouraged to consider re-writing all statements, in a fashion in which they could agree. This provided additional clarity from the group and allowed consensus to be reached. After the integration stage, there are a total of one definition and 20 competence statement:

Definition of Digital Curator:

1. Digital curators have a range of managerial and operating skills, including: domain or subject expertise; good IT skills; and knowledge of best practices in acquiring, organizing and managing digital objects and digital collections for long-term access, preservation, sharing, integrity, authenticity and reuse.

Digital curator Competence statements: (Holistic in approach)

2. Plans, implements, and monitors digital curation projects.
3. Understands and communicates the economic and public value of digital curation to potential funders, including administrators, legislators and funding organizations; understands project costs and business model; writes grant applications for funding.
4. Defines digital curation policies, practices, and services and understands their impact on the creators and (re)users of digital objects.
5. Establishes and maintains collaborative relationships with IT specialists, information professionals inside and outside the institution, data creators and (re)users, and other stakeholders such as vendors, other memory institutions and organizations, and international partners, to facilitate the accomplishment of digital curation goals.
6. Advises and may deliver training programmes for staff that relate to digital curation.

7. Is aware of the need to keep current with international developments in digital curation and understands the professional networks that enable this.
8. Selects and appraises digital documents for long-term preservation.
9. Has sufficient expertise to conceptualize all types of digital information encountered in a given system that can inform preservation planning.
10. Understands and is able to communicate the risk of information loss or corruption of digital entities.
11. Organizes and manages the use of metadata standards, access controls and authentication procedures.
12. Understands the data structures of digital objects and determines the appropriate support they need.
13. Understands storage and preservation policies, procedures and practices that ensure the continuing trustworthiness and accessibility of digital objects.
14. Understands repository activities and information infrastructure to organize the access of proper data storage and recovery procedures.
15. Is aware of relevant quality assurance standards and makes a well considered choice whether to employ them or not.
16. Diagnoses and resolves problems to ensure continuous accessibility of digital objects, in collaboration with IT professionals.
17. Monitors the obsolescence of file formats, hardware and software and the development of new ones (e.g. using such tools as PRONOM registry)
18. Ensures the use of methods and tools that support interoperability of different applications and preservation technologies among users in different locations.
19. Observes and adheres to all applicable legislation and regulations when making decisions about preservation, use and reuse of digital objects in collaboration with legal practitioners.
20. Verifies the provenance of the data to be preserved and ensures that it is properly documented.
21. Has the knowledge to assess the digital objects' authenticity, integrity and accuracy over time.

## 4.5 Opinion related to Digital curator competences and workforce

There were a number of comments and/or suggestions made by panelists in rounds I, II and III of the Delphi survey. Besides the suggestions of additional competence statement or better technical terms to be used, it is interesting to know how members of the panel view digital curator profession, these are summarized as follows.

Some respondents reported difficulty answering the broad question asking them to describe the work of digital curators and to rate against a list of competences those considered essential for advanced level digital curators. This was because there was difficulty in deciding at what level of influence or authority digital curator control could be applied. Furthermore, there was confusion whether these competences are related to individual practitioners or to the broader digital curation workers. This is illustrated in the following response:

“Digital curators are not only people who do this, though. Other professions would claim this to be what they did, for example, some computer professionals.”

“The other question is whether the curator should apply these standards, controls and procedures her/himself or whether s/he should take care that they are applied.”

“This knowledge is necessary. However, I should notice that in this survey there is no distinction between different positions of digital curators. The issues of policies and compliance with legal requirements are more relevant for managers of digital curation initiatives than for professionals implementing particular activities while managing digital objects”.

Members of the panel, agrees that digital curation workforce had numerous levels, tiers, was multi-disciplinary and included workers from various sectors the following response illustrates this view.

Some of the panel considered the field of digital curation to be an environment for multiple workforce players to act on the various levels of a curation issue/problem, making the workforce structure by nature quite diverse.

“This should be the aim of any systems, policies and procedures the digital curator develops and implements. However, it is not an essential requirement. Probably in collaboration with subject expert and with other content providers for each community of users. ”

“Probably in collaboration with information with information technology specialists and/or external service providers.”

“Not necessarily. IT people should be part of every curatorial team.”

“In conjunction with IT experts”

“I think this is an activity where IT professionals with relevant knowledge and awareness of digital curation tools might be involved.”

“They should do so. But in practice, all or some of these actions are done by staff with other skills, e.g. archivists, computer scientists etc. Also, in many institutions different departments are responsible for the tasks mentioned.”

There was a concept for a hierarchical tiered workforce in digital curation, a position of people who will lead and facilitate coordinated action.

“I don’t think the curator should do this himself. He should be perhaps responsible for it, that is for the fact that it is available.”

“Probably in collaboration with information technology specialists (particularly with regard to implementing access controls and authentication procedures.”

“The other question is whether the curator should apply these standards, controls and procedures her/himself or whether s/he should take care that they are applied.”

“I wouldn’t expect that from the “standard” digital curator, but of course it would be very, very useful to have one such person in a digital curation team. In general, while reading through the list of important competencies, I increasingly doubt that one can combine them all in one job description. Perhaps one needs to think more of digital curation – management staff (funding, contractual and legal matters and the like), and digital curation – technical staff?”

Development of a recognized professional group for digital curators was widely supported.

“I think this is a good list and reflects what digital curators should know at a basic level at the time they complete the initial curation education. Their knowledge should include awareness of the need to keep up with the developments in these areas and knowledge of the professional networks that will enable them to do is.”

## **4.6 Conclusion**

This chapter provided the results of the Delphi study. It started discussing the profiles of the participants to briefly presenting chronologically the results of Round I, II and III. In the last section, suggestions and comments of the participants showed the complicated present status of the digital curator profession.

## Chapter 5

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary and discussion of conclusions regarding the forgoing ideas. In addition, implications and recommendations for future research.

### 5.1 Summary

The aim this research was to define competences for digital curators, and to validate a Delphi process in the context of Library, Archives, Museum curriculum development. The objective for the study was to obtain consensus regarding competence statements for Library, Archives and Museum digital curators.

Sixteen experts from eleven countries participated. A three round of iterative questionnaire was used. Competences were rated using a five-point Likert scale. Competences which receives a mode higher than 3, an average mean more than 3.5, and a standard deviation smaller than 1.0 were regarded as necessary for the list of competences.

All in all, twenty competence statements were selected from 41 submitted to and collated from the panel of experts. Response rates for rounds I, II and III were: 70% (n=16), 87.5% (n=14), and 94% (n=15) respectively.

### 5.2 Conclusion

Given the status of our fast changing society, plus the stated interest of governments, national leaders and institutions in digital curation, it is vital to develop a generation of digital curators who are equipped to work in this challenging environment. The initial required competences for digital curators set in motion one component of the agenda for digital curation research. The result of this study – a preliminary set of competences for LAM digital curators can be used in curriculum development and training programs for digital curators at pre-doctoral and postdoctoral level.

As this list of competences will be use into practice, it is likely that gaps will be identified or that one or more of these competence statements will be shown to be unnecessary. For that reason, critical and regular evaluation of these digital curator competence statements should be instituted. To assess the continued relevance of these competence statements, initial evaluation should take place within two or three years. The regular review of competences would provide digital curation curriculum and training programs with the evolving tools necessary to keep pace with the learning opportunities taking place in centers across the academic enterprise.

The set of competences produced in this study is the first research study which used Delphi method to define competences and activities for digital curators in LAM context. Further, any one digital curator may have varying degrees of facility across these 20 competences, and any one digital curation setting or training program can make varying use of these activities.

In addition, these competence statements can be very useful in setting research agendas for next generation of LAM digital curators. This can be started by adding digital curation component to the typical seminars for LAM pre-doctoral and postdoctoral students.

### **5.3 Recommendations for Further Research**

Based on the findings of this study, the following recommendations are offered for further research:

Because this study dealt exclusively with building and validating a list of competence statement with LAM professionals in mind, another research should be conducted for each separate domain, which would confirm the list of competence developed in this study.

Taking into consideration the suggestions and comments of the participants, that digital curation workforce had numerous levels, tiers, was multi-disciplinary and includes workers from various sectors, another research should be conducted. In addition techniques to distinguish essential from non-essential competence should be included in the study.

Additional research for competence dictionary could be a valuable tool for updating and upgrading new competence statements or model.

Research should be conducted to show procedure and benefit of applying these competence statements in LAM curriculum development or training programs.

### **5.4 Conclusion**

The use of Delphi technique in defining sets of digital curator competence through this study has been an important move towards developing a digital curator curriculum requirement and training program, and has opened opportunities and cooperation.

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**APPENDIX A**  
**KEY INFORMANT'S INVITATION LETTER**

## KEY INFORMANT'S INVITATION LETTER

21 March 2011

Director General Johanna Rachinger  
Austrian National Library  
Josefsplatz 1  
PO box 308  
1015 Vienna, Austria  
[johanna.rachinger@onb.ac.at](mailto:johanna.rachinger@onb.ac.at)

Dear Director Rachinger:

I am Melody Madrid and I am a librarian. I've been working in the National Library of the Philippines since 2002. I am also a student of International Master in Digital Library Learning (DILL). DILL (<http://dill.hio.no/>) is a two year Master Programme for information professionals who intend to work in the complex world of digital libraries. It is offered in cooperation between Oslo University College (Norway), Tallinn University (Estonia), and Parma University (Italy). We will spend at least one semester at each institution. I am now here in Italy for the 4<sup>th</sup> semester.

I am writing a research paper covering digital curation and long-term preservation which are an emerging area of research in our field. While doing a literature search, I have accumulated a great deal of knowledge and information from European National libraries and National Library of Austria (ONB) is one of the top on the list. In view of this I am writing to inquire about possible opportunity to interview you or your staff in order for me to learn the different aspect of ONB's national strategies, and workflow required to perform digital preservation and other related task. The brief interview will last for about 30 to 45 minutes and will be conducted via Skype and will focus on ONB's experience and strategies and the staff's knowledge of performing digital curation and preservation activities, and barriers experienced to perform these tasks.

The intended interview can be made from March 22 to 31, 2011, in a time that is more convenient for you or your staff. The results will help in the design of important recommendations and will identify areas for further research in the area of digital curation and preservation in libraries. I am willing to send you a draft copy of our final report for suggestions or comments.

I will appreciate the time that you will take out of your schedule to speak with me. This project is an important contribution to the field of digital preservation in libraries. My enclosed résumé provides additional details about my background and experience. I may be reached at (372) 58390654 or [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com) with any questions or comments regarding my inquiry.

Thank you for your time and consideration.

Yours sincerely,

MELODY M. MADRID  
DILL 2009-2011

**APPENDIX B**  
**KEY INFORMANTS**

## KEY INFORMANTS

**Louise Fauduet**

Digital Preservation Expert  
Conservation and Preservation Department  
The French National Library

**Bettina Kann**

Department Director  
Digital Library Main Department  
National Library of Austria

**Thomas Ledoux**

Systems Engineer  
The French National Library

**APPENDIX C**  
**PANEL OF EXPERTS INVITATION LETTER**

## PANEL OF EXPERTS INVITATION LETTER

23 March 2011

DR GILLIAN OLIVER  
Victoria University of Wellington  
New Zealand

Dear Dr. Oliver:

I am Melody Madrid, a librarian from the Philippines. I am also a student of International Master in Digital Library Learning (DILL). DILL (<http://dill.hio.no/>) is a two year Master Programme for information professionals who intend to work in the complex world of digital libraries. It is offered in cooperation between Oslo University College (Norway), Tallinn University (Estonia), and Parma University (Italy).

I am writing a Master thesis related to digital curation for the final semester in Parma University under the supervision of Prof. Anna Maria Tamaro. You have been identified as an expert on digital curation and preservation. In view of this, I am writing to invite you to serve on a panel of experts for a study tentatively titled "A Study of Digital Curator Competences: A survey of experts". The purpose of this study is to identify competences required for digital curators as perceived by a panel of experts.

A modified Delphi Technique will be used to gather feedback about this study. This process will involve three rounds of questionnaires - each round lasting two weeks. After each round, all participants will receive anonymous responses from the group, and have an opportunity to expand on each idea. The final and third questionnaire will be a rating of the ideas expressed by the group to identify general consensus. Each round will be done through an online survey. Again, responses from each round will be shared anonymously. There will be no matching of names of participants with the data they provide.

Each of the three rounds should not take more than 20 to 30 minutes to complete. This study is spread over six weeks. You will receive the first round questionnaire by April 4, 2011, link will be sent to your emails. Your responses will remain confidential; however, your name will be listed in the study as one of the experts on the panel. A summary of this study will be sent to all participants.

As an internationally recognized digital curation expert, your participation is vital to this study. Please email me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com) to confirm your willingness to serve on the panel of experts. If you have questions related to the study please send me an email or call (39) 3278805679. Please respond to this request by March 25, 2011.

I hope this application will merit your favorable action. Thank you.

Sincerely,

MELODY MADRID  
Master student  
International Master in Digital Library Learning  
Parma University  
Italy

**APPENDIX D**  
**FACE AND CONTENT VALIDITY PANEL**

## **FACE AND CONTENT VALIDITY PANEL**

**Elena Corradini**

Municipality of Ala,  
Library and Archives Office,  
Ala, Trento, Italy

**Federico Monaco**

Department of Social and Political Studies  
University of Parma  
Italy

**Anna Maria Tamaro**

DILL Master Coordinator  
University of Parma  
Italy

**APPENDIX E**  
**PANEL OF EXPERTS**

## PANEL OF EXPERTS

### **Chiara Cirinna**

Project Coordinator and Researcher  
Fondazione Rinascimento Digitale  
Florence, Italy

### **Luciana Duranti, Ph. D.**

Chair and Professor, Archival Studies  
Director, The InterPARES Project [www.interpares.org](http://www.interpares.org)  
Director, Digital Records Forensics Project [www.digitalrecordsforensics.org](http://www.digitalrecordsforensics.org)  
School of Library, Archival and Information Studies (SLAIS) [www.slais.ubc.ca](http://www.slais.ubc.ca)  
The University of British Columbia  
The Irving K. Barber Learning Centre  
Suite 470, 1961 East Mall  
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### **Candida Fenton**

Information / Data Scientist  
MRC Social and Public Health Sciences Unit  
Glasgow, Scotland

### **Maria Guercio, Ph. D.**

Professor in Archival Science and Electronic Record Management, ISTBAL,  
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### **Ross Harvey, Ph. D.**

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**Franco Niccolucci, Ph. D.**

Professor  
University of Florence  
Florence, Italy

**Jörgen Nilsson**

Professor  
Department of Computer Science, Electrical and Space Engineering  
Luleå University of Technology

**Gillian Oliver, Ph. D.**

Senior Lecturer, Archives & Records Management, School of Information Management  
Victoria University of Wellington  
Wellington, New Zealand

**Christos Papatheodorou, Ph. D.**

Professor  
Dept. of Archives and Library Sciences, Ionian University  
Corfu, Greece

**Bob Pymm, Ph. D.**

Senior Lecturer in Information Studies  
Charles Sturt University Faculty of Education  
Australian Centre for Christianity and Culture

**Joyce Ray, Ph. D.**

Associate Deputy Director for Library Services  
Institute of Museum and Library Services  
Washington, DC, USA

**Barbara Sierman**

Digital Preservation Officer and Team leader  
Digital Preservation Research, National Library of the Netherlands  
The Hague, Netherlands

**Sabine Schrimpf**

Information Specialist  
NESTOR - Kompetenznetzwerk Langzeitarchivierung, National Library of Germany  
Frankfurt am Main, Germany

**Natascha Schumann**

Information Specialist  
NESTOR - Kompetenznetzwerk Langzeitarchivierung, National Library of Germany  
Frankfurt am Main, Germany

**APPENDIX F**  
**ROUND I PRE-NOTICE EMAIL REMINDER**

## **ROUND I PRE-NOTICE EMAIL REMINDER**

Dear Dr. Harvey,

Thank you for agreeing to participate in the research study. On Monday, April 4, 2011, you will receive an email containing a Website link for round one of the questionnaire. The questionnaire should take approximately 30 minutes to complete.

If you have any questions, please feel free to contact me via email at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com).

Thank You,  
Melody

**APPENDIX G**  
**INFORMED CONSENT FORM**

## INFORMED CONSENT FORM

### INFORMED CONSENT DOCUMENT

**Tentative Project Title:**

A Study of Digital Curator Competences: A Survey of Experts

**Researcher:**

Melody M. Madrid

International Master on Digital Library Learning

Parma University

Italy

**Purpose:**

This study, which is research conducted for a masters of digital library learning student thesis, is being conducted through Parma University. The purpose of this study was to describe the opinions of Library, Archives, Museum (LAM) leaders and respected professors and researchers and practitioners within the digital curation and preservation field as it relates to competences necessary for educating digital curators. Findings of this study will be a useful guide in the curriculum of future LAM digital curators in the researcher's home country.

**Procedures:**

The project will involve the completion of three rounds of questionnaires. The first questionnaire will ask to select competences from a list that you believe to be the most important then you will also be ask to list as many competences you believe a potential digital curator should have to be proficient in digital curation work. In addition, you will be asked for demographic information such as your age, country of residence and institution.

The second questionnaire will ask you select competences from a new list (based on the suggestions given plus the competences that did not reached consensus on Round 1 questionnaire) that you believe to be the most important.

The third questionnaire will ask you to rank a condensed list of competences based on importance as it pertains to employment in your respected area of the digital curation. The researcher will send you a copy of the final result of the study and you have the chance to express whether or not you agree with the provided list of competences as being those with the most importance for employment in your area of digital curation.

You will be given the opportunity to provide comments for your selections in questionnaires one, two, and three. Name and emails will be asked for every round of questionnaire to monitor non-respondents. The study is designed to last over the course of six weeks.

**Risks of Participation:**

There are no risks associated with this project, including, however, if you begin to experience discomfort or stress in this project, you may end your participation at any time.

**Benefits of Participation:**

There are no expected personal benefits for the participation of this research study. However, information obtained through the Delphi study will enhance the future of digital curation curriculum in the Philippines.

**Confidentiality:**

All information about you will be kept confidential and will not be released. Responses from each round will be shared anonymously; however, your name will be listed in the study as one of the experts on the panel.

**Compensation:**

There are no compensations to be received for the participation of this research study.

**Contact:**

You may contact the researcher at the following address and phone number, should you desire to discuss your participation in the study and/or request information about the results of the study: Melody Madrid, Via C. I. Frugoni 26, Parma PR 43123, Italy or send email at melmadrid@yahoo.com or call (39) 3278805679.

I have been fully informed about the procedures listed here. I am aware of what I will be asked to do and the benefits of my participation. I also understand the following statements:

I have read and fully understand this consent form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my participation in the study.

by clicking this link, I agree to the terms and conditions.

<https://spreadsheets2.google.com/viewform?formkey=dDdIRXF0a3Z4NDNjZ3liVjhIYXNaTUE6MQ>

If you cannot open the link, please let me know and I will send the questionnaire as attachment. Thank you!

**APPENDIX H**  
**ROUND I QUESTIONNAIRE**

# A Study of Digital Curator Competencies: A Survey of Experts

One definition of Digital curation is given by Digital Curation Center (<http://www.dcc.ac.uk/about-us/dcc-charter>), it is "maintaining and adding value to a trusted body of digital research data for current and future use; it encompasses the active management of data throughout the research lifecycle".

The following statements, except the first one, represent the competences - the skills, knowledge and/or behaviour – that every professional digital curator working in Library, Museum and Archive context might be expected to have. Please rate how strongly you agree or disagree with each of the following statements by clicking in the appropriate button.

You are asked to provide comments for your selections and add in the Comment space whatever you feel is lacking or has to be corrected.

\* Required

**1. Digital curators are the people who organize and manage digital objects to ensure preservation, longevity, integrity, accessibility and reusability of data \***

1 2 3 4 5

Strongly Disagree

Strongly Agree

**Comments:**

Comments:

**8. Employs appropriate quality assurance standards and procedures to ensure delivery and retrieval of digital objects that meet organization/user's needs. \***

1 2 3 4 5

Strongly Disagree      Strongly Agree

Comments:

**9. Implements policies and legal requirements to ensure that data retains longevity, integrity and accessibility. \***

1 2 3 4 5

Strongly Disagree      Strongly Agree

Comments:

**10. Uses methods and tools that support interoperability among users in different locations. \***

1 2 3 4 5

**19. Diagnose and resolve problems to ensure continuous accessibility of data \***

1 2 3 4 5

Strongly Disagree      Strongly Agree

Comments:

4/23/2011

A Study of Digital Curator Competenci...

[Report Abuse](#) - [Terms of Service](#) - [Additional Terms](#)

Strongly Disagree      Strongly Agree

**Comments:**

**14. Develops own digital curation practice, policies, and services and its impact on that of the stakeholders \***

1 2 3 4 5

Strongly Disagree      Strongly Agree

**Comments:**

**15. Promotes awareness to stakeholders related to digital curation needs and development \***

1 2 3 4 5

Strongly Disagree      Strongly Agree

**Comments:**

**16. Establishes and maintains collaborative relationship with data creators and**

**APPENDIX I**  
**ROUND I QUESTIONNAIRE EMAIL REMINDER**

## ROUND I QUESTIONNAIRE EMAIL REMINDER

11 April 2011

Dear Dr. Duranti:

Greetings! Just a reminder that if you have not had a chance to submit your response to the Round one questionnaire, please do so on or before **April 15, 2011**. If you have any question, please do not hesitate to contact me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com).

The link below will take you to the website. Questionnaire link:

<https://spreadsheets0.google.com/viewform?formkey=dDdIRXF0a3Z4NDNjZ3liVjhIYXNaTUE6MQ>

Thank You.

Best regards,  
Melody

**APPENDIX J**  
**COMPETENCES THAT DID NOT REACH CONSENSUS IN ROUND I**

## COMPETENCES THAT DID NOT REACH CONSENSUS IN ROUND I

List of competences that DID NOT reached overall consensus in Round 1 (Revised competence statements based on the comments and suggestions)					
Revised competence statements based on the comments	Five-point scale				
	1	2	3	4	5
Knowledge of data structure of different digital objects and ability to determine appropriate support it needs	1	2	3	4	5
Comments:					
Knowledge of hardware and software architectures and tools to ensure collaboration with IT professionals in managing continued archiving system.	1	2	3	4	5
Comments:					
Ability to ensure that the delivery and the repository of digital objects in a Trusted Digital Repository meet security	1	2	3	4	5

requirements.					
Comments:					
Ability to define a policy and legal requirements, in collaboration with legal advisers and administrators; then to implement and monitor it with coordination with different section of the institution to ensure digital object's authenticity, integrity and accuracy.	1	2	3	4	5
Comments:					
Understands contract management related to digital preservation services.	1	2	3	4	5
Comments:					

**APPENDIX K**  
**ROUND II QUESTIONNAIRE PRE-NOTICE EMAIL REMINDER**

**ROUND II QUESTIONNAIRE PRE-NOTICE EMAIL REMINDER**

5 April 2011

Dear Ms. Schrimpf,

Thank you so much for your responses in round one of the research study. I greatly appreciate your time and feedback. On April 18, 2011, you will receive the questionnaire for second round of the study. If you have any questions, please feel free to contact me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com).

Thank You,  
Melody

**APPENDIX L**  
**ROUND II COVER LETTER**

## ROUND II COVER LETTER

Dear Ms. Schumann:

Thank you for your responses on the Round I Questionnaire for the research study tentatively titled “A Study of Digital Curator Competences: A survey of experts”. The purpose of this study is to identify competences required for Library, Archives, and Museum digital curators as perceived by a panel of experts.

During Round I, the goal for the Delphi process is to achieve consensus among the panel of experts and to solicit additional digital curator competences as recommended by the members of the panel. One definition statement and thirteen competence statements achieved consensus during the first round. Items that have reached consensus were listed on the first part of the enclosed document. Competence statements were revised based on your comments and suggestions. Consensus was determined when a competence statement received a mode higher than 3, an average mean more than 3.5, and a standard deviation smaller than 1.0. The competence statements were ranked according to the mean score, from largest to smallest value.

Also enclosed are the competences that have not reached an overall consensus and the additional competences suggested by the panel in Round 1. If you feel that a particular item should be considered included in the list of LAM digital curator competences you have the chance to put a higher rating on the scale. It should take about 30 minutes to complete. Please return the questionnaire to [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com) before April 29, 2011. If you have questions please send an email or call (39) 3278805679. You will receive the third and final questionnaire in May 2.

Thank you in advance for your cooperation.

Kind regards,

Melody

**APPENDIX M**  
**ROUND II QUESTIONNAIRE**

## ROUND II QUESTIONNAIRE

### ROUND 2 : A STUDY OF DIGITAL CURATOR COMPETENCES: A SURVEY OF EXPERTS

<p>I. Items that reached consensus in Round 1 (Revised statements based on the comments and suggestions)</p>
<p>Definition of Digital curator</p>
<p>Digital curators are the people with a range of technical and operating skills, including domain or subject expertise and high IT skills, in addition to those with knowledge of best practices in acquiring, organizing and managing digital objects and digital collections for long-term access, preservation, sharing, integrity, authenticity and reuse.</p>
<p>II. List of competences that reached consensus in Round 1. (Revised competence statements based on the comments and suggestions) (Ranking according to Mean Score)</p>
<p>Ability to organize, collaborate and manage the use of metadata standards, access controls and authentication procedures to ensure long-term access, preservation, and reuse of digital object</p>
<p>Ability to employ quality assurance standards and procedures to ensure delivery and retrieval of</p>

digital objects that meet organization/user's needs.

Ability to establish and maintain collaborative relationship with data creators and (re)users and other stakeholders to agree on common standards or to exchange experiences.

Ability to provide education, training and support or consultation for digital curation practices and services.

Ability to observe, and adhere to all applicable legislation and regulations when making decisions about preservation, use and reuse of digital objects.

Ability to, or may collaborate with IT professionals, in diagnosing and resolve problems to ensure continuous accessibility of data.

Knowledge of storage and preservation policies and practices including subject or domain expertise to ensure trustworthiness and accessible digital objects.

Ability to plan, monitor and control digital curation projects.

Ability to promote awareness to stakeholders related to digital curation needs and has to offer information about new techniques, methods and developments in digital curation.

Knowledge of storage activities, and technical infrastructure and requirements to be able to collaborate, plan and organize the use of proper data storage and recovery procedures.

Develops customized but standard-based digital curation practices, policies, and services and its impact on the creators and users of digital objects.

Ability to ensure the use of methods and tools that support interoperability of different applications and preservation technologies among users in different locations.

Knowledge of project cost and business models and ability to assess project quality and communicate its meanings to stakeholders.

Comments:

II. List of competences that DID NOT reached overall consensus in Round 1

(Revised competence statements based on the comments and suggestions)

The following statements represent the competences - the skills, knowledge and/or behaviour – that every professional digital curator working in Library, Archive, and Museum context might be expected to have.

Please indicate your level of agreement regarding whether LAM digital curators should possess the following competences in the next five to ten years by highlighting or circling the item – please choose what works for you. Use the following scale to indicate your opinions.

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

You are asked to provide comments for your selections and add in the Comment space whatever you feel is lacking or has to be corrected.

Revised competence statements based on the comments	Five-point scale				
	1	2	3	4	5
Knowledge of data structure of different digital objects and ability to determine appropriate support it needs	1	2	3	4	5
Comments:					

<p>Knowledge of hardware and software architectures and tools to ensure collaboration with IT professionals in managing continued archiving system.</p>	1	2	3	4	5
<p>Comments:</p>					
<p>Ability to ensure that the delivery and the repository of digital objects in a Trusted Digital Repository meet security requirements.</p>	1	2	3	4	5
<p>Comments:</p>					
<p>Ability to define a policy and legal requirements, in collaboration with legal advisers and administrators; then to implement and monitor it with coordination with different section of the institution to ensure digital object's authenticity, integrity and accuracy.</p>	1	2	3	4	5
<p>Comments:</p>					
<p>Understands contract management related to digital preservation services.</p>	1	2	3	4	5

Comments:

### III. List of competences RECOMMENDED by the Panel in Round 1

The following statements represent the competences - the skills, knowledge and/or behaviour – that every professional digital curator working in Library, Archive, and Museum context might be expected to have.

Please indicate your level of agreement regarding whether LAM digital curators should possess the following competences in the next five to ten years by highlighting or circling the item – please choose what works for you. Use the following scale to indicate your opinions.

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

You are asked to provide comments for your selections and add in the Comment space whatever you feel is lacking or has to be corrected. If you think that some of the items are repetition of other existing items, please indicate on your comment and refrain from rating it.

Additional list of competences recommended by the Panel	Five-point scale				
	1	2	3	4	5
(1)Have a high level IT understanding to really understand the					

digital material (complex objects, websites) to identify risks;	1	2	3	4	5
Comments:					
(2)Ability to perform information quality assessment	1	2	3	4	5
Comments:					
3)Ability to collaborate with international partners – on things related to digital curator	1	2	3	4	5
Comments:					
(4)Knowledge on semantic interoperability to access and retrieve heterogeneous data	1	2	3	4	5
Comments:					
(5)Ability to ensure the provenance of the preserved data					

	1	2	3	4	5
Comments:					
(6)Ability to develop, maintain and preserve language resources ( e.g. vocabularies, authorities)	1	2	3	4	5
Comments:					
(7)Ability to communicate with other information professionals, e.g. computer scientists, IT specialists	1	2	3	4	5
Comments:					
(8)Knowledge of information architecture	1	2	3	4	5
Comments:					
(9)Ability to select and appraise digital documents for preservation (e. g. establishing significant properties, policies					

for the establishing the preservation period etc.)	1	2	3	4	5
Comments:					
(10)Knowledge of economics of digital preservation which would include competences enabling effective and efficient management of digital preservation initiatives (e. g. using outsourcing, collaboration, automation and human labour decreasing methods etc.)	1	2	3	4	5
Comments:					
(11)Ability to monitor the obsolescence and development of file formats, hardware and software (e.g. constructing or usage of such tools as e.g. PRONOM registry)	1	2	3	4	5
Comments:					
(12)Understanding of the context of creation of the digital objects	1	2	3	4	5
Comments:					

(13) Knowledge of the different origin and types of digital objects and that they may need to be treated differently.	1	2	3	4	5
Comments:					
(14) Understanding the different preservation strategies.	1	2	3	4	5
Comments:					
(15) Ability to write grant applications for funding.	1	2	3	4	5
Comments:					
(16) Ability to set up and run servers, a deep understanding of file types, scripting ability.	1	2	3	4	5
Comments:					

(17)Collaboration skills and program management skills					
Comments:					
(18)Knowledge of relevant digital curation standards, best practices, and workflows.	1	2	3	4	5
Comments:					
(19)Have digital forensics competences.	1	2	3	4	5
Comments:					
(20)Ability to identify the nature of the entities they need to protect (whether documents, records, publications, information systems, artefacts) and act accordingly, as the	1	2	3	4	5

""curation"" needed for each is very specific.					
Comments:					
(21)Ability to develop metadata standards.	1	2	3	4	5
Comments:					
(22)Knowledge of the risks of his digital material and ability to communicate these risks to the stakeholders	1	2	3	4	5
Comments:					
(23)Ability to know the user needs to define the significant properties	1	2	3	4	5
Comments:					

Thank you very much for your participation!

**APPENDIX N**  
**ROUND II QUESTIONNAIRE EMAIL REMINDER**

## **ROUND II QUESTIONNAIRE EMAIL REMINDER**

April 27, 2011

Good morning,

This is a reminder that the deadline to submit the response to Round Two of the research study is on Friday, April 29, 2011. Please find attached the questionnaire in MS Word format.

I also want to express my appreciation that out of your busy schedule you're helping me complete the data needed for my research 'A Study of Digital Curator Competences: A survey of experts' – thank you! Truly, your inputs are valued and essential on the success of this study! If you have any question, please do not hesitate to contact me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com).

Thank You,  
Melody

**APPENDIX O**  
**ROUND III QUESTIONNAIRE COVER LETTER**

### **ROUND III QUESTIONNAIRE COVER LETTER**

May 5, 2011

Dear Dr. Manzuch:

First, I would like to apologize for the delay in sending the third round out for our research study. I waited for some more responses and with some other difficulties on our part, additional time was needed to ensure the quality of round three. I am pleased to announce that this will be the final round of the study and looking at the information you have presented thus far, the study promises to be a success.

Attached here is the survey form. Please have your response submitted no later than Friday next week, **May 13, 2011**.

Again, thank you very much for your participation in our research study. I hope you have enjoyed participating. As stated in the initial agreement, once the study has been completed, a summary will be send to you via e-mail. If you have any questions, please feel free to contact me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com). Thank you so very much.

Best regards,

Melody

**APPENDIX P**  
**ROUND III QUESTIONNAIRE**

### ROUND III QUESTIONNAIRE

#### Round 3: A Study of Digital Curator Competences: A Survey of Experts

**Direction:** Below is the list of statements regarding digital curator competences in Library, Archives, and Museum context in a master's level. Please read each statement and determine if you AGREE with the statement. If you DISAGREE, please rewrite the sentence so that you would AGREE.

If you have any question regarding this study, please e-mail me at [melmadrid@yahoo.com](mailto:melmadrid@yahoo.com). Thank you so much.

No.	Statement	Agree	Rewritten Statement
1	Digital curators are the people with a range of managerial and operating skills, including domain or subject expertise and good IT skills, in addition to those with knowledge of best practices in acquiring, organizing and managing digital objects and digital collections for long-term access, preservation, sharing, integrity, authenticity		

	and reuse.		
Digital Curator Competences:			
No.	Statement	Agree	Rewritten Statement
2	Plans, monitors and controls digital curation projects.		
3	Knows and communicate the economic and public value of digital curation to potential funders, including administrators, legislators and funding organizations; Understands project cost and business models, etc., as well as write grant applications for funding.		
4	Defines digital curation policies, practices, and services and knows its impact on the creators and (re)users of digital objects.		
5	Establishes and maintains collaborative relationship with IT specialist, information professionals inside and outside the institution, and to data creators and (re)users and other stakeholders like vendors and other memory institutions and organizations and international partners as well to facilitate the accomplishment of digital curation work goals.		
6	Provides education, training and/or support for new techniques, methods and developments of digital curation practices and services.		
No.	Statement	Agree	Rewritten Statement
7	Aware of the need to keep up with international developments in digital curation and knows the professional networks that will enable them to do this.		
No.	Statement	Agree	Rewritten Statement
8	Selects and appraise digital documents for preservation (e. g. establishing significant properties, policies for the establishing the preservation period etc.)		

9	Have an expert knowledge on the purpose of each kind of digital entities and its impact on preservation.		
10	Understands and communicates risks of digital entities' (e.g. complex objects, websites).		
11	Organizes and manages the use of metadata standards, access controls and authentication procedures to ensure long-term access, preservation, and reuse of digital objects.		
12	Knows data structure of different digital objects and determines appropriate support it needs; have a general knowledge about different nature of digital entities and its implication for preservation.		
13	Knows storage and preservation policies and practices including subject or domain expertise to ensure trustworthiness and accessible digital objects.		
14	Knows repository activities, and information infrastructure to be able to organize the access of proper data storage and recovery procedures.		
15	Employs quality assurance standards and procedures to ensure delivery and retrieval of digital objects that meet organization/user's needs.		
16	Diagnoses and resolves problems to ensure continuous accessibility of digital objects, in collaboration with IT professionals.		
17	Monitors the obsolescence and development of file formats, hardware and software (e.g. constructing or usage of such tools as e.g. PRONOM registry)		
No.	Statement	Agree	Rewritten Statement
18	Ensures the use of methods and tools that support interoperability of different applications and preservation technologies among users in different locations.		
19	Observes and adheres to all applicable legislation and		

	regulations when making decisions about preservation, use and reuse of digital objects		
20	Ensures the provenance of the preserved data.		
21	Have an expert knowledge to judge the digital objects' authenticity, integrity and accuracy.		

Thank you very much for your active participation!

**APPENDIX Q  
ROUND III QUESTIONNAIRE EMAIL REMINDER**

### **ROUND III QUESTIONNAIRE EMAIL REMINDER**

May 12, 2011

Dear Ms. Cirinna,

Just a quick reminder. Please remember that on Friday, May 13, 2011 is the due date for the Round 3 questionnaire. I have attached the instrument for your easy access. We have already received several great responses and I hope you find time to respond to it too. Your opinions are important to this research effort. If you have any questions, suggestions or additional comments please attach or include it in the form.

Thank you so very much for your assistance,

Melody

