Barriers to Adopting PREMIS in Cultural Heritage Institutions: an Exploratory Study

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Abstract

Digital preservation is a significant challenge for cultural heritage institutions and other repositories of digital information resources. The challenges of long-term access issues are multifaceted, often requires a mixture of approaches. The Preservation Metadata Implementation Strategies (PREMIS) has been extremely influential on providing a "core" set of preservation metadata elements that support the digital preservation process. However, there is no evidence, in the form of previous research, as to what factors explain and predict the level of adoption of PREMIS. This paper will present some preliminary result on factors that affect the adoption of PREMIS in cultural heritage institutions. The study employed a web-based survey to collect data from 123 participants in 20 country as well as a semi-structured, follow-up telephone interview with a smaller sample of the survey respondents. Roger's diffusion of innovation theory was used as a theoretical framework. The main constructs considered for the study were relative advantage, compatibility, complexity, trialability, observability, and institution readiness. The study yielded both qualitative and quantitative data, and preliminary analysis showed that all six factors influence the adoption of PREMIS in varying degrees.

Introduction

Today the entire information landscape has changed and continues to change at a breathtaking pace. Digital technologies are shaping creation, management, access, and preservation of information in ways that are so profound that traditional methods may no longer be effective. The main technical problems of digital preservation relate to inadequate media longevity, rapid hardware obsolescence, and dependencies on particular software products. In addition to technological issues, responsible and viable preservation planning for digital materials needs to address various issues, such as policy, economic, and organizational issues.

Different communities are developing and implementing various digital preservation methods at different rates. Considering the complex set of digital preservation challenges, many researchers agree that there are no effective preservation methods or tools that work for all communities or types of resources [1]. There is a fundamental need to know more about digital preservation in general. However, most agree that metadata plays a significant role in any preservation activities[2], [3]. Therefore, it is critical to have a deeper understanding of the factors which affect the adoption of preservation metadata for the purpose of managing digital resources for long-term access and use. This paper will present some preliminary result on factors that affect the adoption of PREMIS (PREservation Metadata: Implementation Strategies).

Purpose of the Study

The purpose of this exploratory research is to identify factors that affect adoption of preservation metadata, specifically PREMIS, in cultural heritage communities using the theoretical framework provided by the diffusion of innovations theory. Understanding adoption of innovation in any given situation requires identification and analysis of factors that may facilitate the adoption and those that may operate as barriers to adoption [4]. The diffusion of innovations theory provides a model for conceptualizing the acceptance of PREMIS in a cultural heritage community [5].

Various researchers have examined the diffusion of information technologies and related innovations using the framework from the diffusion of innovations theory [6]. Digital preservation metadata is part of digital technology innovation, and it would be expected that factors which have been found to be related to other digital technology innovations would also explain the adoption of PREMIS in the cultural heritage institutions.
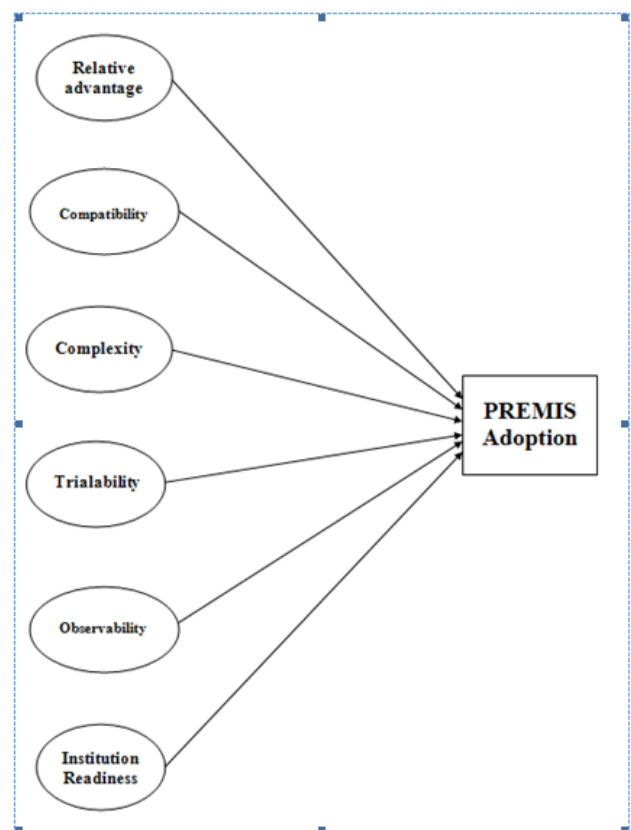

Figure 1. *Operationalization of PREMIS Adoption Factors*

Description of Instrument

The researcher conducted a comprehensive review of the available innovation adoption literature to develop criteria. Rogers' five perceived characteristics or attributes were shown to influence the rate of adoption of innovation namely: relative advantage, compatibility, complexity, trialability, and observability. In addition to Rogers' five perceived characteristics, several determinants of adoption related to the institutional readiness would help to gain a better understanding of factors that affect PREMIS adoption in cultural heritage institutions. The literature review revealed that several other attributes have been added to the literature including several key organizational factors that may affect innovation adoption decision. Most researchers noted that readiness of organization is strongly associated to other parameters such as organization culture and IT infrastructure (architecture, sophistication, skill sets, etc.) [7], [8], and [9]. Institutional readiness is thus conceptualized as an adoption characteristic, for the purpose of this study.

As shown in Figure-1, the constructs utilized to understand factors affecting PREMIS adoption in cultural heritage institutions were relative advantage, compatibility, complexity, trialability, and institution readiness. Descriptive statistics methods were used to summarize the data and to identify similarities, differences, and possible relationships among factors and institutions. Such triangulations of methods provided a holistic framework to identify factors and their relationship in order to understand the factors that affect adoption of preservation metadata in cultural heritage institutions.
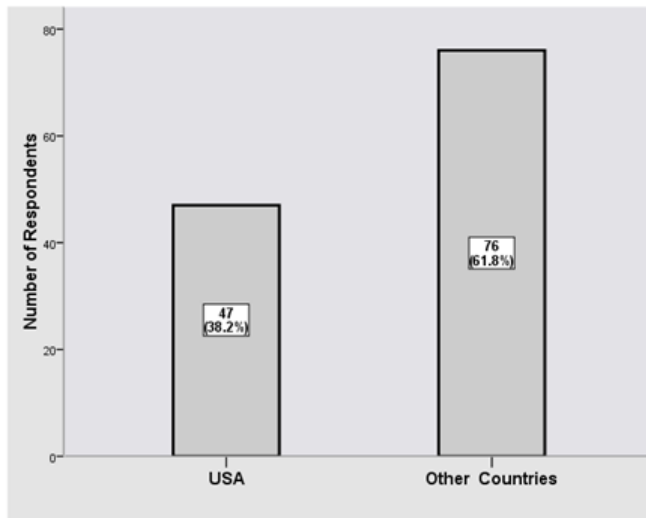

Figure 2. *Distribution of the Participants by Countries*

Demographic Characteristics of Participants

This research used survey questionnaires and telephone interviews to collect both quantitative and qualitative data from 123 participants in 20 countries. As shown in Figure 2, the three countries with the large majority of respondents were the USA with 47 (38.2%), followed by Canada with 25 (20.3%), and the UK which had 15 (12.2%). These three countries accounted for about 70% of the overall participating institutions.
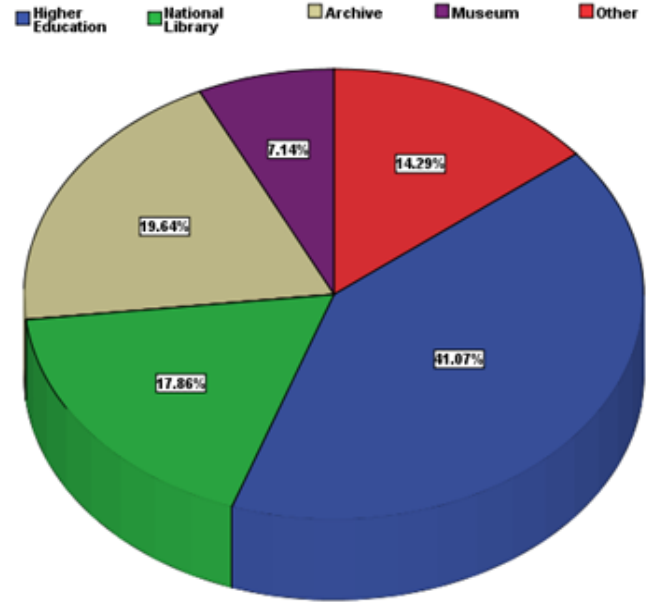

Figure 3. *Survey Respondents by Institution Type*

As can be seen from Figure 3, respondents were predominantly from higher education institutions (about 40%), followed by archives (about 18%), museums (16%), and national libraries (9%). Some of the participant institutions categorized as *others* include: government and non-government research institutes, digital documents producers (e.g., publishers, broadcasting agencies, or image service companies), non-profit art institutions, and other libraries (e.g., public, state, and charity libraries).
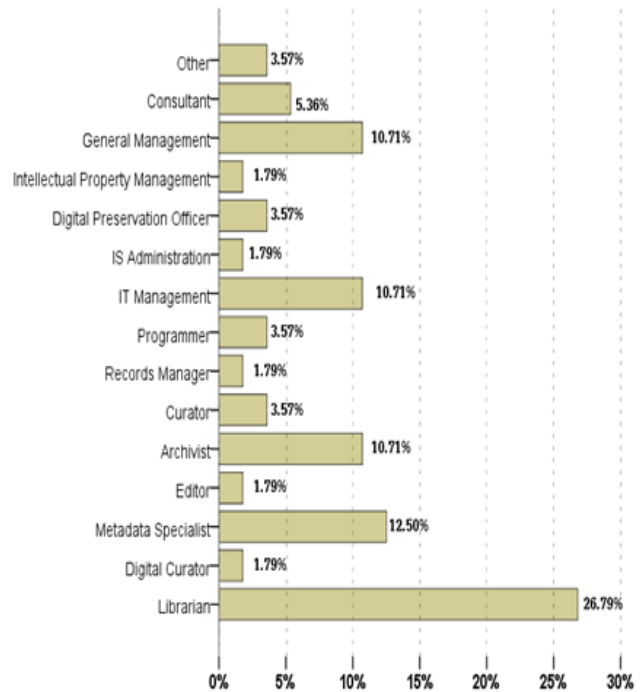

Figure 4. *Distribution of the Participants by Fields of Specialty*

Respondents' fields of specialty were distributed as shown in Figure 4; a significant number (about one-fourth or 26%) of the respondents were librarians, while more than 20 % represented IT and general management positions. However, it is interesting to note that many respondents to the survey indicated that they regarded themselves as metadata specialists, archivists, digital curators, intellectual property managers, and digital preservation officers.

PREMIS Adoption

Like any other innovation, PREMIS is not a goal in itself, but an instrument for an institution to achieve its digital preservation (strategic) goals. Many researchers agree that innovation is simply converting knowledge into solutions that create distinctive value. However, converting knowledge into long-term business value is, in practice, a far more difficult process than in theory [10]. And, in innovation adoption research it is generally assumed that the innovation, often a technological innovation, has stable, pre-determined features and is considered for adoption when the organization judges it to be beneficial to the business.

The data analysis revealed that a vast majority of the institutions had not yet reached the development stage in terms of their level of PREMIS adoption. Although academic institutions and national libraries were among the early adopters, as can be seen from Figure 4, the overall adoption was not that high. Out of the 123 participants who responded to the survey, only 4 institutions (fewer than 3% of the respondents) had fully adopted PREMIS.
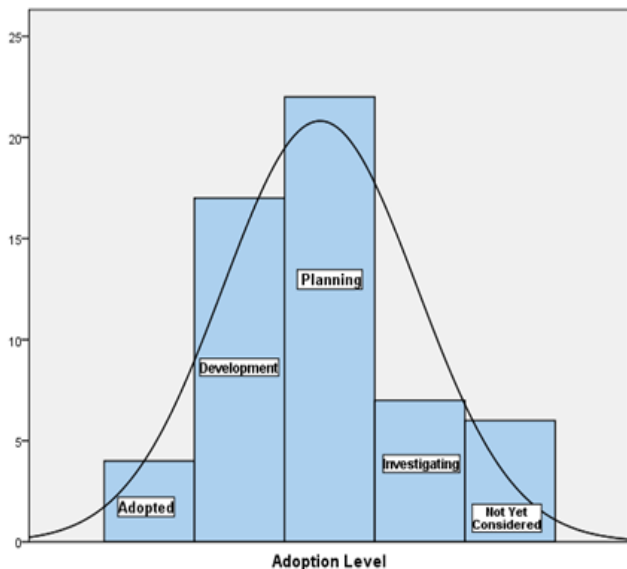

Figure 5. PREMIS Adoption Status

Figure 5 depicts the PREMIS adoption stage category assignments as reported by the respondents, which tend toward a normal distribution. There is a strong resemblance with the innovation of adoption curve of Rogers that classifies adopters into five categories (innovators, early adopters, early majority, late majority, and laggards).

As can be seen in Figure 6, institutions were assigned to one of the two categories: "Decision has been made to adopt" or

"Decision has not been made to adopt". This categorization was based on respondents' self-assignment. As Figure 5 shows, the fact that an institution was at the *planning stage*, *development stage*, or *fully adopted stage* indicates that a decision had already been made to adopt PREMIS, whereas if the institution had *not yet considered* or was still at an *investigation stage*, the decision had not yet been made to adopt PREMIS.
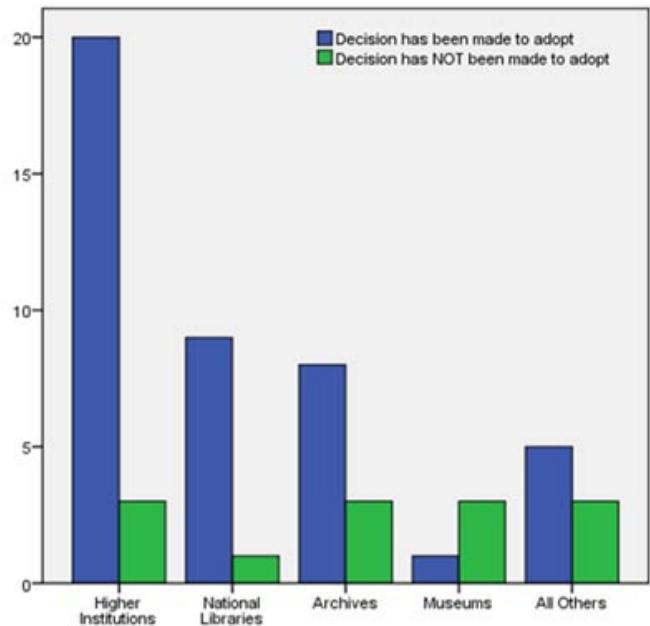

Figure 6. PREMIS adoption decision status by institutions type

Figures 6 shows the categories based on adoption decision status by institution types, as indicated by participants. This new categories helped to find common characteristics among the participants and group data together, which otherwise seemed more widely spread out in the survey responses.

Factors Affecting PREMIS Adoption

The questionnaire addressed a range of factors (i.e. attributes in the diffusion of innovations theory) that affect the adoption of PREMIS across the diverse cultural heritage institutions. Analysis of the data revealed that all of the six factors influence the adoption of PREMIS, albeit in varying degrees.

Based on the standardized coefficients values, among the six variables, institutional readiness, trialability, and relative advantage were the best three predictors of PREMIS adoption. In many DOI studies, perceived relative advantage, complexity, and compatibility seem positively related to adoption. Although trialability and observability are among the less-commonly used innovation attributes in some studies the relationship between perceived trialability and PREMIS adoption has been found positive [11]. In support of this finding, the perception of attributes of the innovation can predict the adoption, with some degree of consistency across various settings. The greater the perceived characteristics of an innovation, the more rapid its rate of adoption will be.

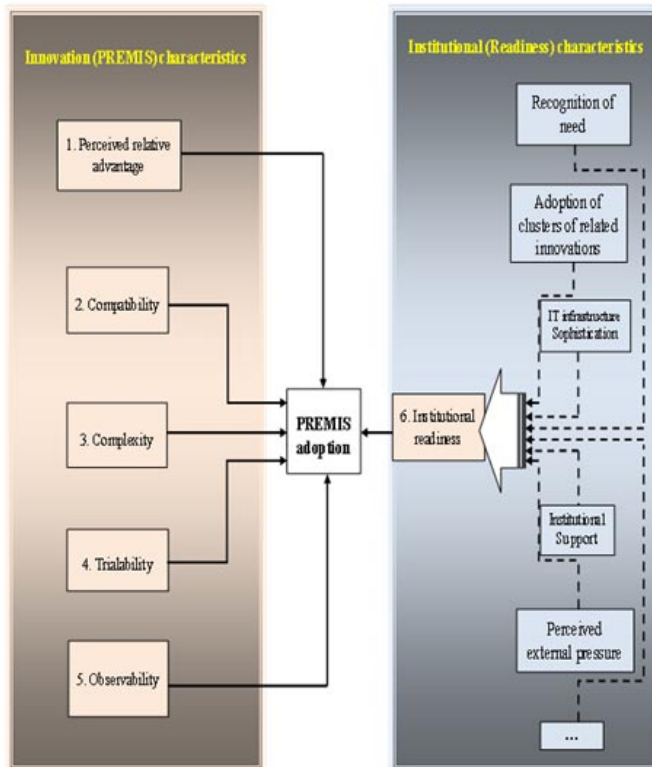Figure 7 provides summary of attributes that influence PREMIS adoption.

Figure 7. *Summary of factors affecting PREMIS adoption*

Although PREMIS played significant role in analyzing preservation requirements, it cannot accommodate all metadata requirements. Most cultural heritage institutions use a combination of metadata schemes to address their diverse metadata needs. For example, many respondents (about 43%) indicated that their institutions use the Metadata Encoding and Transmission Standard (METS) to implement metadata in digital library applications. Some of the most frequently identified metadata schemes and community standards used by cultural heritage institutions include: Dublin Core, MIX or Z39.87, Creative commons, MODS, VRA, TEI.

Table 1: Tools for Technical Metadata Generation or Extraction

	Yes	No	Don/t Know	Total
JHOVE	36	25	4	65
	55.4%	38.5%	6.2%	100%
DROID	19	35	3	57
	33.3%	61.4%	5.3%	100%
NLNZ	9	43	1	53
	17%	81.1%	1.9%	100%
GDFR	2	45	4	51
	3.9%	88.2%	7.8%	100%
NOID	4	43	4	51
	7.8%	84.3%	7.8%	100%
Other	5	-	-	5
	100%	0. %	0%	100%

Most respondents use one or more format identifications tools Some of the highly-used, externally available (or locally developed) tools are identified in Table 1. The open source JHOVE characterization tool was identified as one of the widely used components of many cultural heritage institutions' digital preservation workflows.

Institutional Factors

The findings show that almost all institution types believe that institutional readiness is one of the powerful factors that can significantly influence PREMIS adoption. As can be seen from their statements, many emphasized that the institutional context actually matters when it comes to adopting PREMIS. A number of respondents believe that institutions need to create an environment that fosters innovations. In this regard one of the respondents said that "creating an infrastructure to support digital preservation will facilitate PREMIS adoption." Another interviewee focused on training issue: "preparing the workforce to better operate in a digital world of rapid change is critical."

Although there are some commonalities among cultural heritage institutions, there are notable differences. One respondent said that "PREMIS is more library-centric and our team members are cautious in recommending full PREMIS adoption." But, many believe that ground-breaking digital preservation ideas can come from anyone, or even from outside of the cultural heritage community. One of the interview respondents even mentioned the OAIS as a good example of digital preservation solution, although it came from the space science community rather than originating within cultural heritage community.

In support of these findings, several interviewees noted that they viewed PREMIS adoption in light of their institutions' specific characteristics. The following statement from one of the interview respondents sums up the views of many participants: "While we can be informed by PREMIS and what worked elsewhere in terms adopting preservation metadata, we must take account of our own local specific conditions before implementing change."

Other Factors

A number of participants viewed PREMIS as an innovation that was not yet fully developed. Since the data collection was conducted before the release of PREMIS 2.0, most respondents, particularly from those institutions that were in the planning stage mentioned that they were eagerly awaiting a much-anticipated version 2.0. As one respondent put it: "We are ready [to adopt PREMIS], but we don't want to adopt PREMIS 1.0, which can be changed anytime now."

In March 2008 the PREMIS Editorial Committee issued a much-revised version of the PREMIS Data Dictionary [12]. The researcher attempted to contact some of the early adopters (during the analysis phase of this study, in summer 2008), but it was still too early to know the impact of the changes on their respective systems. As one respondent summarized it "we hope that PREMIS 2.0 will address the concerns we have about the PREMIS."

There are common factors in the decisions of cultural heritage institutions regarding whether to adopt or not to adopt PREMIS. Table 2 lists eight of the most frequently identified stimulants factors that facilitate PREMIS adoption in cultural heritage institutions.

Table 2: Eight Most Frequently Identified Stimulants or Factors that Facilitate PREMIS Adoption

Factors	Frequency	Percent
Adopting the PREMIS is seen as a practical necessity by our institution.	33	58.9%
My institution has the resources necessary to support the initial adoption of the PREMIS.	22	39.3%
My institution has enough technical knowledge to adopt the PREMIS.	20	35.7%
Interest from the decision-makers within our institution.	20	35.7%
Most cultural heritage institutions are adopting the PREMIS or seriously considering it.	14	25.0%
Benefits will outweigh costs when it comes to adopting the PREMIS at our institution.	18	32.1%
The PREMIS is compatibility with existing system.	12	21.4%
From a technical standpoint, it is/will be easy to implement the PREMIS.	7	12.5%

Cultural heritage institutions that adopt PREMIS also identified possible barriers that may prevent the institutions that are not yet decided to adopt from adopting PREMIS. Table 3 lists eight of the most frequently identified barriers or factors that discourage PREMIS adoption in cultural heritage institutions.

Table 3: Eight Most Frequently Identified Barriers or Factors that Discourage PREMIS Adoption

Factors	Freq.	Percent
Lack of training/expertise.	26	48.1%
Lack of integration or incompatibility with existing system	20	37.0%
We lack the knowledge necessary to be confident in our ability to implement the PREMIS.	16	29.6%
Lack of interest from the decision-makers within our institute.	13	24.1%
Institutions that have adopted the PREMIS cannot provide evidence of its effectiveness.	11	20.4%
Usability requirements are too high.	11	20.4%
Our institution prefers to take a wait-and-see approach when it comes to adopting new system.	8	14.8%
Our institution has limited capacity to absorb negative consequences that might occur as a result of implementing the PREMIS.	8	14.8%

Summary

PREMIS is new and in the early stage of innovation, so growth is relatively slow as the innovation establishes itself. As shown in this study, most of the national libraries and academic institutions are the innovators and earlier adopters in PREMIS adoption. Even though there are some commonalities, there are notable differences among cultural heritage institutions. As discussed in this document, this disparity in the adoption of PREMIS among diverse cultural heritage institutions can be attributed to the factors identified in the study. Results of a regression analysis of adoption level on the six factors showed a statistically significant relationship. The R square value for the model was .528, which means that 52.8% of the variance in PREMIS adoption was explained by a combination of the six factors.

Studying adoption of innovations requires a longitudinal study to understand an inherently complex set of issues that affect adoption. The more institutions that adopt a standard, the faster it will be adopted by the general population due to the network externality effect. Given the wide range of responses, generalization of the findings from an institutional perspective are difficult to make. For example, many respondents stated that because PREMIS is still changing and because they see little success story, they wouldn't be adopting PREMIS in the near future. The data collection for this study was conducted before the release of the new version of the PREMIS. Although the data shows a reluctance to adopt a preservation metadata that is in revision, it is the nature of developing standards to continually revise. In other words, there is no good timing.

This research on preservation metadata adoption just barely begins to show the many layers of this complex problem. Considering the diverse needs of cultural heritage institutions and the complexity of digital preservation issues, much remains to be illuminated. Nevertheless, this exploratory study has important implications for future research on preservation metadata and stakeholders engaged in digital preservation and metadata standards development efforts. Further developments in digital technologies are likely to produce new digital preservation challenges as well as opportunities.

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