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PEER REVIEWED RESEARCH



Interconnected Disaster Management - Bridging the Physical and Digital Divide

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ABSTRACT

When a disaster strikes, major damage can occur to physical and digital collections. However a major research project, undertaken in the context of Australian national state and territory (NSLA) libraries, has uncovered that the approaches to the disaster management of physical and digital collections are largely divided and uncoordinated. The outcomes of the research project have demonstrated the benefits and feasibility of integrating disaster management across all collection formats – physical and digital, while also noting barriers and areas of disconnect. A practical application of the research has been the updating of the ALIA disaster management resources, as a ‘one stop shop’ integrated approach to managing disasters across all collection formats. Overall, at a time of elevated risk of disasters due to climate change, this research provides an important contribution to the field of disaster management with an integrated perspective that has potential application across the wider GLAM sector within Australia, and internationally, with organisations such as Blue Shield International.

KEYWORDS

Disaster management; disaster preparedness; risk management; preservation management; digital preservation; physical preservation

Sacred sites, museums, libraries, collections, and archives including those that can hold local, national and global artefacts, legal deposits and vital records on governance and land tenure are part of the crucial human infrastructure that is often destroyed in the event of a disaster. (United Nations Office for Disaster Risk Reduction United Nations Office for Disaster Risk Reduction (UNDRR), 2017)

Background

The research for this article on disaster management was undertaken as a component of a doctoral research project with the overall aim of investigating the relationship between the preservation management of physical and digital collections in Australian national and state and territory (NSLA) libraries (Brown, 2020). The NSLA libraries were selected for the research project because they have a legislated mandate to collect and preserve cultural heritage (National and State Libraries Australia (NSLA), 2021). Furthermore,

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these libraries represent a wide cross section of geographic diversity and size within Australia, while their collections comprise a wide variety of physical and digital formats.

The overarching research question was:

What is the relationship between the preservation management of physical and digital collections in Australian national and state and territory (NSLA) libraries?

The strategy of disaster management was investigated as a special focus area for the research project due to its pivotal role in safeguarding collections, and this is discussed further below in the section on **The Importance of Disaster Management**.

Within the focus area of disaster management, the research was driven by the following sub-questions:

- (1) What are the disaster management approaches for both physical and digital materials in NSLA libraries?
- (2) What are the areas of synergy and disconnect between the approaches to physical and digital disaster management?
- (3) How can the areas of synergies and disconnect contribute to the linking of disaster management approaches across the two domains?

This article updates an earlier *JALIA* article by the author (Brown, 2018), which was written while the doctoral research project was in progress. It focuses on the outcomes of the research that have led to the updating of the ALIA disaster management resources (Australian Library and Information Association (ALIA), 2019) and subsequent practical workshops on integrated disaster management. This article also incorporates recent issues relating to the impact of climate change and Covid-19.

The Importance of Disaster Management

Overall, disaster management plays a pivotal role in the preservation management of digital and physical collections. Indeed, without a sound disaster management strategy in place, all the various preservation management principles, strategies and actions can be shattered in an instant of destruction (Garnett, 2021; Harvey et al., 2020; Kahn, 2004, 2012; Prestamo, 2018).

Disaster management essentially involves planning, reducing risks and vulnerabilities, and establishing strategies to respond and recover (Australian Institute for Disaster Resilience (AIDR), 2021). Disaster management is linked with resilience which is defined as:

... the ability of individuals, communities or countries to anticipate, withstand and recover from adversity – be it a natural disaster or crisis. Resilience is supported by disaster preparedness and especially through training, planning, reducing risks and vulnerabilities, and establishing strategies to respond and recover. (Australian Institute for Disaster Resilience Australian Institute for Disaster Resilience (AIDR), 2021)

Across the galleries, libraries, archives and museums (GLAM) sector, disaster management of cultural collections plays a significant role in reducing damage and loss, while helping to rebuild organisational and community resilience after disaster events.

The important role of disaster management in safeguarding cultural heritage is highlighted in key international resources such as the United Nations Office for Disaster Risk Reduction (UNDRR) *Sendai Framework for disaster risk reduction* (United Nations Office for Disaster Risk Reduction (UNDRR), 2015). Similarly, peak organisations that focus on disaster management such as Blue Shield International (BSI) and Blue Shield Australia (BSA) recognise the importance of the ‘vital expression of the culture that makes up unique communities’ and that ‘its loss during conflict and disaster can be catastrophic’ (Blue Shield International (BSI), 2021).

The key role that libraries can play in disaster management is highlighted by the International Federation of Library Associations and Institutions (IFLA) in its statement on disaster risk response:

Libraries have a duty to preserve our cultural heritage and make it accessible to the public, in order to inform and inspire future generations. Though many libraries already have disaster plans, there is still more that can be done. (International Federation of Library Associations and Institutions (IFLA), 2018)

The Impact of Climate Change

The prominent role played by disaster management is heightened by the elevated risk of disasters due to climate change that has been highlighted by a number of peak bodies. These international bodies include the International Council on Monuments and Sites (ICOMOS) Climate Change and Cultural Heritage Working Group (2019) and UNESCO, World Heritage Centre’s (2021). Similarly, IFLA’s *Call for input on Cultural Rights and Climate Change* (IFLA, 2020b) notes the increased threat to collections of documentary heritage:

... due to rising temperatures and the increased severity of natural disasters and storms. (IFLA 2020b, section10).

Likewise, current Australian literature highlights climate change as a major contributor to what Glasser calls ‘an emerging era of disasters’, which features an increase in extreme weather and cascading events that follow in close succession (Glasser, 2019, p. 4). In turn, these events pose heightened risks to Australian cultural collections. Missingham and Fletcher (2020) similarly refer to the impact of climate change and increased risks in the context of university libraries, while Pagliarino and Meredith (2020) map the impact of climate change and associated risks across Australia’s significant GLAM cultural collections.

Literature Review

The extensive literature review undertaken for the major research project identified a major gap in the exploration of the relationship between digital and physical disaster management. Furthermore, it uncovered that, while library collections are hybrid, comprising expanding varieties of digital and physical objects, there is a major divide between physical and digital disaster management that represents a metaphorical fault

line between the two domains. This is reflected in the widely held view that ‘digital is different’ (Gilliland, 2014; Harvey et al., 2020, p. 4).

The literature review uncovered four thematic areas of disaster management in libraries. In the first three areas, there is a disconnect between physical and digital disaster management, and this is further exemplified by the collection disaster resources that have been specifically developed in response to the Covid-19 pandemic. In contrast, the fourth thematic group comprises related areas where there are synergies between the digital and physical domains:

- (1) digital collections
- (2) physical collections
- (3) physical collections with references to digital materials
- (4) synergies in areas such as risk management, business continuity planning, scale of disasters, the role of copies/surrogates and key stages.

Digital Collections

The important role that disaster management plays in safeguarding digital collections is highlighted in the publications of Robertson and Borchert (2014) and Frank and Yakel (2013). These sources identify that disaster management is a primary responsibility of institutional repositories and that it is a mandatory requirement for trusted digital repositories. Furthermore, disaster management is an essential component of two major digital standards: the OAIS reference model (Consultative Committee for Space Data Systems (CCSDS), 2019) and the international standard for certifying a trustworthy digital repository, (ISO/DIS 16,363, 2012) that specifies:

... suitable written disaster preparedness and recovery plan(s), including at least one off-site back up of all preserved information together with an offsite copy of the recovery plan (ISO/DIS 16363, 2012, 5.2.4).

However, none of these key sources attempt to link digital disaster management with existing disaster management practices for physical collections. Likewise, this divide continues in digital disaster management studies undertaken in specific countries, as exemplified in the study by Zaveri (2015) that focuses on digital only collections in Indian libraries, and Rachman and Afidhan (2018) that discusses management of digital collections in special libraries in Indonesia.

Physical Collections

The overall trend of the literature on library disaster management is on physical collections. This is exemplified in earlier resources such as IFLA’s disaster manual (McIlwaine, 2006) the Library of Congress’s instructions on disaster response and recovery (Library of Congress, n.d.) and reflected in the first version of the ALIA disaster resources (Australian Library and Information Association (ALIA), 2010). This trend of focusing on library collections in the physical domain continues in recent articles by Garnett (2021), Garnett et al. (2018), and Missingham and Fletcher (2020). Similarly, an overview

by Blue Shield Australia, GLAM Peak & NSF Consulting (2020) on the impact of fire storms and other events on Australian GLAM institutions also focuses on the physical domain. Similarly, the scope of the recent practical disaster plan developed by the University of Tasmania, Disaster Management Team (Library Collections) (2020) is confined to physical collection materials.

Physical Collection Resources that Reference Digital Materials

A small number of sources on disaster management do make reference to both digital and physical formats. These include the *dPlan* online disaster planning tool (2006), Decker and Townes (2016), Idiegbeyan-Ose et al. (2018), Ilo et al. (2020), and Kahn (2012); Robertson & Borchert (2014) and Zachary (2018). However none of these sources overtly or systematically connect disaster management across the physical and digital domains.

The Example of Covid-19 Resources

The recent resources on safeguarding collections during the Covid-19 pandemic provide further evidence of a continuing divide between the disaster management of digital and physical collections.

Physical collections have frequently been locked up during periods when staff have been working from home and hence are vulnerable to risks such as undetected leaks, pest infestations and outbreaks of mould growth. Recent resources that have been tailored to the risks to physical collections during the pandemic include those produced by the Canadian Conservation Institute (CCI) (2020), the American Institute of Conservation (AIC) (2021) and the joint Australian Institute for the Conservation of Cultural Materials (AICCM) (2020) and Blue Shield Australia (BSA) resource *Closed by Covid-19?* (Blue Shield Australia (BSA), 2020). None of these refer to potential risks to digital collections.

In the digital domain, the risks of security breaches and malicious attacks by state-sponsored hackers have escalated dramatically during the pandemic (Perlroth, 2021). Examples of resources that have been developed in response to risks to digital collections during the pandemic include IFLA's *Awareness, Planning, Resilience: Thoughts on Libraries' Cyber Defense in 2020* (2020a) and the *Seven lessons learned about digital security during the COVID-19 crisis* by Organisation for Economic Cooperation and Development (OECD) (2020). These resources are provided separately and independently from physical collection disaster resources. Similarly, this trend is reflected in the Vable News Aggregation service article *Cyber security in an age of COVID-19 – What your library needs to know*, that is designed for a more popular audience (C. Brown, 2020). Likewise, apart from resources on sanitising, the ALIA Covid-19 resources for libraries largely focus on the digital security risks (Australian Library and Information Association (ALIA), 2021).

Primarily, these recent Covid-19 resources exemplify and mirror the continued bifurcation between physical and digital collection disaster management.

Areas of Synergy

As a counterpoint to the divide between the two domains, the literature also identifies five areas of synergy that feature in both domains. These areas provide a common foundation that can potentially interconnect disaster management across the two domains. They are:

- risk management
- business continuity planning
- scale of disaster
- the role of copies, surrogates and backups; and
- stages of disaster management.

Risk Management

As disaster management is founded on risk management principles, risk management features as a prominent theme in both domains. In the digital domain, risk management is central to two key international standards: the OAIS reference model (Consultative Committee for Space Data Systems (CCSDS), 2019 and the certification standard for trustworthy digital repositories (International Organization for Standardization (ISO), 2012). The importance of risk management in digital disaster management is confirmed by Bishoff and Claeson (2015), Conn (2015) and McGovern and Stuchell (2014). In relation to the disaster management of physical collections, risk management also features prominently (Decker & Townes, 2016; McIlwaine, 2006; Wellheiser & Scott 2002). Risk management features prominently in UNESCO's major disaster training program, where a major focus is on how risk management can provide a common foundation for linking disaster management for heritage buildings, with their internal collection contents (UNESCO, 2021).

Business Continuity Planning

Business continuity planning features widely in the literature on disaster management. This is exemplified by McGovern and Stuchell's *Disaster planning policy framework* (McGovern & Stuchell, 2014), which highlights the importance of aligning disaster management with corporate documents such as the *Business continuity plan* and *Continuity of operations plan*, and the National Archives of Australia's *Digital Continuity Policy* (National Archives of Australia (NAA), 2020). Garnett et al. (2018) note the links between business continuity and disaster management in relation to the special collections of Australian university libraries, and this trend is supported by the research of Velasquez et al. (2016) in the context of South Australian public libraries. The State Library of Queensland's *Counter disaster planning template* (2013) exemplifies a disaster plan template that incorporates links with business continuity.

Similar Stages

The literature identifies four stages of disaster management that are common to both domains: *prevention*, *preparation*, *response* and *recovery* (Kahn, 2012; Prestamo, 2018; United Nations Office for Disaster Risk Reduction United Nations Office for Disaster Risk Reduction (UNDRR), 2015). These common stages mean that there is

potential for aligning the various stages of disaster management of physical and digital collections at higher strategic levels. However at the more specific and technical levels, the disaster actions are very likely to be different for physical and digital collections.

Copies, Surrogates and Backups

Another area of synergy relates to the role of physical and digital copies or surrogates, their locations (on and offsite, backed up, in cloud storage) and their relationship to the original. The revised ALIA disaster management resources (Australian Library and Information Association (ALIA), 2019) highlight the importance of identifying copies, surrogates and backups, together with their locations to assist in prioritising disaster responses for different collections.

Scale of Disaster

The literature confirms that the concept of scale or level of disaster is common to both the domains. The scale of disaster can vary from a small insect infestation to a major loss of data. The scale or level of a disaster depends on a number of factors such as the cause, the size of the area that is damaged and the level of damage to the collections and infrastructure (Colorado State University, section 5, University, 2016). An example from the digital literature is Meister and Michalek's *Disasters at any scale* (2016) which exemplifies the application of disaster scale to the digital domain. Examples of disaster scales in the physical domain feature in the Library of Congress *Scenarios, levels of collections emergency* (Library of Congress, n.d.), Colorado State University's disaster plan (2016) and the *Sendai framework* (United Nations Office for Disaster Risk Reduction. United Nations Office for Disaster Risk Reduction (UNDRR), 2015).

In summary, the literature review revealed a major disconnect between physical and digital disaster management, while also identifying key areas of synergy. The areas of synergy are risk management, business continuity, copies, surrogates and back-ups, disaster management stages and disaster scale. Also revealed is a significant gap in the literature relating to the lack of integration of disaster management across digital and physical collections, and this mirrors the divide between the two domains.

Methodology

The research methodology incorporated an interpretivist perspective and qualitative approach. The interpretive paradigm was judged to be well suited to exploring the research questions, enabling the exploration of the NSLA preservation managers' interpretations and 'everyday reality' experiences of preservation management, disaster management and of the interrelationships between the two domains. Ethics approval was granted by the University of South Australia's Human Research Ethics Committee prior to commencement of the research (Approval ID: 0000030820).

Researcher's Role

As the researcher is also a practitioner in the field, it was essential to minimise the risk of bias and leading the research outcomes. These risks were mitigated using triangulation (Connaway & Powell, 2010), which is discussed further below.

Selection of Participants

As previously noted, the NSLA libraries were identified as a useful sample group because they have legislated mandate to collect and preserve cultural heritage (National and State Libraries Australia (NSLA), 2021) and their collections comprise a wide variety of physical and digital formats.

The target sample group of participants comprised the 18 preservation managers responsible for digital and physical preservation in the nine NSLA libraries. This represents what Battaglia (2011) describes as 'purposive sampling'. The participants contributed to the richness and validity of the data, as they were state and national experts in their field, with responsibilities for preserving territory, state and national documentary physical and digital heritage.

Data Collection

Empirical data was collected in four stages. The first stage of data collection involved a survey questionnaire of the 18 NSLA digital and physical preservation managers. The second stage involved follow-up semi-structured interviews with the same preservation managers. Data collection in the third stage was collated in the context of working with a focus group to develop an integrated disaster plan template as a proof of concept. The fourth and final stage of the research involved trialling the integrated disaster plan template in workshops with diverse groups from the Galleries Libraries Archives and Museums (GLAM) sectors in Australia and India. These stages are discussed further below.

Stage One: Survey Questionnaires

The survey questionnaire method was selected as a tool to collect data due to its ability to provide standardised information that was relevant to the research questions (Gorman & Clayton, 2005). The survey questions were designed from the key principles, strategies and themes that had emerged from the literature review and were guided by the research questions.

The survey questionnaire collected both quantitative and qualitative data. The quantitative data provided useful information on trends and context. For example, it indicated the extent to which NSLA libraries had disaster plans in place. Information provided from the qualitative data included preservation managers' views about the synergies and differences between physical and digital preservation. Information gathered from the surveys was used to inform the questions in the next stage of interviews.

As separate survey questionnaires were designed for the two domains, each NSLA library completed two surveys; a total of 18 survey questionnaires across the nine NSLA

libraries. The survey questionnaires were designed with parallel questions relating to physical and digital preservation management in each category. This approach provided a means of comparing and cross-validating answers to issues that were common to both domains.

The survey questionnaires were designed and distributed using LimeSurvey (2021), a free open source software survey tool. This tool was selected for its ease of use, its capability for respondents to upload documentary evidence and its capacity to generate basic reports. The relevant preservation managers were invited to participate and their support and consent requested. Once the preservation managers formally agreed to participate, they were emailed a link to the relevant digital or physical survey questions. The survey period extended over 10 months with the surveys being sent and responded to according to NSLA preservation managers' availability and organisational commitments. The first survey questionnaire was distributed in June 2015 and the last response received in April 2016, providing a 100% response rate.

Stage Two: Interviews

The second stage of data collection comprised semi-structured interviews and, as occurred with the survey questions, 18 separate interviews were conducted with staff across the nine NSLA libraries, constituting a 100% response rate. The interview questions were designed to delve deeper into information provided in the survey responses and hence uncover the complexities of preservation managers' views about the relationship between digital and physical preservation disaster management.

Funding from an ALIA Research Grant facilitated the visits to the libraries for the face-to-face interviews, which took place during the period October 2015 through to May 2016. The interactions with respondents for both the interviews and survey questionnaires constituted a 'prolonged engagement' period as described by Lincoln and Guba (1986, p. 18), extending over 11 months, June 2015 to May 2016. This is one of the factors that contributed to the overall credibility of the research by providing opportunities to assess possible distortions or discrepancies (Lincoln & Guba, 1986).

The semi-structured interviews included open and closed questions, which were provided to interviewees prior to the interview. The interviews incorporated both the questions for the broader research project on preservation management and the more specific questions about the area of disaster management. All interviews were recorded and subsequently transcribed verbatim by a professional transcription service. To ensure the validity of the data, the researcher listened to the recordings and corrected any minor errors in the transcripts and this process provided a valuable re-familiarisation with the interviews.

Data Analysis of Stages One and Two

The survey data was translated into reports and tables using the *LimeSurvey* software. The reports summarised the range and number of responses to the questions, and included the qualitative comments. The interviews were transcribed as noted above and analysed from the dual perspectives of the physical and digital domains. Data from the datasets of the survey questionnaires and interviews were hand-coded according to a thematic analysis approach (Gray, 2018).

Stage Three: Focus Group

The next phase of data collection involved working with a focus group. During the survey and interviews the concept of an integrated approach to disaster management had emerged as an area that warranted more detailed investigation. The researcher recognised that the process of investigating the feasibility of developing an integrated disaster plan as a proof of concept would enable the collection of additional data relevant to this research. This led to the third stage of working with a focus group to explore the feasibility of developing an integrated disaster plan template.

The State Library of Queensland (SLQ) agreed to participate in this project and the researcher worked with a focus group of SLQ staff to develop a 'proof of concept' integrated disaster plan template. The State Library of Queensland (SLQ) was identified as a useful organisation to work with, based on its experiences in responding to the disaster caused by the flooding of the Brisbane River in January 2011 (Collins, 2012). Additionally, SLQ had a clearly structured flexible disaster plan template that was publicly available (State Library of Queensland (SLQ), 2016).

The purpose of the focus group was to generate interaction and discussion between staff with a range of different organisational roles and responsibilities about the feasibility of an integrated disaster plan, the benefits and barriers for SLQ, and how an integrated plan might work in practice. Participation in the focus group was voluntary. The group comprised senior SLQ stakeholders with responsibilities for and experience in disaster management of digital collections and systems, physical collections and broader organisational infrastructure functions. A number of these staff members shared valuable insights based on their personal and professional experience in responding to the 2011 Queensland flood disaster.

The focus group discussed the following questions about an integrated disaster plan:

- What would be the benefits of an integrated disaster plan and what would be the barriers?
- How can the barriers be mitigated?
- Is there a need for two specialist collection disaster coordinators in the digital and physical domains in an integrated plan?
- How could these roles work in practice and what would the overall command structure would look like?
- How can one effectively incorporate physical and digital requirements into a plan to ensure that it is quick and easy to use?
- Where can the specialised response and recovery actions be located in the plan?
- What would a 'scale of disaster' framework look like if it incorporates digital and physical collections?
- What would an integrated plan mean for prioritising response and recovery actions across the organisation in the event of a disaster, especially salvage priorities?
- What changes, if any, would need to be made to other related in-house documents such as the *Business continuity plan* and *Risk register*?

The outcome of the work with the focus group was the development of an integrated disaster plan template which is discussed further below under **Findings from Focus Group**.

Stage: Four: Workshops to Trial the Integrated Disaster Plan

The fourth stage of the research involved trialling the concept of an integrated disaster plan template at three different workshops with over 20 participants in each workshop. These workshops involved cultural heritage professionals in Australia (Blue Shield Australia (BSA), 2018) and India (Artlab Australia, 2019) and an international audience of archivists and allied professionals at the International Council on Archives/Australian Society of Archivists/Archives and Records Association of New Zealand/PARBICA (Pacific Regional branch) (2019). The workshops are discussed further below under Workshop trials.

Findings

Findings from Survey Questionnaires

All collection managers from the nine NSLA libraries indicated that disaster management was implemented as a key strategy for preserving their physical collections. However, in the digital domain, only four of the NSLA libraries identified that disaster management was a strategy for preserving their digital collections, while only one of these NSLA libraries had a formal digital disaster plan. This library's disaster plan was documented separately from their physical collections disaster plan. The comparatively low levels of digital disaster plans led the researcher to seek further information on digital disaster practices during the interviews.

Triangulation

The risk of bias and of leading the research outcomes was achieved through using triangulation which involved analysing supporting documentation, such as relevant policies and procedures, to search for convergence of information (Suter, 2014). It also involved cross-validation of the survey responses on similar issues from the two domains, and later discussion of potential discrepancies with interviewees.

An additional opportunity for triangulation was provided when NSLA granted permission to access data from their combined self-assessment survey of digital preservation capability (National and State Libraries Australia (NSLA), 2016a; National and State Libraries Australia (NSLA), 2016b), which was conducted during a similar timeframe as the surveys and interviews for this research. This enabled a comparison of individual NSLA libraries' self-assessed 'maturity level' ratings for digital preservation with the survey responses and interview data for this research, giving the opportunity to uncover any discrepancies.

The NSLA digital levels of maturity are summarised below: the complete definitions can be found in the survey that is available on the internet (National and State Libraries Australia (NSLA), 2016a).

- (1) **Initial** (ad hoc)
- (2) **Repeatable** (basic processes are repeatable)
- (3) **Defined** (digital preservation processes are repeatable, workforce competencies align with business strategies and objectives)
- (4) **Managed/predictable** (digital preservation is effectively controlled)

- (5) **Optimising** (continuous improvement of performance, innovative technological improvements).

Analysis of the research project survey questionnaire responses from the digital preservation managers revealed a high level of congruence with the NSLA self-ranked organisational maturity levels. For example, the higher ranked organisations in the NSLA digital preservation maturity survey consistently identified in the research project survey that their organisations correspondingly implemented an extensive range of key digital preservation principles to all, or a great extent; they practised a wide range of specialised technological strategies that were commensurate with their maturity levels and had digital preservation policies in place. Similarly, the organisations that had rated themselves at a lower level of organisational maturity in the NSLA maturity survey consistently identified that the digital preservation principles applied only to some extent, or never, and that they had only implemented a small number of digital preservation technological strategies.

In summary, the data from the NSLA *Digital preservation maturity matrices survey* provided useful corroborating information that assisted with validating the data. It confirmed that answers provided by respondents for the research project survey questionnaires relating to digital preservation principles and strategies were consistent with the organisational maturity levels of individual NSLA libraries.

Findings from Interviews

The interviews provided further evidence about disaster management practices, especially arrangements relating to digital collections. The interviews revealed that, in practice, a level of digital disaster management was in place for all NSLA libraries. Furthermore, the interviews identified that digital disaster management was usually the responsibility of the Information Communications Technology (ICT) section, commonly undocumented, and managed independently from the disaster management of physical collections. This finding had significant implications for the research, as it confirmed that disaster management was occurring in the equivalent of ‘parallel universes’ within the various NSLA libraries. In the event of a disaster, this risks an uncoordinated disaster response across the physical and digital collections, together with a lack of informed staff who can work together cohesively, effectively and quickly.

Another significant point of interest about the implied scope of existing disaster plans occurred when the researcher was granted permission to view confidential or draft in-house disaster plans during the interviews. All of the disaster plans for physical collections examined had broad titles such as *Collections Disaster Plan* that implied coverage of all collections – physical and digital – when, in reality, their scope largely covered physical collections, with some references to digital objects on physical carriers. The practice of using broad titles in the NSLA libraries mirrors the use of broad titles in a range of other library disaster plans (University, 2016; University of Tasmania, Disaster Management Team (Library Collections), 2020; University of Toronto, 2019). The use of broad titles such as *Collections Disaster Plan* potentially adds to the disconnect and lack of clarity about disaster management arrangements in the two domains by creating the

impression that a plan potentially covers all the library collections, whereas the disaster arrangements for digital collections are likely to be managed separately and may be undocumented.

Potential Benefits of an Integrated Disaster Plan and Interconnections

The majority of preservation managers interviewed (17 out of 18 managers) were supportive in principle about the potential key advantage of an integrated disaster plan template. The preservation managers identified that a major advantage of having an integrated disaster plan is its potential to provide a comprehensive 'one stop shop' approach, and 'one comprehensive disaster portal' covering all collections.

All interviewees identified areas of synergy that can potentially interconnect disaster management across the two domains and which had been previously highlighted in the literature review. These areas included common stages, scale of disaster, risk management and business continuity that are part of the whole organisational ecosystem. In relation to a fifth area of copies, surrogates and back-ups, a significant number of preservation managers (from Organisations 1, 2, 3 and 6, 7, 8) articulated the potential benefits that an integrated disaster plan can provide through centrally listing originals, surrogates and their locations and hence helping to inform overall salvage priority decisions.

Potential Barriers and Areas of Disconnect

A number of potential barriers and areas of disconnect relevant to the development of an integrated disaster plan were also identified during the interviews.

A prominent barrier relates to the expanded scope of an integrated disaster plan. One digital preservation manager (Organisation 5) explicitly emphasised the risk of an integrated plan becoming too large and complex to navigate with the expanded scope. One way of addressing this potential barrier is through using a range of design features to mitigate the risk of increased size and complexity. These design features could include clear logical structuring and signposting, along with combining common areas, while separating out specialist areas as appendices. Accordingly, these same features have been incorporated into the design of the ALIA disaster management resources (Australian Library and Information Association (ALIA), 2019) and are discussed further below.

During the interviews, four organisations (Organisations 1, 5, 6 and 8) recognised that an integrated approach to disaster management requires appropriate change management and buy-in at all organisational levels. Effective change management is critical to developing an integrated disaster plan, as the changes involve a new way of seeing and understanding the connections between physical and digital disaster management. In turn this links with organisational structure and sections or teams that may have traditionally approached disaster management independently (such as the ICT, physical preservation and facilities management sections). Effective change management must ensure that buy-in and understanding occurs at all levels in the organisation and is embedded into all stages of plan development, including staff training.

Closely related to change management is the theme of specialised staff skill sets, the specialised nature of the work and associated specialist technological infrastructure, which was identified by the preservation managers as a barrier in implementing an integrated disaster plan. Preservation managers confirmed that each of the domains

requires unique and highly specialised skill sets and infrastructure relating to disaster management and this was further corroborated in the later discussions held with the focus group.

The requirement for specialisations has implications for an integrated disaster plan to be flexible enough to incorporate the specialisations and to align communication across the physical and digital domains. For example, this could be achieved by ensuring specialist expertise is represented in the disaster team and its team leaders, as well as incorporated into the design features of the plan such as the specialist digital and physical response and recovery sections and specialist equipment. These features are discussed further below under **ALIA disaster management resources**.

A major challenge identified in this research and reported widely in the literature relates to the need for efficient and effective communication during a disaster (Forde & Rhys-Lewis, 2013; Frank & Yakel, 2013; Kahn, 2004). An integrated disaster plan that combines physical and digital disaster management potentially adds another layer of complexity. This means that the communications and command structure of an integrated plan need to be clear. An example of a clear command structure that features both digital and physical teams is incorporated in Chart B of the *ALIA Disaster Management for Libraries – Part two Disaster plan template* (Australian Library and Information Association (ALIA), 2019).

Interviews with staff from those NSLA libraries that had experienced a recent disaster also highlighted the closely related area of access and the need to explicitly clarify authorisations that include physical access to buildings and remote access to ICT infrastructure. Therefore the implications for an integrated disaster plan are that it needs to effectively embed access and authorisation requirements for digital and physical collections throughout. This includes disaster teams, team leaders and the command structure as well as clarifying physical and digital access arrangements and authorisations, and these correspondingly feature in the ALIA disaster management resources *ALIA Disaster Management for Libraries – Part two Disaster plan template*, Table 8, 2019).

Noting that the interviewees had confirmed that a level of disaster management for digital collections was already in place in all libraries to varying levels, this was identified as a point of disconnect, given that these arrangements were commonly undocumented and assigned to the ICT section. In turn, this has implications for documenting and aligning existing practices into an integrated plan. This will entail clarifying ICT specialist disaster roles and responsibilities, along with their involvement in change management processes.

Table 1 provides a summary of the interview findings, highlighting potential inter-connections between physical and digital disaster management, together with areas of synergy and disconnect, and the potential implications for developing an integrated disaster plan.

Findings from Focus Group

In the earlier section of the **Methodology**, stage three discusses working with a focus group at SLQ to explore the feasibility of developing an integrated disaster plan.

The focus group discussion revealed general support for aligning physical and digital disaster management. From these discussions, it was clear that the major points of

Table 1. Interconnections and implications.

Interconnections, areas of synergy and disconnect	Potential implications for developing an integrated disaster plan
Key advantage: a comprehensive, cohesive ‘one stop shop’	A synergy that supports development of an integrated disaster plan.
Synergies	
Business continuity	Integrated disaster plan requires thoughtful and systematic alignment with strategic documents across the organisation’s ecosystem, such as business continuity plan.
Risk management	Integrated disaster plan requires thoughtful and systematic alignment with strategic documents across the organisation’s ecosystem, such as risk management system.
Scale of disaster	Useful to incorporate into an integrated disaster plan, addressing both domains.
Copies, surrogates and backups	Include lists of copies, surrogates, and back-ups, their locations and relations to the originals in an integrated disaster plan.
Stages of disaster management (prevention, preparation, response recovery)	Useful to incorporate four stages into integrated disaster plan template, integrating stages for both domains.
Barriers and areas of disconnect	
Expanded scope leads to risk of size and complexity	Address through design features to mitigate risk of increased size and complexity e.g. clear, logical structuring and signposting, combining common areas, separating out specialist areas as appendices.
Integrating physical and digital disaster management requires change management	Ensure that effective change management is embedded into all stages of plan development, including staff training, and that buy-in occurs at all levels.
Specialised staff skill sets, specialised nature of work, specialist technological infrastructure	Flexibly incorporate specialisations and align communication e.g. by ensuring specialist expertise in disaster team and team leaders, and plan design features.
Integrated plan adds complexity: increased need for effective and efficient communication	Effectively embed communication requirements throughout e.g. disaster teams, team leaders and command structure; clarify physical access and authorisations for buildings, utility cut-off points, remote authorisations for ICT and digital infrastructure.
A level of digital disaster management in place (disconnected), undocumented and assigned to ICT	Incorporate and align existing digital disaster practices, clarify ICT specialised roles and responsibilities, involve ICT staff in change management processes.

difference between physical and digital domains occurred at the granular level – for example, in first response, and in recovering damaged physical and digital collections. As reflected in the earlier survey and interviews, the discussions indicated that there was already a significant amount of digital disaster preparedness in place managed by the ICT section, and that these processes were largely invisible in the current SLQ disaster plan.

The focus group confirmed the need to align key strategic documents such as the Business Continuity Plan and Risk Register. The focus group also confirmed the need for two specialist roles for physical and digital disaster team leaders and two specialist disaster teams. These roles were incorporated in the generic template for an integrated disaster plan, and were subsequently included in the ALIA resources on disaster management (Australian Library and Information Association (ALIA), 2019).

The focus group also discussed how potential barriers could be addressed. For example, the group identified how effective and efficient communication could be achieved within an integrated plan by incorporating a *Command structure* that covered

both domains and clarified access and authorisations for physical and digital infrastructure.

A further finding related to the concept of disaster scale. The focus group explored the concept of an integrated disaster scale framework using a model adapted from the University (2016). These discussions led to the development of an integrated disaster scale framework that covered examples from the physical and digital domains and this framework was subsequently incorporated into the integrated plan template in Table 13 of the ALIA disaster management resources (Australian Library and Information Association (ALIA), 2019). .

Overall, the findings from the focus group research confirmed interest in and support for the concept of an integrated disaster plan and facilitated the development of a disaster plan template as a proof of concept, which had not been previously documented in the literature.

The ALIA Disaster Management Resources

In 2018 the researcher was approached by ALIA's representative on Blue Shield Australia about the possibility of updating the earlier ALIA disaster resources (Australian Library and Information Association (ALIA), 2010). This provided an opportunity to incorporate the findings of the research project, including the potential to introduce the concept of integrated disaster management to the wider Australian library community. Following further discussions with ALIA and with professional development support from employer organisations Artlab Australia, the State Library of South Australia and the State Library of Queensland, the researcher worked with Christine Ianna from the State Library of Queensland to jointly update the ALIA disaster management resources.

The remodelling of the earlier edition of the ALIA disaster resources (Australian Library and Information Association (ALIA), 2010) constitutes a major contribution to the research in this field, as the updated resources incorporate the option of a 'one stop shop' integrated approach to managing disasters across all collection formats that are held in current libraries. Furthermore the updated ALIA resources incorporate the key features from the research, particularly the work with the focus group, as discussed below. Importantly, the new ALIA resources have also been designed flexibly so that libraries can readily expand or 'deconstruct' them to focus separately on digital or physical formats according to their needs and preferences. The revised ALIA disaster management resources (Australian Library and Information Association (ALIA), 2019) comprise a *Guide*, *Disaster Plan Template* and *Scenarios*.

Key features from the findings of this research project that have been incorporated into the new ALIA disaster management resources include the following:

- integrated approach
- principle of interconnectedness applied throughout
- structured around four stages of disaster management
- uses risk management framework
- links with the wider organisation ecosystem (e.g. business continuity planning, risk management, broader emergency procedures)

- incorporates synergies such as scale of disaster, role and locations of surrogates, copies and back-ups
- incorporates required specialisations e.g. specialist disaster team leaders and disaster teams, specialist response and recovery sections
- communication features embedded throughout e.g. emergency contacts, command structure, clarifying physical access and authorisations as well as remote access; and
- design features to mitigate risk of complexity e.g. clear logical structuring, signposting by using icons, combining common areas and separating out specialisations in the disaster plan template.

The *Guide* (Part one) sets the scene, giving an overview and context for the disaster plan. Additionally the *Guide* provides context for an interconnected view of disaster management across digital and physical collections. Additionally the *Guide* aligns disaster management of collections with the broader context, such as business continuity and risk management plans, emergency procedures for people, links with parent organisations such as a school, or GLAM organisation or department, and broader emergency infrastructure and organisations. It also highlights the direct links with collection priorities and issues of significance that determine salvage priority lists. To assist in prioritising collections for response and recovery, the *Guide* identifies the importance of identifying and documenting where backups are located (for example, off-site, or in ‘the cloud’) and other surrogate copies (such as microfilm master copies).

Section six of the *Guide* outlines the four stages of disaster management: prevention, preparation, response and recovery. It explains useful features of a disaster plan, together with the typical roles of a disaster team leader and highlights the importance of disaster training for all relevant staff, including at the induction stage. The final section includes additional roles that the library may undertake, including acting as a community hub or shelter, acting as a signpost for resources on recovering personal treasures and collecting and recording the history of the disaster. The collecting and recording role has been recently exemplified by NSLA libraries collecting the memory of the Covid-19 pandemic (National and State Libraries Australia (NSLA), 2020).

The *Disaster plan template* (Part two) provides further details and a flexible integrated template for users to develop their organisation’s integrated disaster plan. An introductory checklist provides a systematic pathway to preparing an integrated plan. The generic contents list for an integrated plan can be readily adapted and tailored to the particular needs of an organisation. Part two also includes examples of emergency contacts, authorisations and access protocols, along with examples of a command structure and details of disaster team roles. Other key sections provide examples of salvage priorities, augmented by references to specialist digital and physical resources on salvaging and freezing different types of material. Additional information is provided on mapping storage locations, together with lists of typical emergency equipment and supplies, and record keeping templates. As previously noted, Table 13 in the ALIA template provides examples of how the responses to digital and physical disasters can vary from a small incident to a large scale disaster.

The *Scenarios* (Part three) are provided for training purposes, to help familiarise staff with their organisation’s disaster plan and various staff roles, and to identify any gaps or areas for improvement. Six short scenarios cover the impact of burst pipes, storms, fire

and dust on digital and physical collections. A checklist of key issues for has been prepared for facilitators to assist groups to explore the practical implications of different disaster scenarios.

In summary, the updated ALIA disaster resources constitute a major contribution to the research in this field, as they incorporate the new concept of of an integrated approach to disaster management of collections across the physical and digital domains, adding to the body of knowledge on disaster management.

Workshop Trials

The fourth and final stage of the research provided opportunities to confirm the transferability of the concept of an integrated collection disaster plan to wider audiences. This stage involved three different workshop trials of the integrated disaster template with diverse groups from the GLAM sector in Australia and India with over 20 participants in each workshop.

The first workshop, organised by Blue Shield Australia, involved cultural heritage professionals from across the Australian GLAM sector (Blue Shield Australia (BSA), 2018). This workshop utilised the generic integrated disaster template that had been developed as an outcome of the focus group discussions (Brown, 2018, Figure 3). The second and third workshops occurred following the publication of the new ALIA disaster management resources and trialled the use of the ALIA resources in the workshop delivery (Australian Library and Information Association (ALIA), 2019). The second workshop involved an international audience of archivists and allied professionals at the International Council on Archives/Australian Society of Archivists/Archives and Records Association of New Zealand/PARBICA (Pacific Regional branch) Conference (International Council on Archives/Australian Society of Archivists/Archives and Records Association of New Zealand/PARBICA (Pacific Regional branch), 2019) in Adelaide. The third workshop provided an opportunity to trial the resources throughout an intensive five day program. The integrated disaster management program was jointly delivered by Artlab Australia and the Indira Gandhi National Centre for the Arts (IGNCA) in Delhi for representatives across the GLAM sector (Artlab Australia, 2019).

During each of the three workshops, small groups investigated different stages of the integrated disaster plan (for example, prevention or response) in the context of a hypothetical scenario involving digital and physical collections, using the integrated disaster plan template as a framework. The groups discussed what their particular component of the integrated plan template might look like in more detail, what the challenges were, and what issues or questions needed resolving. The feedback from participants in all three workshops was positive; all groups were able to successfully apply the integrated disaster plan template, providing examples of how the plan would work in practice, using the scenarios as context. Importantly, they provided opportunities to confirm the transferability of the concept of an integrated disaster plan beyond NSLA libraries to participants across the GLAM sector from a range of different organisations, and countries on three separate occasions.

Ongoing Interest

As a measure of the contribution of this research, there has been steady ongoing interest in integrated disaster management and the ALIA disaster management resources. This is evidenced in the recent download figures for the ALIA resources provided by ALIA (July 2021). The figures indicate that over 2000 downloads have occurred for the combined resources since they were first published in mid 2019: Part one – 1264; Part two – 905. As a specific example of direct application, the State Library of Western Australia, one of the participating NSLA libraries in the research project, is currently developing a draft integrated disaster plan for its physical and digital collections.

While the recent Covid-19 pandemic has limited additional opportunities to provide in-person training, ongoing interest in integrated disaster management has also been demonstrated during 2020 and 2021 by the range of presentations to GLAM audiences at webinars and other sessions on integrated disaster management using the ALIA resources. Within Australia, these sessions have included presentations to colleagues at Queensland University Libraries Office of Cooperation (QULOC), the School Library Associations of New South Wales and Victoria and a symposium for GLAM colleagues on disaster preparedness organised by Blue Shield Australia in Adelaide (Blue Shield Australia (BSA), 2021).

During this same period, the researcher has delivered a range of international webinars featuring an integrated approach to disaster management to Universitas Gadjah Mada (Yogyakarta), the National Library of India, the Indian Society for Advancement of Library and Information Science (SALIN) and Panjab University. Additional Indian webinars have been organised by a joint IGNCAL/ University of Applied Arts Vienna symposium and India's Developing Library Network (DELNET) NACLIN online conference. In January 2021, a presentation on integrated disaster management was also delivered at the National Institute of Library and Information Sciences University of Colombo, in partnership with the South Asia Chapter of the Association for Information Science and Technology.

Conclusion

This research has led to the development of the new concept of an integrated approach to disaster management of collections across the physical and digital domains, adding to the body of knowledge on disaster management. Overall the research project has confirmed the benefits of an integrated disaster management plan in providing a 'one stop shop' coordinated approach to disaster management across physical and digital library collections.

The development of the new ALIA disaster management resources constitutes a major contribution to the research in this field. The updated resources incorporate the key features from the research, including an integrated approach, areas of synergy such as risk management and stages, clear communication features, specialisations in response and recovery approaches and the use design features such as signposting and icons.

The workshop trials have provided opportunities to confirm the transferability of the concept of an integrated disaster plan beyond NSLA libraries to participants across the GLAM sector from a range of different organisations, and countries.

As an indication of the potential impact of this research there has been steady ongoing interest in the concept of integrated disaster management and the ALIA disaster management resources as reflected in the ALIA download statistics and the range of presentations to GLAMR audiences in Australia and internationally.

Overall, at a time of elevated risk of disasters due to climate change, this research provides an important contribution to the field of disaster management with an integrated perspective that has potential application across the wider GLAM sector within Australia, and internationally, with organisations such as Blue Shield International.

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