Disaster Management and Backup Strategies for Digital Libraries

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❖ **Abstract:**

This research paper explores disaster management and backup strategies for digital libraries, highlighting key techniques and best practices to ensure continuity of services and protect digital collections.

❖ **Introduction**

Digital libraries have become essential repositories of knowledge, providing access to vast collections of digital resources. However, these digital collections are vulnerable to various disaster risks, including natural disasters like earthquakes and floods, and human-made disasters like cyber-attacks and power outages. Effective disaster management and backup strategies are crucial to ensure the continuity of digital library services and protect valuable digital collections. This research paper explores key disaster management and backup strategies for digital libraries, highlighting techniques and best practices to mitigate disaster risks and ensure the long-term preservation of digital resources.

Background: Digital libraries face various disaster risks, including natural disasters and human-made disasters.

Problem Statement: Effective disaster management and backup strategies are crucial to ensure continuity of digital library services and protect valuable digital collections.

Research Objective: To identify key disaster management and backup strategies for digital libraries.

❖ **Disaster Management Strategies**

Risk Assessment: Identify potential disaster risks and assess their likelihood and impact.

Disaster Planning: Develop a comprehensive disaster plan outlining procedures for emergency response, backup, and recovery.

Training and Awareness: Provide regular training and awareness programs for library staff and users.

❖ **Disaster Management**

Disaster management is the combination of two major undertakings by an organization, the development of a disaster recovery plan and the implementation of those plans should the need arise. Disaster management also includes broader management issues such as finance, risk assessment and training and should be considered a key area of library management.

Disaster Management Act 2005 defines disaster management as a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for:

a) Prevention of danger or threat of any disaster

b) Mitigation or reduction of risk of any disaster or its severity or consequences

c) Capacity building

d) Preparedness to deal with any disaster

e) Prompt response to any threatening disaster situation or disaster

f) Assessing severity or magnitude of effects of any disaster

g) Evacuation rescue and relief, and

h)   Rehabilitation and reconstruction.

Disaster management has moved to the forefront of library and archives concerns, due in part to the considerable increase of natural disasters in the past decade, but also because of the vast and varying collections of information in both physical and digital manifestations, that are the most valuable assets that many of these organizations possess. The planning and implementation of a disaster recovery plan must be understood by the entire organization that it is not a quick fix, it is not possible to extinguish the fires or contain the floods and quickly return to normal operations. In the event of a disaster, there is a "ripple effect" that may require extraordinary efforts, resulting in suspended period before the status quo can be returned.

A disaster management plan or disaster recovery plan is designed to prevent catastrophic damage from happening and ease the process of recovering from any damage that is incurred, enabling people to overcome the confusion and turmoil created by a disaster and providing pre-planned and rehearsed courses of action.

❖   Libraries and disasters

Library and information centres are the repositories for the records of a culture's existence. These records reflect the scholarly and creative efforts of a civilization as well as its social and historical interaction. They are a gift from the past to the future, collected in the hope that what we have thought, created, and discovered will be a source of pleasure and assistance for generations to come. The preservation of these fragile and sometimes tenuous links is the responsibility of those to whom their care has been given.

Importance of Libraries

I. Enabling forces for learning
II. Libraries provide an environment in which creativity is fostered
III. Centre for creation and recreation of academic activities
IV. Promotes dissemination of research
V. Enables networking between researchers
VI. Heart of an academic institution
VII. Repository of culture and society

One of the greatest tragedies, which can befall a library and information centre is disaster. When the librarian accepts holdings into his repository, it implies taking the responsibility for their custody. All this may be jeopardized, if the library is damaged or lost because of a disaster. Viewed from the point of view of the library, a disaster can be anything or event, which directly or indirectly affects the normal administration of the library, i.e., the disruption of, services to readers for either a short time or a long-time basis.

Natural events like earthquakes, floods, and volcanic eruptions are termed disaster because of the effects they have on human beings as well as their normal way of occurrence. In addition, man-made events like fire, acts of war and terrorism, structural (building) deficiencies and chemical spills are termed disaster; because of their effects on materials and properties of the library. However, criminal acts, like book theft and mutilation are also termed as physical disasters.

❖   *History of disasters in libraries*

It is very important to provide an historical perspective on disasters. Among one of the earliest noted incidents, Xiang Yu, rebelling against Emperor Qin Er Shi, led his troops into Xianyang in 206 BC. He ordered the destruction of the Epang Palace (or Xianyang Palace) by fire. (Qin Shi Huang had ordered the burning of books and burying of scholars earlier.) The great library at Alexandra established in the third century BC, was destroyed by fire first in 47 BC, during the time of Julius Caesar and then finally in 373 AD.

The Library of Antioch library was burnt by Emperor Jovian in AD 364. It had been heavily stocked by the aid of his non-Christian predecessor, Emperor Julian. In AD 651 Books of Library of Ctesiphon were thrown into the Euphrates on the order of Caliph Umar. In 976 AD, Library of al-Hakam II, all books consisting of "ancient science" were destroyed in a surge of ultra-orthodoxy. In 1029, Sultan Mahmud of Ghazni burned the Library of Rayy and all books deemed as heretical. Nalanda University complex (the most renowned repository of Buddhist knowledge in the world at the time) was sacked by Turkic Muslim invaders under Bakhtiyar Khilji in AD 1193, this event is seen as a milestone in the decline of Buddhism in India.

The Library of Congress was destroyed during the War of 1812 when British forces set fire to the US Capitol during the Burning of Washington. The 1966 Florence flood destroyed 2 million volumes of cultural objects in the Bibliotheca Nazionale Centrale. The fire at the library of the Nigeria Institute of Policy and Strategic Studies, Kuru, Jos in 1988 arson by students destroyed books in the Nigeria Forestry Research Institute Library. Fire severally damaged the Cabildo in New Orleans in 1988; the Loma Prieta earthquake damaged several San-Francisco's area museums and libraries in 1989.

The Public Records Office of Ireland was burnt down during the 1992 civil war leading to the loss of Irish Cultural Heritage from the Middle Age to 1790. The devastating fire at Norwich City Library in 1994, showed how vulnerable collections are the great loss that can result. In November 1998, a tornado swept through Colombia destroying some records of the University of Missouri. In 1999, the invading force of Slobodan Milosevic systematically destroyed records pertaining to land, financial, citizenship and genealogical entitlements of the Albanian community in Kosovo.

On September 11, 2001, terrorists bombed the World Trade Centre and the Pentagon libraries in the United States of America, destroying records, books and other documentary materials. The National Library and Archives, a priceless treasure of Ottoman historical document including the Royal Archives of Iraq, were turned to ashes in 3,000 degrees of heat on 14th April, 2003 during the United State's invasion of Iraq. Several libraries of Iraq were looted, set on fire, damaged, and destroyed in various degrees during the 2003 Iraq War.

Several libraries, archives, and museums of India, Indonesia, Malaysia, Maldives, Thailand, Sri Lanka were destroyed because of the 2004 Indian Ocean earthquake. Library of Egyptian Scientific Institute, Cairo was destroyed in December 2011 and only 30,000 volumes have been saved of 200,000. Many libraries were destroyed due to Hurricane Sandy in New York in November 2012 particularly in New York City, its suburbs, and Long Island.
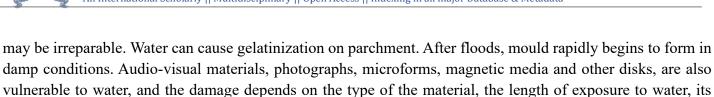
It can be said that large or small, natural or man-made disaster or emergencies put an institution's staff and collections in danger.

❖ *Possible threats to libraries and their resources*

The greatest threat to the collections are considered to be from fire and water. Physical damage is considered less likely. However, a worst-case scenario could involve all three hazards occurring simultaneously. The staff should be mindful of any signs of problems arising in these areas.

Fire: Books burn slowly. Paper chars and crumbles when handled. Smoke and soot discolour books not otherwise affected. Microforms and audio-visual materials can be completely destroyed or damaged beyond repair. Fire could originate from either external or internal sources. External sources include the risk of bush fire and lightning strikes. Internal risks of fire are ever-present with our widespread reliance on the use of electrical appliances, such as desk lamps, heaters, computers, power boards and other equipment within the collection buildings. Other possible sources of fire could include chemical spills.

Water: Paper absorbs water at different rates depending on the age, condition and composition of the material. Generally speaking, books and manuscripts dated earlier than 1840 absorb water to an average of 80% of their original weight. Modern books, other than those made of the most brittle paper, absorb to an average of 60% of their original weight. Leather and parchments usually warp, wrinkle or shrink. The damage done to book covers

may be irreparable. Water can cause gelatinization on parchment. After floods, mould rapidly begins to form in damp conditions. Audio-visual materials, photographs, microforms, magnetic media and other disks, are also vulnerable to water, and the damage depends on the type of the material, the length of exposure to water, its temperature, etc.

Physical Damage: Physical damage to the collection could arise from damage to the building (e.g., structural failure or storm damage) resulting in damage to the collection, or from unauthorized entry leading to theft or vandalism of library collection. Maintenance arrangement for all large trees in proximity to the buildings minimize the chance of damage to the building from a tree falling on it during a storm. Security arrangements at both sites minimize the risk of the unauthorized access. However, it should be noted that security arrangements are not fail-safe. Systems failure is always a possibility and people should be cautious of unauthorized people. There also is the potential for the security system to fail if it is impaired in some way associated with the disaster.

Biological Agents: Materials may be eaten, soiled, stained and shredded.

E-disasters: E-disasters like virus in personal computers, server failure, network failure and website hacking are the modern disasters which hamper the normal functioning of the libraries. A disaster plan should include a detail information about the systems Inventory (hardware, software) and list of cloud services library is using to store/create data.

❖ Best Practices

Test and Review: Regularly test and review disaster management plans and backup strategies to ensure effectiveness.

Collaboration: Foster collaboration among library staff, IT teams, and emergency responders to ensure a coordinated response to disasters.

Insurance: Consider insuring digital collections and library infrastructure to mitigate financial losses in the event of a disaster.

❖ Conclusion

In conclusion, disaster management and backup strategies are essential for digital libraries to ensure the continuity of services and protect valuable digital collections. This research paper has highlighted key techniques and best practices for disaster management and backup, including risk assessment, disaster planning, cloud storage, regular backups, encryption, and Disaster Recovery as a Service (DRaaS). By implementing these strategies, digital libraries can mitigate disaster risks and ensure the long-term preservation of digital resources. Ultimately, effective disaster management and backup strategies are critical for safeguarding the integrity and accessibility of digital library collections.

Summary: This research paper highlights key disaster management and backup strategies for digital libraries.

Recommendation: Digital libraries should implement robust disaster management and backup strategies to ensure continuity of services and protect digital collections.

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