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Risk Management in Libraries, Archives and Museums

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Abstract: The world is becoming subject to diverse risks due to environmental and human-based hazards that Libraries, archives, and museums (LAMs) are more exposed to than before. Proactive risk management is necessary because the emergencies and disasters are unpredictable. The four main pillars of disaster management preparedness, mitigation, response and recovery need to be well cooked, planned properly and strictly carried out before any incidence occurs. The first step which is indispensable in a healthy Risk Management System in library, archive, and museums (in general, all of them are regarded as information and documentation centers) is to define the hazards along with the assessment of the level of their threat, and only after that, it is recommended to set the priorities. Continuous improvement is one of the key dimensions of the system upholding its effectiveness over the years, where a cyclical process under the influence of Plan-Do-Check-Act (PDCA) model plays a central role. Deliberate risk analysis must consider among others: the frequency and severity and frequency of possible disasters; the quantity and contents of collections and materials; the staff and users; structural and non-structural characteristics of the building; geological perimeters of the location; and existence of harmful facilities in the adjacent landscape. These risks can only be tackled by developing specific plans that should be to cope with both short-term, medium-term and long-term goals with regards to every risk identified. This paper will emphasize the importance of thorough risk analysis and assessment to be carried out as required by the Occupational Health and Safety (OHS) rules especially as relevant to LAMs. An example of a risk analysis carried out using risk matrix methodology of 5x5 is given to give a view of how such analyses can be practically performed.

Keywords: *Cultural Heritage Risk Management, Risk Analysis Methods, Risk Monitoring, Information and Documentation Management.*

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I. INTRODUCTION

Risk in library, archive and museum buildings risk management of the library, archive and museum buildings is an orderly procedure of foreseeing potential risk that can befall the establishment in the event preventive measures have not been instigated to arrest the hazard. Such dangers may result to serious destruction of occupants as well as precious collections in buildings. Many researchers have engaged in projects aimed in risk assessment so as to reduce the threats to these institutions. The International Federation of Library Associations and Institutions (IFLA) among others has come up with guidelines and principles to guide their members in reducing disaster risk, especially during crisis or conflict (IFLA, 2023). IFLA is also interested in preserving cultural objects and undertaking disaster preparedness with the assistance of UNESCO and other heritage organizations. The key components of a modern academic library infrastructure are also obliged to meet more stringent requirements in terms of seismic protection, indoor climate conditions, air quality, and thermal and light comfort in order to sustain human life as well as the material assets in collections (Dowlin, 2004, as cited in Sharma & Patel, 2023).

The use of digitization projects is also important risk mitigation strategies. A project that was working on the digitization of special collections examples used magnitudes of risk according to their frequency, loss of value, and exposure of collections (Ketzer, Marzo, & Pimlott, 2012). In another health and safety survey in the libraries of the universities of Nigeria, Oketunji, (2014) discussed the issues of occupational hazards among library employees. On the same note, Senyah and

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Lamptey (2011) also evaluated the risk of security and personal risk among the staffs within the Kwame Nkrumah University of Science and Technology Library, Ghana.

In his publication, Abdul-Wahab (2011) mentioned the syndrome of a sick building with reference to poor indoor environment causing complaints among the staff of the Sultan Qaboos University Library in Oman. These threats to museum collections are usually physical forces (earthquakes, vibrations), fire, water damage, theft, pest infestation, pollutants, radiation, environmental factors (temperature, humidity, etc.) (UNESCO, 2024; ICOM, 2023). Agents of deterioration that would be relevant today, back in the days in 1992, outlined by Michalski (1992, as cited in Walker, 2024), include: direct physical force, displacers or vandals, fire, water, pests, contaminants, radiation, incorrect temperature, and relative humidity.

There are risks to assess consistency, recognition, the purpose of risk assessment is to determine the existence of the hazard and potentially assess their effects (Prideaux, 2007; Tan & Lee, 2022). As in, the Cultural Property Risk Analysis Model (CPRAM) by Waller, 2005 most especially has been used in the museum settings like in Canadian Museum of Nature. The model used in the British Museum Risk Management Policy (2023) includes the risk matrix system, referring to the frequency and severity of losses, which are regarded as the best practices in the contemporary approach toward prioritizing mitigation activities. Similarly, the new version of Risk Management Best Practices Module, created by the British Columbia Museums Association (Hall & Duckles, 2024) incorporates sorting techniques in their practices assessment of risks regarding probability and impact. Research interests have changed to reflect the need to consider risks of not only individual people (staff, visitors, volunteers) but also to physical assets (collections, buildings, artifacts and equipment) to encourage an integrated culture of risk awareness and readiness in libraries, archives and museums.

II. MATERIALS AND METHODS

In the current study, health and safety risks of library, archive, and museum buildings in the framework of the Code on Occupational Health and Safety with reference to related regulations, including Regulation on Risk Assessment in respect of Occupational Health and Safety are assessed and measures that can be taken in order to minimize the existing risks in acceptable limits are determined. To this end, the study deploys the methodology of 5x5 Risk Assessment Table. To facilitate the provision that the application will be functional across all the library, archive and museum buildings and it should be an example, as study area Mwalimu Nyerere Memorial Academy (Tanzania) is apparently not at risk at any certain buildings but at any library, archive and museum buildings, the parameters of probability and magnitude are included in 5x5 Risk Assessment parameters. Depending on the risk score rating is performed by scales of intolerable, significant, moderate, tolerable, insignificant risks. Risks that are going to cause damage to staff and works are studied in the course of threat study. There are 5 factors of threats which are identified differently according to the staff members, the workplace and the cultural heritage objects and library materials. Admittedly, one can speak about hundreds of risk factors at library, archive and museum buildings. But here it is concentrated on threats that have been met more mostly.

III. RISK CONCEPT AND RISK MANAGEMENT

The concept of risk defined in one of the international standards might differ in international literature because of the peculiarities particular to this or that industry or this or that scientific area. Despite the common notion that the risk language applies in many areas and is usually based on a common conceptual ground the engineering, banking, insurance, medicine, psychology and the sociology areas the actual usage and meaning differs significantly. This is because of the fact that uncertainty is a quality that supports all the arguments about risks. The most appropriate metaphor that best describes the Chaos Theory is a flap of a butterfly in the Amazon Rain Forests can cause a cyclone in the States, an approach that can be used in the case of Libraries, Archives, and Museums (LAMs), and highlights the vulnerability of the systems. The impact of a small emergency or other disaster in a part of a building often has far-reaching consequences, which may even endanger the whole building. It might result in physical harm or death of employees and patrons, loss of library holdings and damage to facilities, facilities or mechanism. Finally, these disruptors have the capacity to drastically halt or curtail the working operations of the LAM institutions. However, here risk is not a hypothetical theoretical concept but an undesired occurrence, which can always happen unexpectedly and with immense effects. This portrays the importance of uncertainty as a fundamental aspect in any risk definition. As demonstrated in Table 1, in most of the authoritative sources, risk is always associated with the probability of damage or loss and therefore, prospective identification and mitigation of risk are required and must be conducted with sensitivity especially within a LAMs environment.

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Table 1: Definition of Risk	
Definition provided by	**Definition**
AS/NZS ISO 31000:2018	**Risk**: The effect of uncertainty on objectives.
COSO ERM Framework, 2023	**Risk**: The possibility that events will occur and affect the achievement of strategy and business objectives including events that create, preserve, or erode value.
HSE (UK), 2024 Update	**Risk**: The likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard.
ILO Guidelines on Occupational Safety and Health, 2001	**Risk**: The combination of the probability of occurrence of hazardous events and the severity of injury or damage to health that can be caused by these events.
ISO/IEC Guide 51:2014	**Risk**: A combination of the probability of occurrence of harm and the severity of that harm.
ISO Guide 73:2009 (latest as of 2025)	**Risk**: The effect of uncertainty on objectives, a deviation from the expected, positive and/or negative.
Work Health and Safety Regulation 2017 (Australia)	**Risk**: The possibility that harm (death, injury or illness) might occur when exposed to a hazard.
Occupational Health and Safety Law and Regulation on OHS Risk Assessment, Turkey (2012)	**Risk**: The probability of occurrence and the potential severity of a harmful result due to a hazard.

Source: Secondary Data, 2024

Even though as shown in the table terminologies can have slight variations, there is common ground attained; a risk involves probability aspect and a result aspect. Against this background, Libraries, Archives, and Museums being institutes that dwell upon the preservation of human capital on the one hand, and cultural heritage on the other, strongly need resolute and sound risk analysis tools that, predicting some vaguely-known future events, can anticipate them and plan accordingly. In short, there is risk, which has two key parameters: The likelihood of occurrence; the likelihood of occurrence of the risk and the impact or severity; the magnitude of destruction or loss in the event of occurrence of the risk. These two sides are how the risk assessment frameworks ought to be guided in LAM institutions so that they, through preparedness, mitigation and continuity planning, can safeguard human life, property, collections and institutional integrity.

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This is done by carrying out an exploration of those factors, which can affect the damage to workers, users, buildings, objects and collections and also the preventative measures in existence or necessary to counteract these threats across the whole of a facility. Some of the most dangerous threats to museum collections, library materials and archival records may include buildings, fixtures, equipment, substances, operations, and natural or man-made disasters (UNESCO, 2023). Records storage facilities and archival structures should be equipped with safety system to protect them against inadequate environmental conditions, pest infections, unstable moisture and temperature, fire, flood, theft, among damage caused intentionally (IFLA, 2022). All dangerous elements need to be discovered and listed in priority. After such a vulnerability analysis, an evaluation ought to be done to check which risks could be tolerated and those that need urgent mitigation. Employees have to be trained on the recognized hazards, elaborate emergency plans need to be prepared and drills need to be carried out on a regular basis. The scenario of possible disaster response could be prepared corresponding to the evaluated weaknesses of objects and library or archival collections, aspects of resource usage, staff interception, and the protection of objects. These situations should also involve documentations, immediate conservation and preservation, and safe removal of affected ones to other safe storage places. This will involve activities in place to be carried out after the main disaster has been averted together with those that will be put in place just in case certain secondary risks occur but all under the supervision of trained conservation experts. It is important to review and update Emergency Plans regularly. Cultural heritage is a common heritage of the host country and humanity in general. It is the world duty to protect this heritage against any risks to secure its transmission to the future generations (ICOM, 2023). In the past few years, there are many international efforts that aim at limiting threats to cultural institutions. Interestingly, both the International Council of Museums (ICOM) has extended its Museum Emergency Preparedness and Response Toolkit (ICOM, 2023) and UNESCO has revised its Strategy for Risk Reduction at Cultural Heritage Sites (UNESCO, 2023). Subsequently, the Getty Conservation Institute has been maintaining training

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campaigns of integrated emergency planning in cultural institutions worldwide (Getty, 2022).

Five thematic priorities under which cultural heritage reinforcement is targeted, have been identified according to the Sendai Framework for Disaster Risk Reduction 2015-2030:

- Policy and institutional governance structures
- Definition, risk monitoring and early warning systems
- Capacity building and management of information
- Enhancing preparation, emergency readiness as well as recovery planning (UNDRR, 2022).

In such frameworks, the focus is made on participation of local and national agencies, the importance of information and education to inspire the preventative culture, and the strategic evaluation of disaster risks against cultural objects. Also, the Memory of the World Programme by UNESCO has diversified its agenda on records and archives preservation to include assistance in digitization activities, risk management, and inclusive access to members (UNESCO, 2024). The work of campaigning has also further been organized such as the Preservation and Conservation Core Principles developed by IFLA have been revised addressing new standards concerning non-specialist staff involved in maintaining basic standards of collection care (IFLA, 2023).

Table 2: Statistics of Accidents that Occurred in Library, Archive and Museum Workplaces (2022-2024)

Year	Number of employment injuries			Number of Permanent Incapacity			Number of Death Cases			Standard employment injury rates
	M	F	T	M	F	T	M	F	T	%
2022	2	0	2	1	0	1	2	0	2	25.0
2023	1	0	1	1	0	1	5	0	5	12.5
2024	5	0	5	0	0	0	0	0	0	62.5
Total	**8**			**2**			**7**			**100**

Source: Field Data, 2024

➢ *Abbreviations used in the table: M: Male, F: Female,T: Total, %: Percentage*

Standardized employment injury (%) has been calculated with the following formula: Injury rates (%) = $\left(\frac{\textbf{Total Number of Employment Injuries}}{\textbf{Total Number of Workers or a Standard Base}}\right) x\ 100$

As the table reveals, like in all workplaces, risks on workers at also library, archive and museum workplaces may result in the injury, incapacity and death of workers. While assessing the risks in library, archive and museum buildings, the process should be set up so that the overall risk is analysed rather than only the risks on objects, library-archive materials or workers.

IV. RISK ANALYSIS

Methods in risk analysis exist in two forms, the qualitative methods and the quantitative methods. The quantitative technique involves mathematical/statistical tools in the identification of the risk and minimization of the same. When there is no any data concerning the probability, the specific qualitative approach with definition of risk in the qualitative terms (low, moderate, and high) can be applied. The aim of the risk analysis is to forecast the intensity of the damage which may occur to the piece of art. The formula through which the risk can be formulated includes Probability of Occurrence of a Hazardous Incident Impact of the Hazard. In the light of this prediction risk analysis decision is made and hence protection strategies are formulated. Feasibility and cost should also be addressed when coming up with such strategies. Criteria of risk assessment has been established as: -

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Table 3: Probability of the Occurrence of the Risk	
Probability	**Rating for the Probability of Occurrence**
VERY LOW (1)	Almost zero
LOW (2)	Very rare (once a year), only in abnormal cases
MODERATE (3)	Rare (several times a year)
HIGH (4)	Frequently (once a month)
VERY HIGH (5)	Very frequent (once a week, every day), in normal work conditions

Source: Field Data, 2024

Table 4: Severity of the Risk on Workers and Users	
Magnitude	**Rating the Severity**
VERY LOW (1)	No loss of work hour, no first aid required
LOW (2)	No loss of work day, no permanent effect, ambulatory treatment, first aid required
MODERATE (3)	Minor injury, inpatient treatment required
HIGH (4)	Serious injury, long-term treatment, occupational disease
VERY HIGH (5)	Death, permanent incapacity

Source: Field Data, 2024

Table 5: Severity of the Risk on Museum Collections and the Library and Archival Materials	
Magnitude	**Rating the Severity**
VERY LOW (1)	No/very limited damage; no conservation required
LOW (2)	Slight damage; conservation required
MODERATE (3)	Moderate damage (snap, break), conservation required
HIGH (4)	High damage (snap, disintegration, etc.), conservation required
VERY HIGH (5)	Very high damage (severe damage in the collection / material), conservation required

Source: Field Data, 2024

Table 6: 5x5 Risk Matrix					
Risk Level					
Magnitude					
Probability	Very Serious 5	Serious4	Moderate 3	Weak 2	Very Weak 1
Very High5	High 25	High 20	High 15	Moderate10	Low5
High4	High20	High16	Moderate12	Moderate8	Low 4
Moderate 3	High15	Moderate12	Moderate9	Low 6	Low3
Low 2	Moderate10	Moderate 8	Low 6	Low 4	Low2
Very Low1	Low 5	Low 4	Low3	Low2	Low 1

Source: Field Data, 2024

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Table 7: Rating the Risk Score

Conclusion	Risk Category
Intolerable Risks(25)	The work should not be started or any running process immediately be stopped until the identified risk is brought down to an acceptable level. If it is not possible to reduce the risk despite the actions taken, the activity should be avoided.
Significant Risks (15,16,20)	The work should not be started or any running process immediately be stopped until the identified risk is reduced. If the risk is linked with the progress of the work, then immediate measures should be taken and decision should be made on the progress of the work based on such measures.
Moderate Risks(8,9,10,12)	Actions should be started to reduce the risks identified. Such actions should be appliedin accordance with a specific plan.
Tolerable Risks(2,3,4,5,6)	Additional control processes may not be needed to eliminate the risks identified. However, existing controls should be maintained and such maintenance should be audited.
Insignificant Risks (1)	Planning control processes and retaining the records of actions may not be needed to eliminate the risks identified.

Source: Field Data, 2024

Table 8: Indicating the Scores Based on the Matrix Method on the Risk Analysis Table

No	Hazard sources/ hazards	Risks Identified	Damage	P	M	R	Corrective preventive control measures
1a	Cable insulations are worn out	Electrical shock/fire	**E** Injury/death	5	4	20	Immediately replacing defective and worn-out cables not conforming to the standards Undertaking periodicalchecks
1b	Cable insulations are worn out	Fire	**C** Damage/loss	5	5	25	Additional measures shouldbe taken to protect objects against fire, number of fire extinguishers should be increased.
2a	Electric leakagein electrical equipment	Electrical shock/fire	**E** Injury/death	4	5	20	Using uninsulated sockets Insulating the electricalswitchboards Placing an insulated mat in front of electricalswitchboards Installing residual currentrelays
2b	Electric leakagein electrical equipment	Fire	**C** Damage/loss	4	4	16	Fire measures should beextended.
3a	High concentration and disorganization of wiring	Tripping	**E** Injury/death	3	4	12	Avoiding the potential electrical leakage and theresulting fire, all cables should be organized and arranged in conduits.

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3b	High concentration and disorganization of wiring	Fall down of the artwork carried by the tripping worker	**C** Damage/ loss	**2**	**3**	**6**	Handling the artworks not manually but in containers Avoiding manual overload
4a	Attaching labels and warning signs to the electrical switchboard	Electrical shock/fire	**E** Injury/death	**5**	**4**	**20**	Warning signs and labels indicating the hazard should be attached to electrical switchboards. Operating instructions for all devices should be prepared and hung.
4b	Attaching labels and warning signs to the electrical switchboard	Fire	**C** Damage/ loss	**4**	**4**	**16**	Fire measures should be extended.
5a	Failure to take necessary fire-fighting measures	Fire	**E** Injury/death	**5**	**5**	**25**	One (1) - printed instructions for a fire condition should be in place, fire trainings should be presented, fire-fighting equipment should undergo regular maintenance, warning signs showing emergency escape routes during a fire should be attached, and such routes should be kept clear (tables, chairs, cabinets, etc. should be removed).
5b	Failure to take necessary fire-fighting measures	Fire	**C** **Damage/ loss**	**5**	**5**	**25**	Additional firefighting measures should be taken in areas hosting the objects (exhibition, reading, storage areas).

Source: Secondary Data, 2024

➢ *Abbreviations:*

Sections marked with (a): Employees: E Sections marked with (b): Collections and library, archival material: C Probability: P, Magnitude: M, Total Risk Score: R

On Risk Analysis forms; date of realization, validity date, location, person-department in charge of control measures against identified risks, and deadline for the correction of identified problemsshould be specified.

V. RESULTS AND DISCUSSION

Undoubtedly, it is possible to determine hundreds of hazards and corresponding risks involved in loss which can be found in library, archive and museum (LAM) buildings. Among the modern literature and research on risk management of cultural institutions, the study points out five major hazards to the workers and the users, and five major hazards to the contents and collections in libraries and archives. Structured risk analysis was carried out and through use of magnitude tables, risk indexes were compiled to measure severity. These have been further divided into two groups: (1) the risk to workers and users, and (2) risk to the museum collections, and the library and archival materials (see Table 4 and Table 5). The risk classification was done according to the developed well-known risk analysis techniques: basic forms of control, the 5x5 matrix approach, the Fine-Kinney approach, and Failure Mode and Effects Analysis (FMEA) to identify the risk in a comprehensive way. These instruments are gaining their popularity in risk assessment in cultural heritage because of their applicability to real life and ability to prioritize the mitigation measures (DallArmi et al., 2022; Rivera & Iliev, 2023). More than that, it is important to create a risk-focused culture among employees. The training of all personnel should be structured, and the continued change in behavioral approach should be encouraged at institutions to incorporate strong risk management culture in the facility (IFLA, 2022; UNESCO, 2023). In a bid to continually minimize risk scores, some regular evaluation needs to be done and preventive and overlook action offered. The end result should not merely be the anticipation of and evaluation of risk but proactive and reduction of such risks in all the aspects of the operations of libraries, archives and museums (CENL, 2024; ISO 31000:2024).

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A holistic approach to risks concerning people (board members, people working in libraries, archives, and museums, as well as users, visitors, volunteers, and patrons), property (it includes buildings, artefacts, archival and library materials, and equipment), income (any revenue sources), and community perception (including opinions of officials, associations, other cultural establishments, and general population) must be embraced by the present risk assessment studies in libraries, archives, and museum work places. Risk management must be freely provided by all people and body so interested and would be shared by risk analysis as well as assessment so as to guarantee the security of employees and safeguarding of precious collections. This will aim at determining hazards, assessing risks that come with them, prioritize, and implement mitigation measures systematically. Such pro-active practice lends credence to the sustainability and security of cultural institutions resources and operations in the long term. This paper concentrates on the assessment of general threats and determination of an inclusive risk assessment framework that will aid in making responsible decisions within the environmental setting and protection of important assets.

VI. CONCLUSION

According to study results, in order to have a successful risk management in libraries, archives and museums, these risks have to be dealt with not only on the collection and material level but also about staff and user related risks. In order to accomplish it, the institutions ought to establish SPECIFIC Occupational Health and Safety (OHS) policies and objectives, develop a workplace Occupational Health and Safety (OHS) unit, introduce a set of tools aimed at facilitating safe behavior, with written instructions and warning signs being the primary ones. The management should release reasonable resources and time, be responsible in assessing the risks and been involved in the decision-making process relating to safety. Safety practices should and must be embraced by employees/users actively. Physical, biological, chemical, psychosocial and ergonomic risks should be brought to legal limits. The awareness levels are to be created with help of the promotional strategies, safety briefings, group meetings and the training sessions on working health, hygiene and fighting stress. Furthermore, the OHS Week seminar schedule ought to target on emergency mechanism, accidents, and environmental reporting. There should be a systematized approach to all the associated risks in the facility recognized in the order of their severity and mitigated by a team-based methodology.

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