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Risk Assessment and Determining the Content Production Risk Index of Governmental Digital Libraries in Tehran

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Abstract

Purpose: This research aimed to identify and evaluate the risks of content production in the governmental digital libraries of Tehran.

Method: In terms of essence, this research is synthetic (library studies, qualitative and quantitative), and regarding purpose, it is an applied one. In the first part, using the studies of the research literature, a set of indicators related to the risks of content production in the governmental libraries of Tehran was obtained. The second part of this research involved a fuzzy Delphi approach that was conducted at two stages among 20 experts. In this stage, a researcher-made questionnaire based on the indicators obtained from the first stage was used. The third part of the research was a survey-analysis conducted

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with a quantitative method using a questionnaire made out based on the results of qualitative stage with three criteria: the probability of occurrence, effect intensity, and the inability of organization to respond and was distributed among 100 managers and experts of governmental digital libraries in Tehran.
Findings: In this research, the risks of content production were identified and fell into nine major categories (human force, environmental factors, infrastructure, protection and maintenance, creators` technical rights, integration, content evaluation of sources and authors and information security).
Conclusion: The results of this evaluation show that digital libraries are not exactly at their best level when it comes to their responses to the risk of human resources, authors' rights, and integration risks.

Keywords: Risk Assessment, Content Production, Risk Identification, Governmental Digital Libraries in Tehran, Risk Management.

Introduction

Organizations are encountering new competition, technology change, integration and joint provision of materials, changing customer expectations, and economic instability. Technological changes affect all aspects of work, from financial systems to human resources and knowledge-based systems (Mintzberg, 2009). In the external environment, organizations are faced with the challenge of users who want to customize everything and want everything in the minimum time. Also, meeting the demands that are constantly changing has aggravated the challenges of planning and organizing work for maximum efficiency and usefulness. Libraries are not immune from such pressures and library managers must find out how these forces influence their organizations (Gisek & McNeil 2008). Environmental uncertainty and intense competition have made organizations and managers face many challenges. It can be said that identifying and evaluating risks is one of the new techniques used to strengthen and improve the effectiveness of organizations. Risk management refers to the concept of measuring risk and adopting strategies to manage it, and it guarantees the improvement of the efficiency and effectiveness of organizations (Vaez Shahrashtani & Hosseini Fuladi, 2015; Gatenby, 2015).

Forming a suitable collection in order to facilitate access and use is one of the basic goals of a digital library, but in practice, there are various problems in presenting different objects and their level of efficiency to users (ISO, 2005). Due to the fact that the most expensive and time-consuming work process in a digital library is the production and preparation of digital resources, therefore, it is not enough to have traditional knowledge and specialized skills to produce content in digital libraries. Familiarity with risk factors as threats, having the ability to control them, and turning threats into opportunities, are quite essential. The process of creating content in digital libraries is much more complex and detailed than the acquisition in traditional libraries. In digital libraries, content production is a variable factor and must be synchronized with the changes as needed(Samiei & Farzadi, 2019). As science in the field of technology and digitization of libraries is more advanced, the importance of content production and its management in this field increases too. Managers of digital libraries can have a correct understanding of these possible risks when they first have a proper understanding of the context in which the library has formed and

continues to exist; secondly, the risks of content production have been taken into account in their managerial discussions and the policy they have defined for the digital library. Now the following questions arise? Can content production in digital libraries be risky? , and How effective are these risks?

Evidently, the challenges of digital libraries have been studied in Iran , as well as risk assessment in the fields of information security, human resources, and supply chain. However, the measurement and determination of the risks of content production in the governmental digital libraries of Tehran have inadequately been investigated. On the other hand, by measuring the risk index of content production of governmental digital libraries, we can form a picture of the existing conditions of digital libraries in this field and try to reach the desired level of content production. Therefore, the most important application of this research results can help managers in policy making and proper management of risks that threaten the performance of the digital library in the field of content production. The current research aims to evaluate and determine the index of content production risks in the governmental digital libraries of Tehran by answering the following questions:

– According to experts, what are the risks related to the production of the content of the governmental digital libraries in Tehran?
– How are the risks related to the content production of digital governmental libraries in Tehran measured?

Literature Review

To access the research background, databases and external sites such as Google Scholar, Emerald, Science Direct, Springer, ProQuest, etc.; Also, internal databases such as Scientific Information Database (SID)[1], Noormags[2], Magiran[3], Comprehensive Humanities Portal[4] (ensani), Iranian Research Institute for Information Science and Technology (IranDOC)[5], National Digital Library of Iran[6], etc., were searched. Cases and examples of domestic and foreign studies and similar researches are examined in the following table:

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1 .www.sid.ir
2 . https://www.noormags.ir/
3 . https://www.magiran.com/
4 . http://ensani.ir/fa
5 . https://irandoc.ac.ir/
6 .https://www.nlai.ir

Table 1. Research backgrounds

Researcher	Research goal	Findings
Doroudi and Jamshidi (2019)	Measuring the components of information security in the access and use of digital libraries	The findings indicate a strong level of information security in the digital libraries of Qom
Samiei and Farzadi (2019)	Content supply risks in digital libraries	Identifying 24 risks of suppliers, the risk of the library's financial ability to supply digital resources among high risks
Moqarabi Manzari (2018)	Assessing the risks of human resources of digital libraries of state universities in Tehran	The risks of specialized skills, operational skills, human capital, and finally the risks of individual skills have been assigned priorities one to four.
Basafa et.al (2016)	Technical skills of digital librarians of central libraries of state universities in Tehran	Identification of technical skills (hardware, software, internet, and network, collection, digital information processing, digital services, protection and maintenance of digital resources)
Wang (2021)	The plan of protecting the author's right from visual media in the big data environment	Copyright protection can save the confidentiality, integrity, availability, and auditability of the big data of visual media in the digital library.
Anyim(2020)	Internal control system and risk management in academic libraries	Identifying financial risks, information technology risks, human resource risks, safety risks, and issues in digital libraries
Ngwum et.al. (2020)	A model for evaluating the security of digital libraries	In order to attract users and maintain digital libraries, the security of digital libraries is very important. Using standards and other security guidelines, they proposed a new model for evaluating the security of digital libraries.
Andy et al. (2017)	Information security during the years 2000 to 2010	The results indicated that issues such as infrastructure, digital content, users and standards, legal issues, and in general both technology and management play a vital role in information security.
Han(2016)	Risk assessment of information protection of digital libraries	There are seven major risks involving information security

Researcher	Research goal	Findings
Hielmcrone(2012)	Digital library and legal issues in the field of preserving digital cultural heritage	One of the main problems of electronic resources is the collection and copyright

The previous studies can be divided into two categories, studies that investigated the challenges of the digital library and the second category that identified and evaluated the risks and challenges of the digital library. Basafa et.al. (2016) discussed the importance of human skills and identified technical skills (hardware, software, internet and network, collection, digital information processing, digital services, protection and maintenance of digital resources). Hielmcrone (2012) and Wang (2021) have stated the main problems in the digital library as copyright and protection of creator's rights. Ngwum et.al. (2020), Andy et al. (2017), have addressed the importance of digital library security and information security.

In the second category, Samiei and Farzadi (2019) have identified 24 content supply risks, and have declared the risk of financial ability is very high. In Moqarabi Manzari's research (2018), the risks of specialized skills, operational skills, human capital, and finally the risks of individual skills have been prioritized as the first four risks of human resources. Anyim (2020) identified financial risks, information technology risks, human resources risks, and safety risks and issues in digital libraries. Han(2016) has also evaluated the risks of information protection; he has identified seven major risks in the information security of digital libraries. In total, no research was found to have measured the risks of content production in governmental digital libraries in Tehran. Therefore, in this research, an attempt was made to measure and determine the risks of content production in the governmental digital libraries of Tehran.

Method

The current research is essentially synthetic (library studies, qualitative and quantitative) and typically an applied one. Its implementation method is survey-analysis, and Delphi techniques, dispersion index, and central statistical indices have been used to evaluate and determine the risk index. In this research, first by using the library method and referring to databases and libraries, books, publications, and theses related to the topic of content production risks were identified, which

included 9 main topics and 61 sub-topics. Next, 20 experts were asked to participate in a researcher-made questionnaire based on the indicators obtained in the fuzzy Delphi analysis. The above-mentioned questionnaire was a Likert spectrum with a 5-point scale.

At this stage, 20 people from the research population were selected purposefully with the following conditions, and 13 people out of 20 participated in two rounds:

– Being at least an assistant professor in the field of Knowledge and Information Science and having 15 years of work experience
– Being experienced experts in the field of risk management with at least 15 years of work experience

The average and definitive results of the responses were estimated with the fuzzy Delphi method and were made ready to be sent again for the second round of the survey. In the second round, experts were asked to re-examine and declare the level of agreement with the risks according to the average scores of the answers and the removal of one case of the risk index of human source shortage due to low scores. According to the views presented in the first stage and comparing them with the results of the second stage, the difference between the two stages was less than the threshold (0.2). Therefore, the polling process was stopped. Afterward, according to the opinions of the research team, some categories of risks were merged. Ultimately, nine main risk and 39 sub-risk categories were finalized. Identified content production risks include three criteria: the probability of occurrence, the intensity of the effect, and the inability of the organization to respond. The probability of occurrence conveys the expectation of risk; The intensity of the effect shows the amount of negative impact on performance, and the inability of the organization to respond to the risk expresses the inability of the organization to predict the risk and readiness to deal with it. Two measures of the probability of occurrence and effect intensity had a positive load, that is, the reaction to risk had a negative load, which means that the higher their values, the less important the risk. In the risk analysis stage, central statistical indicators (mean and median) and dispersion index (standard deviation) were examined. The statistical population in this part consisted of the managers and experts of the digital library departments affiliated with a governmental organization in Tehran. A list was prepared by searching on the Internet, reviewing some sources, and referring to the online section of the

National Library. 28 digital libraries affiliated with governmental organizations in Tehran were active[1]. The steps of the research to identify and rank the content production risks of governmental digital libraries in Tehran are shown in figure 1:

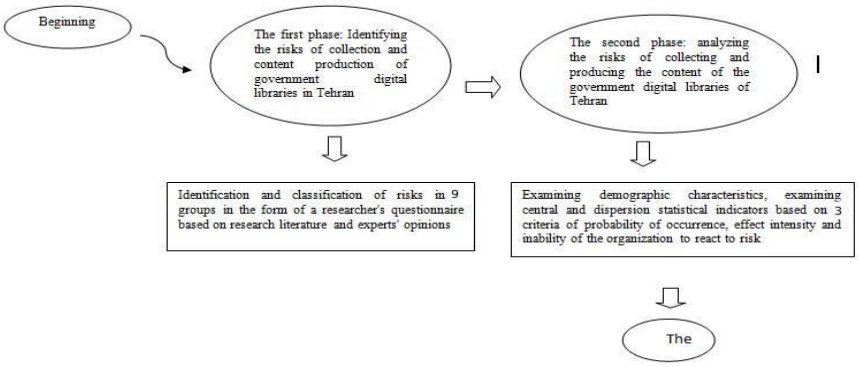

Figure 1. Research steps

Findings

Question 1: What are the indicators of content production and collection development risks of digital governmental libraries in Tehran?
what are the risks related to the production of the content of the governmental digital libraries in Tehran?

The findings from the identification of content production risks, which were extracted from the literature and research background, then confirmed and next finalized with the consensus of experts and with the help of the fuzzy Delphi method, are shown in the following tables.

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1. Al-Zahra University, Imam Sadiq University, Amir Kabir University, Tehran Medical University, Khaje Nasir University, Kharazmi University, Shahed University, Shahid Beheshti University, Sharif University, Allameh Tabatabai University, University of Science and Technology, Iran University of Medical Sciences, Modares University, Hosseinieh Irshad University, Imam Hossein University (Baqerul Uloom Library), Broadcasting Research Center, University of Rehabilitation Sciences and Social Welfare, Satellite Systems Research Institute, Power Research Institute, Research Institute of Communication and Information Technology (Iran Telecommunication Research Center), Center for information technology and agricultural information, Iran's National Library and Documents Organization of the Islamic Council, Iran National Petrochemical Industries Company, Humanities Digital Library, Iran Space Research Institute, Ports and Maritime Organization, Museum of The Holy Defense

Table 2. Indicators of human resources risks

General risks	Subsidiary risks
Human force risks (Salari, Nowrozi, 2010, Moqrabi Manzari, 2018)	1. Lack of knowledge and skills in the field of new technologies and communication sciences
	2.. Low-level information literacy
	3. Low commitment among employees
	4. Weak and inappropriate support of managers
	5. Lack of individual and perceptual skills

In terms of human resources risks, slow response, lack of skill in finding useful information, lack of vigilance in actively providing information services and adding value to information, as well as the inability to do group work, solve problems and make decisions, flexibility when risks occur, inability to negotiate and not being able to establish social communication are threatening the process of collecting and producing the content of digital resources in digital libraries, and if they happen they will cause damages to digital libraries that have been identified based on the opinions of five experts.

Environmental risks are risks caused by natural factors such as floods, earthquakes, storms, etc., which are considered unintentional threats, as well as damages related to environmental pollution that are unintentional and avoidable.

Table3. Environmental risk indicators

General risks	Subsidiary risks
Environmental risks (International Standards Organization, 2005)	1. Risk of natural disasters
	2. Cultural, social and political changes
	3. Damages related to the internal environment of digital libraries (including humidity, ventilation, poor lighting, fungal and bacterial contamination...)

Table 4. Infrastructure risks index

General risks	Subsidiary risks
Infrastructure risks (Nowrozi, 2010; Salari, Andy and others, 2012, Gatenby, 2005)	1. Lack of policy and lack of organizational perspectives regarding the increasing growth of information sources
	2. Incorrect prioritization in the digitization of resources
	3. Instability of the mother organization
	4. Lack of suitable hardware infrastructure at digital libraries

In terms of infrastructural risks, lack of hardware equipment for installation, deployment, start-up such as scanner, digitizer, storage tank, communication equipment for remote user services, lack of vision of the organization's goals, lack of planning, and lack of policy are identified as the factors.

Table 5. Protection and maintenance risks index

General risks	Subsidiary risks
Protection and maintenance risks (Samiei, Rezaee-Sharifabadi, 2016; Rasouli, Vahdat and others, 2016)	1.distortion of information (change of information)
	2. Data loss (deletion of some files)
	3. Incorrect choice of storage media
	4. Absence of a backup file of the master file of the information
	5. Existence of repetitious resources and waste of money, energy and time

The purpose of protection and maintenance risks is paying attention to the volume of the storage tank and also paying attention to the high quality of the resources which is of great importance, so it is significant to choose the right storage media and also to transfer the information correctly without leakage or deviation. In this matter, the existence of repetitious sources or the lack of correct information are factors that threaten the process of collecting and producing the content of digital resources in digital libraries, and if they occur, they will cause damage to digital libraries, which have been identified in 5 cases based on the opinions of experts.

Table 6. Technical risks index

General risks	Subsidiary risks
Technical risks (Samiei, 2010; Nowrozi, 2010; Garud, Hardy, Magor, 2007; International Standard Organization, 2005)	1. Obsolescence of technology and equipment
	2. Negligence concerning the development of software
	3. Slow network and low-speed connections
	4. Improper maintenance of hardware and software
	5. Lack of software support for standards
	6. Inability of library software to interact with other libraries (interoperability)
	7. Low software security

Technical risks include the ability of a system to interact and exchange

data without intermediaries with other systems, hardware and software updates, software support for input and output standards, and support for multiple formats that lead to high interaction with other systems.

Table 7. Index of authors' rights risks

General risks	Subsidiary risks
Copyright risks (Sultanifar, 2010; Alipourhafezi, 2010; Samuelson, 2007)	1. Incorrect and unclear copyright protection strategies
	2. Absence of legislative activities and legal considerations regarding access, copying, and publication of resources
	3. Authors ' ignorance of copyright law

One of the risks of the authors' rights is to pay attention to the fundamental role of the author of the work in content production, and this role will be acknowledged by ensuring that the author`s rights in the process of creating a work, are well protected. People and even authors are not aware of their rights.

Table 8. Integration risks index

General risks	Subsidiary risks
Integration risks (Alipourhafezi, 2014)	1. Lack of syntactic integrity
	3. Lack of semantic integrity
	3. Not following integration standards

The risk of evaluating the content of information sources and authors index refers to the risks of integrating the hardware and software communication of digital library information systems, as well as issues such as the existence of output and input metadata standards, the existence of a memorandum of understanding for exchange, and metadata descriptive language, as well as the semantic relationship between information sources scattered in digital libraries and creating the possibility of semantic retrieval and semantic connection between information sources.

Table 9. The risk of evaluating the content of information sources and authors ` index

General risks	Subsidiary risks
The risk of evaluating the content of information sources and authors ` index (Nowrozi, 2012; Samadi, 2005)	1. Information content not being evaluated by knowledgeable scholars and specialists
	2. Not updating the information content of repetitious sources

	3. Failure to evaluate and check the credibility of the author or provider of the information source to validate and measure the quality of the information content
	4. Lack of information comprehensiveness

Index of information security risks refers to the risks of evaluating the content of information resources and authors, making available correct and up-to-date information, the diversity and richness of information resources, and the thematic connection of resources with the type of library and the needs of users of that library.

Table 10. Index of information security risks

General risks	Subsidiary risks
Information security risks (Baghbanzadeh, 2013; Samadi, 2014; Han, 2016)	1. Weak encryption management
	2. The lack of commitment of employees to the organization and preservation of information (theft of information)
	3. Failure to handle and control the auditing of event registration, and failure to review user activities
	4. Disturbance in authentication and confirmation of the user's identity
	5. Negligence of security management standards use
	6. Disorder in the security of servers
	7. Disorder in the security of cables
	8. Disorder in the security of alarm systems as regards time and unauthorized access

Information security risks include correct encryption with high security, information security management, and information access management.

Question 2: How is the index of risks of collection and content production of the Tehran governmental digital libraries evaluated? In this section, the questions of the risk indicators will be answered based on three criteria: "probability of occurrence", "level of impact" and "inability of the organization to respond". It should be noted that the two criteria "probability of occurrence" and "level of impact" have a positive load; That is, the higher the values, the more important the risk in the evaluation, and risk rating increases in terms of importance. But the criterion of the organization's inability to respond has a negative

charge, in the sense that the higher values they assign to themselves, the lower the risk rating, and risk becomes less important for its management.

Evaluating the human resources risks of digital library content production

The findings of the human resource risks index of the content production of the governmental digital libraries of Tehran based on the criteria of "probability of occurrence", "level of impact" and "inability of the organization to respond" are shown in Tables 11, 12 and 13, respectively.

Table 11. The statistics of the human resources risks index based on the probability of occurrence

No.	Indicator	Mean	Median	standard deviation	Variance
1	Lack of knowledge and skills in the field of new technologies and communication sciences	3.46	4	0.91	0.838
2	Low-level information literacy	3.77	4	1.16	1.35
3	Low commitment in employees	3.73	4	1.09	1.21
4	Weak and inappropriate support of managers	3.40	4	0.98	0.97
5	Lack of cognitive skills such as flexibility when risks occur, ability to negotiate, and ability to establish social communication	3.33	3	097	0.952
General statistics of indicators		3.53	3.40	039	0.15

The findings show that the low-level information literacy risk index with the highest mean of 3.77, median of 4, standard deviation of 1.16, and variance of 1.35 is assumed as an important risk.

The risk index "lack of perceptual skills such as flexibility when risks occur, ability to negotiate and the ability to establish social communication" with the lowest mean of 3.33, median of 3, a standard deviation of 0.97, and variance of 0.952 is assumed as low risk.

Table 12. The statistics of the human resources risks index to measure the intensity of the effect criterion

No.	Indicator	Mean	Median	standard deviation	Variance
1	Lack of knowledge and skills in the field of new technologies and communication sciences	2.93	3	0.79	0.63
2	Low-level information literacy[1]	3.10	3	0.88	0.78
3	Low commitment of employees	2.86	3	0.91	0.83
4	Weak and inappropriate support of managers	2.73	3	0.71	0.49
5	Lack of cognitive skills such as flexibility when risks occur, ability to negotiate, and ability to establish social communications	3.06	3	1.03	1.067
General statistics of indicators		2.93	2.80	0.47	0.22

The findings show that the risk index of the "low-level information literacy" with the highest mean of 3.10, median of 4, the standard deviation of 0.88, and variance of 0.78 is assumed as an important risk. The risk index of the "weak and inappropriate support of managers" with the lowest mean of 2.73, median of 3, the standard deviation of 0.71, and variance of 0.49 is assumed as low risk.

Table 13. The statistics of the human resources risks index to measure the organization's inability to respond

No.	Indicator	Mean	Median	standard deviation	Variance
1	Lack of knowledge and skills in the field of new technologies and communication sciences	3.73	4	0.88	0.78
2	Low level information literacy[2]	3.60	4	1.12	1.25
3	Low commitment of employees	3.26	4	1.12	1.25
4	Weak and inappropriate support of managers	3.24	3	1.09	1.21
5	Lack of cognitive skills such as flexibility when risks occur, ability to negotiate and ability to establish social communications	3.73	4	0.96	0.92
General statistics of indicators		3.52	3.40	0.32	0.1

1. Slow speed in responding to external sources, lack of skill in finding useful information, lack of vigilance in actively providing information services and adding value to information.
2. Low speed in responding to external sources, lack of skill in finding useful information, lack of vigilance in actively providing information services and adding value to information.

The findings show that the risk index of "lack of knowledge and skills in the field of new technologies and communication sciences" and lack of perceptual skills with the highest mean of 3.73, median of 4, the standard deviation of 0.88 and 0.96, and variance of 0.78 and 0.92 is assumed as an important risk. The risk index of the "weak and inappropriate support of managers" with the lowest mean of 3.24, median of 3, the standard deviation of 1.09, and variance of 1.21 is assumed as low risk.

Evaluating the environmental risks of digital library content production

The findings of the index of environmental risks of the content production of the governmental digital libraries of Tehran, obtained from the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are given in Tables 14, 15 and 16, respectively.

Table 14. statistics of the index of environmental risks for the measurement of the probability of occurrence

No.	Indicator	Mean	Median	standard deviation	Variance
1	Risk of natural disasters	3.46	4	1.04	1.09
2	Cultural, social and political changes	3.86	4	0.91	0.93
3	Damage related to the internal environment of digital libraries (including moisture, ventilation, poor lighting, etc.)	3.60	4	1.05	1.11
General statistics of indicators		3.60	3.66	0.49	0.24

The findings show that the risk index of natural disasters with the highest mean of 3.46, median of 4, standard deviation of 0.99, and variance of 0.98 is assumed as an important risk. The risk index of damages related to the internal environment of digital libraries (including humidity, ventilation, poor lighting, etc.) has the lowest mean of 3.33, a median of 3, the standard deviation of 0.97, and a variance of 0.95.

Table 15. Statistics of the index of environmental risks to measure the effect intensity

No.	Indicator	Mean	Median	standard deviation	Variance
1	Risk of natural disasters	3.33	4	0.99	0.98
2	Cultural, social and political changes	3.40	3	0.98	0.97
3	Damage related to the internal environment of digital libraries (including moisture, ventilation, poor lighting, etc.)	3.33	3	0.97	0.95
General statistics of indicators		3.40	3.66	0.63	0.40

The index of risk of cultural, social, and political changes with the highest mean of 3.86, median of 4, the standard deviation of 0.91, and variance of 0.93 is assumed as an important risk. The risk index of "risk of natural disasters" with the lowest mean of 3.33, median of 3, standard deviation of 1.04, and variance of 1.09 is assumed as an insignificant risk.

Table 16. Statistics of the index of environmental risks to measure the organization's inability to respond.

No.	**Indicator**	**Mean**	**Median**	**standard deviation**	**Variance**
1	Risk of natural disasters	3.26	3	1.22	1.49
2	Cultural, social and political changes	3.46	3	0.91	0.83
3	Damage related to the internal environment of digital libraries (including moisture, ventilation, poor lighting, etc.)	3.73	4	0.79	0.63
General statistics of indicators		3.48	3.33	0.72	0.52

The findings show that the risk index of damages related to the internal environment of digital libraries (including humidity, ventilation, poor lighting, etc.) with the highest average of 3.73, the median of 4, the standard deviation of 0.79, and variance of 638. 0 is assumed as a significant risk. The risk index of "risk of natural disasters" with the lowest mean of 3.26, median of 3, standard deviation of 1.22, and variance of 1.49 is assumed as an insignificant risk.

Evaluating the infrastructural risks of digital library content production

The findings of the index of infrastructural risks of the content production of the governmental digital libraries of Tehran based on the criteria of "probability of occurrence", "effect severity" and "inability of the organization to respond" are presented in Tables 17, 18 and 19, respectively.

Table 17. Statistics of infrastructure risks index to measure the probability of occurrence

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of policy and digital manual	3.60	4	1.05	1.11
2	Incorrect prioritization in the digitization of resources	3.33	3	0.97	0.95
3	Instability of the parent organization	3.30	3	0.89	0.81
4	Lack of hardware infrastructure and suitable bandwidth for digital library	3.40	3	1.17	1.38
General statistics of indicators		3.40	3.25	0.39	0.15

The findings show that the risk index of "lack of policy and digital manual" with the highest mean of 3.60, median of 4, the standard deviation of 1.05, and variance of 1.11 is assumed as an important risk. The risk index of "instability of parent organization" with the lowest mean of 3.30, median of 3, standard deviation of 0.89, and variance of 0.81 is assumed as low risk.

Table 18. Statistics of the index of infrastructural risks to measure the effect intensity

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of policy and digital manual	3	3	0.98	0.96
2	Incorrect prioritization in the digitization of resources	3.66	4	0.97	0.95
3	Instability of the parent organization	3.26	3	0.96	0.92
4	Lack of hardware infrastructure and suitable bandwidth for digital library	3.10	3	1	1
General statistics of indicators		3.23	3.25	0.57	0.32

The findings show that the risk index of "incorrect prioritization in the digitization of resources" with the highest mean of 3.66, median of 4, the standard deviation of 0.97, and variance of 0.95 is assumed as an important risk. The risk index of "lack of policy and digital manual" with the lowest mean of 3, median of 3, standard deviation of 0.98, and variance of 0.96 is assumed as the low risk.

Table 19. Statistics of the infrastructural risks index to measure the organization's inability to respond.

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of policy and digital manual	3.61	4	1.18	1.40
2	Incorrect prioritization in the digitization of resources	3.86	4	0.74	0.55
3	Instability of the parent organization	3.20	3	1.01	1.02
4	Lack of hardware infrastructure and suitable bandwidth for digital library	3.46	3	0.91	0.83
General statistics of indicators		3.53	3.75	0.55	0.31

The findings show that the risk index of "incorrect prioritization in the digitization of resources" with the highest mean of 3.86, median of 4, the standard deviation of 0.74, and variance of 0.55 is assumed as an important risk. The risk index of "parent organization instability" with the lowest mean of 3.20, median of 3, standard deviation of 1.01, and variance of 1.02 is assumed as low risk.

Evaluating the risks of protection and maintenance of digital library content production

The findings of the index of risks of protection and maintenance of the content production of the governmental digital libraries of Tehran from

the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are presented in Tables 20, 21 and 22, respectively.

Table 20. statistics of the index of protection and maintenance risks of content production of digital libraries for the measurement of the probability of occurrence

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Distortion of information	3.13	3	0.91	0.83
2	Loss of information or deletion of some files	3.40	3	1.29	1.67
3	Incorrect choice of storage media	3.46	3	0.91	0.83
4	There is no backup file of the main data format	3.26	3	1.09	1.21
5	Existence of repetitious resources and restarting	3.40	3	0.98	0.97
General statistics of indicators		3.33	3.20	0.43	0.19

The findings show that the risk index of "the existence of repetitious resources and restarting" with the highest mean of 3.66, median of 4, the standard deviation of 1.04, and variance of 1.95 is assumed as an important risk. The risk index of "lack of backup file of the data parent format" with the lowest mean of 2.93, median of 3, the standard deviation of 0.88, and variance of 0.78 is assumed as the lowest risk.

Table 21. Statistics of risks index of the protection and maintenance of content production of digital libraries for the effect intensity criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Distortion of information	3.20	3	1.08	1.17
2	Loss of information or deletion of some files	3.33	3	1.11	1.23
3	Incorrect choice of storage media	3.46	3	1.18	1.41
4	There is no backup file of the main data format	3.35	3	0.97	0.95
5	Existence of repetitious resources and restarting	3.48	4	1.05	1.11
General statistics of indicators		3.34	3.20	0.54	0.29

The findings show that the risk index of "wrong choice of storage medium" with the highest mean of 3.46, median of 3, the standard deviation of 0.91, and variance of 0.83 is assumed as an important risk.

The risk index of "distortion of information" with the lowest mean of 3.13, median of 3, the standard deviation of 0.91, and variance of 0.83 is assumed as the lowest risk.

Table 22. Statistics of Index of the protection and maintenance risks to measure the organization's inability to respond.

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Distortion of information	3.33	3	0.97	0.95
2	Loss of information or deletion of some files	3.20	3	1.08	1.17
3	Incorrect choice of storage media	3.60	4	1.05	1.11
4	There is no backup file of the main data format	2.93	3	0.88	0.78
5	Existence of repetitious resources and restarting	3.66	4	1.04	1.95
General statistics of indicators		3.34	3.40	0.38	0.15

The findings show that the risk index of "the existence of repetitious resources and restarting" with the highest mean of 3.48, median of 4, the standard deviation of 1.05, and variance of 1.11 is assumed as the highest risk. The risk index of "distortion of information" with the lowest mean of 3.20, median of 3, standard deviation of 1.08, and variance of 1.17 is assumed as the lowest risk.

Evaluating the technical risks of digital library content production

The findings of the index of technical risks of the content production of the governmental digital libraries of Tehran from the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are given in tables 23, 24 and 25, respectively.

Table 23. Statistics of the index of technical risks for the measurement of the probability of occurrence

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Obsolescence and outdatedness of technological equipment	3.26	3	1.03	1.06
2	Negligence of the development of software	3.40	4	1.05	1.11
3	Improper maintenance of hardware and software	3.13	3	10.6	1.12
4	Destructive attacks of viruses, hackers	3.60	4	1.05	1.11
5	Lack of software support for standards	3.33	3	1.11	1.23

No.	Indicator	Mean	Median	Standard Deviation	Variance
6	The inability of library software to interact with other applications (interoperability)	3.20	3	1.01	1.02
General statistics of indicators		3.32	3.33	0.31	0.097

The findings show that the risk index of "destructive attacks by viruses, hackers" with the highest average of 3.60, median of 4, standard deviation of 1.05, and variance of 1.11 is assumed as the highest risk. The risk index of "inability of library software to interact with other applications (interactivity)" with the lowest mean of 3.20, median of 3, the standard deviation of 1.01, and variance of 1.02 is assumed as the lowest risk.

Table 24. statistics of the index of technical risks for the effect intensity criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Obsolescence and outdatedness of technological equipment	3.06	3	0.7	0.49
2	Negligence in the development of software	3.66	4	0.72	0.52
3	Improper maintenance of hardware and software	3.09	3	0.79	0.63
4	Destructive attacks of viruses, hackers	3.46	3	1.18	1.41
5	Lack of software support for standards	3.33	3	0.97	0.95
6	The inability of library software to interact with other applications (interoperability)	3.69	4	0.72	0.52
General statistics of indicators		3.37	3.33	0.44	0.19

The findings show that the risk index of "inability of library software to interact with other applications (interactivity)" with the highest mean of 3.69, median of 4, standard deviation of 0.72, and variance of 0.52 is assumed as an important risk. The risk index of "obsolescence and outdatedness of technological equipment" with the lowest mean of 3.06, median of 3, standard deviation of 0.7, and variance of 0.49 is assumed as the lowest risk.

Table 25. Statistics of the index of technical risks for the measurement of the organization's inability to respond.

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Obsolescence and outdatedness of technological equipment	3.20	4	1.08	1.17
2	Negligence in the development of software	3.06	3	0.96	0.92
3	Improper maintenance of hardware and software	3.12	3	1.09	1.21
4	Destructive attacks of viruses, hackers	3.46	4	0.99	0.98
5	Lack of software support for standards	3.73	4	1.03	1.067
6	The inability of library software to interact with other applications (interoperability)	3.25	3	1.14	1.31
General statistics of indicators		3.28	3.33	0.36	0.13

The findings show that the risk index of "lack of software support of standards" with the highest mean of 3.73, median of 4, standard deviation of 1.03, and variance of 1.067 is assumed as an important risk. The risk index of "negligence in the development of software" with the lowest mean of 3.06, median of 3, standard deviation of 0.96, and variance of 0.92 is assumed as low risk.

Evaluating copyright risks of digital library content production

The findings of the index of copyright risks in the production of the content of the governmental digital libraries of Tehran, based on the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are displayed in Tables 26, 27 and 28, respectively.

Table 26. Statistics of the index of copyright risks for the probability of occurrence criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of legislative activities and legal considerations regarding access, copying, and publication of resources	3.53	4	0.91	0.83
2	Authors' ignorance of copyright law	3.40	3	0.98	0.97
3	Lack of civil and law enforcement protections from copyright law	3.26	3	0.79	0.63
General statistics of indicators		3.40	3.33	0.64	0.41

The findings show that the risk index of "lack of legislative activities and legal considerations regarding access, copying, and publication of resources" with the highest mean of 3.53, median of 4, standard deviation of 0.91, and variance of 0.83 is assumed as the highest risk. The risk index of "lack of civil and law enforcement protections from the copyright law" with the lowest mean of 3.26, median of 3, standard deviation of 0.79, and variance of 0.63 is assumed as a low risk.

Table 27. Index statistics of copyright risks for the effect intensity criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of legislative activities and legal considerations regarding access, copying, and publication of resources	3.33	3	1.04	1.09
2	Authors' ignorance of copyright law	3.73	4	0.88	0.78
3	Lack of civil and law enforcement protections from copyright law	3.53	4	0.91	0.83
General statistics of indicators		3.59	3.66	0.61	0.37

The findings show that the risk index of "authors' ignorance of the copyright law" with the highest mean of 3.73, median of 4, standard deviation of 0.88, and variance of 0.78 is assumed as an important risk. The risk index of "lack of legislative activities and legal inconsideration regarding access, copying, and publication of resources" with the lowest mean of 3.33, median of 3, standard deviation of 1.04, and variance of 1.09 is assumed as a low risk.

Table 28. Statistics of the index of copyright risks to measure the organization's inability to respond.

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Lack of legislative activities and legal considerations regarding access, copying, and publication of resources	3.78	4	1.04	1.09
2	Authors' ignorance of copyright law	3.53	4	0.74	0.55
3	Lack of civil and law enforcement protections from copyright law	3.66	3	0.97	0.95
General statistics of indicators		3.62	3.66	0.69	0.49

The findings show that the risk index of "lack of legislative activities and legal inconsideration regarding access, copying, and publication of

resources" with the highest mean of 3.78, median of 4, standard deviation of 1.04, and variance of 1.09 is assumed as the highest risk. The risk index of "authors' ignorance of the copyright law" with the lowest mean of 3.53, the median of 4, the standard deviation of 0.74, and the variance of 0.55 is assumed as an insignificant risk.

Evaluation of digital library content production integration

The findings of the risk index of the integration of the content production of the governmental digital libraries of Tehran from the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are given in Tables 29, 30, 31 respectively.

Table 29. Statistics of the integration risks index of digital library content production for the probability of occurrence criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Syntactic incoherence	3.60	3	0.73	0.54
2	Lack of semantic integrity	3.40	3	1.24	1.54
3	Failure to follow integration standards	3.13	3	0.83	0.69
General statistics of indicators		3.37	3.33	0.68	0.47

The findings show that the risk index of "syntactic incoherence" with the highest mean of 3.60, median of 3, standard deviation of 0.73, and variance of 0.54 is assumed as an important risk. The risk index of "not following the integration standards" with the lowest mean of 3.13, median of 3, standard deviation of 0.83, and variance of 0.69 is assumed as a low risk.

Table 30. Statistics of the integration risks of digital library content production index to measure the effect intensity

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Syntactic incoherence	3.73	4	1.03	1.06
2	Lack of semantic integrity	3.53	3	1.12	1.26
3	Failure to follow integration standards	3.33	3	1.10	1.21
General statistics of indicators		3.53	3.66	0.66	0.44

The findings show that the risk index of "syntactic incoherence" with

the highest mean of 3.73, median of 4, standard deviation of 1.03, and variance of 1.06 is assumed as an important risk. The risk index of "not following the integration standards" with the lowest mean of 3.33, median of 3, standard deviation of 1.10, and variance of 1.21 is assumed as a low risk.

Table 31. Statistics of the index of risks of the integration of content production of digital libraries to measure the organization's inability to respond

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Syntactic incoherence	3.73	4	0.96	0.92
2	Lack of semantic integrity	3	3	0.65	0.42
3	Failure to follow integration standards	3.60	4	0.98	0.97
General statistics of indicators		3.44	3.33	0.65	0.42

The findings show that the risk index of "syntactic incoherence" with the highest mean of 3.73, median of 4, standard deviation of 0.96, and variance of 0.92 is assumed as an important risk. The risk index of "lack of semantic integrity" with the lowest mean of 3, median of 3, standard deviation of 0.65, and variance of 0.42 is assumed as a low risk.

Assessment of the risks involving evaluation of resources and authors` content of digital libraries

The findings of the indicators of the risks pertaining to evaluation of resources and authors` content of the digital libraries of Tehran resulting from the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are presented in Tables 32, 33 and 34, respectively.

Table 32. Statistics of the index of risks of evaluating the content of resources to measure the probability of occurrence

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Information content not evaluated by knowledgeable scholars and experts	3.33	4	1.11	0.23
2	Not updating the information content of repetitious resources	3.06	3	0.96	0.92
3	Failure to evaluate and check the credibility of the creator or provider of the information source in order to	3.55	3	0.99	0.98

No.	Indicator	Mean	Median	Standard Deviation	Variance
	validate and measure the quality of the information content				
4	Lack of information comprehensiveness	3.80	4	0.56	0.31
General statistics of indicators		3.31	3.33	0.71	0.51

The findings show that the risk index "lack of information comprehensiveness" with the highest mean of 3.80, median of 4, standard deviation of 0.56, and variance of 0.31 is assumed as an important risk. The risk index of "not updating the information content of repetitious sources" with the lowest mean of 3.06, median of 3, standard deviation of 0.96, and variance of 0.92 is assumed as a low risk.

Table 33. Statistics of the risk index of content evaluation of sources for the effect intensity criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Information content not evaluated by knowledgeable scholars and experts	3.26	3	1.03	1.06
2	Not updating the information content of repetitious resources	3.40	3	1.05	1.11
3	Failure to evaluate and check the credibility of the author or provider of the information source in order to validate and measure the quality of the information content	3.13	3	1.06	1.12
4	Lack of information comprehensiveness	3.60	4	0.98	0.97
General statistics of indicators		3.26	3.33	0.36	0.13

The findings show that the risk index of "lack of information comprehensiveness" with the highest mean of 3.60, median of 4, standard deviation of 0.98, and variance of 0.97 is assumed as an important risk. The risk index of "failure to evaluate and check the credibility of the author or provider of the information source to validate and measure the quality of the information content" with the lowest mean of 3.13, median of 3, standard deviation of 1.06, and variance of 1.12 was recognized as low risk.

Table 34. Statistics of the index of risks of evaluating the content of resources to measure the organization's inability to respond

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Information content not evaluated by knowledgeable scholars and experts	3.61	3	1.05	1.11
2	Not updating the information content of repetitious resources	3.73	4	1.09	1.21
3	Failure to evaluate and check the credibility of the author or provider of the information source in order to validate and measure the quality of the information content	3.65	4	1.04	1.095
4	Lack of information comprehensiveness	3.93	4	0.88	0.78
General statistics of indicators		3.64	3.66	0.71	0.5

The findings show that the risk index of "lack of information comprehensiveness" with the highest mean of 3.93, median of 4, standard deviation of 0.88, and variance of 0.78 is assumed as an important risk. The risk index of "non-evaluation of information content by knowledgeable scholars and experts" with the lowest mean of 3.61, median of 3, standard deviation of 1.05, and variance of 1.11 is assumed as a low risk.

Evaluating information security risks of digital library content production

The findings of information security risk indicators of the content production of the governmental digital libraries of Tehran, obtained from the criteria of "probability of occurrence", "effect intensity" and "inability of the organization to respond" are presented in Tables 35, 36 and 37, respectively.

Table 35. Statistics of information security risk index to measure of the probability of occurrence

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Poor Encryption Management	3.73	4	0.79	0.63
2	Non-Adherence Of Employees To The Organization And Preservation Of Information (Theft Of Information)	3.40	4	0.91	0.82
3	Failure To Handle And Control The	3.46	4	1.12	1.26

No.	Indicator	Mean	Median	Standard Deviation	Variance
	Auditing Of Event Registration, And Failure To Review User Activities				
4	Disorder In Authentication And Verification Of The User's Identity	3.13	3	1.11	1.23
5	Ignoring The Use Of Security Management Standards	3.53	4	0.99	0.98
6	The Security Risk Of Network Equipment (For Example, Disruption Of The Security Of Servers, Etc.)	3.33	3	0.89	0.81
General Statistics Of Indicators		3.48	3.42	0.47	0.22

The findings show that the risk index of "poor encryption management" with the highest mean of 3.73, median of 4, standard deviation of 0.79, and variance of 0.63 is assumed as an important risk. The risk index of "impairment in authentication and verification of the user's identity" with the lowest mean of 3.13, median of 3, standard deviation of 1.11, and variance of 1.23 is assumed as a low risk.

Table 36. Statistics of information security Index risk to measure the effect intensity criterion

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Poor encryption management	3.18	3	0.99	0.98
2	Non-adherence of employees to the organization and reservation of information (theft of information)	2.86	3	0.91	0.83
3	Failure to handle and control the auditing of event registration, and failure to review user activities	3.60	4	1.12	1.25
4	Disorder in authentication and verification of the user's identity	3.26	3	1.22	1.49
5	Ignoring the use of security management standards	3.29	3	0.88	0.78
6	The security risk of network equipment (for example, disruption of the security of servers, etc.)	3.40	3	1.05	1.11
General statistics of indicators		3.30	3.28	0.27	0.078

The findings show that the risk index of "failure to handle and control auditing of event registration, and failure to review user activities" with

the highest mean of 3.60, median of 4, standard deviation of 1.12, and variance of 1.25 is assumed as a significant risk. The risk index of "employees' non-adherence to the organization and information preservation (information theft)" with the lowest mean of 2.86, median of 3, standard deviation of 0.91, and variance of 0.83 is assumed as a low risk.

Table 37. Statistics of information security risk to measure the organization's inability to respond

No.	Indicator	Mean	Median	Standard Deviation	Variance
1	Poor encryption management	3.29	3	1.09	1.21
2	Non-adherence of employees to the organization and preservation of information (theft of information)	3	3	0.84	0.71
3	Failure to handle and control the auditing of event registration, and failure to review user activities	3.56	3	0.91	0.83
4	Disorder in authentication and verification of the user's identity	3.36	3	1.03	1.067
5	Ignoring the use of security management standards	3.45	3	0.91	0.83
6	The security risk of network equipment (for example, disruption of the security of servers, etc.)	2.93	3	0.88	0.78
General statistics of indicators		3.33	3.28	0.39	0.15

The findings show that the risk index of "failure to handle and control the auditing of event registration, and failure to review user activities" with the highest mean of 3.56, median of 3, standard deviation of 0.91 and variance of 0.83 is assumed as an important risk. The risk index of "security risk of network equipment (for example, disruption of the security of servers, etc.)" with the lowest mean of 2.93, the median of 3, the standard deviation of 0.88, and the variance of 0.78 is assumed as a low risk.

Conclusion

In the end, according to the obtained information, it can be seen that in the group of protection and maintenance risks, in accordance with tables 20, 21, and 22, and due to the fact that the existence of repetitious resources and rework has a high probability of occurrence and a relatively high effect intensity, the organization does not have the

required ability to respond to it. The high probability of occurrence means that this is frequent and the high effect intensity indicates a destructive effect or a positive effect. However, despite the effect intensity and the high probability of occurrence, libraries rarely discover this category of risks and have the ability to respond to it. This means reworking and wasting too much time and money if repetitious sources are not identified. This result is in line with the results of Salari's research. In his research, he has addressed the issue that to prioritize the digitization of resources, all digitization work processes must be defined in order to have a suitable efficiency, because they will get confused in the digitization of resources.

In the group of human resources risks, according to Tables 11, 12, and 13, and considering the low level of information literacy with a relatively high probability of occurrence and effect intensity, the organization's ability to respond to risk is not acceptable. The human resource category indicates the importance of technical and human skills in the content production process, which is in line with previous research. BaSafa et.al (2016) discussed the importance of technical skills of librarians in his research, and also in Moqrabi Manzari's research (2018) specialized, operational and human capital skills had priority.

In the group of technical risks, according to Tables 23, 24, 25, the subject of destructive attacks of viruses and hackers has a high probability of occurrence and high effect intensity, and fortunately, the organization was evaluated at a favorable level in response to it. Nowruzi (2012) has stated in his research that according to the environment of digital libraries, their software must follow the rules and standards of computer software which is aligned with the results of this research regarding the high importance of software supporting standards in the category of technical risk.

In the group of infrastructural risks, according to Tables 17, 18, and 19, the issue of lack of policy and digital manual with a high probability of occurrence and relatively high effect intensity, the organization is quite able to react. Andy et al. (2012) has addressed management challenges in digital libraries. His research, along with other challenges he mentioned, showed the lack of written planning for creating a digital library. These results are in line with the results of this research, which showed the high importance of the lack of digital policy and manual in digital libraries.

In the group of integration risks, according to Tables 29, 30, and 31, the indicator of "lack of syntactic integrity" was very important, which is consistent with the results of Gatenby's research (2015).

The results showed that in the group of risks involving evaluation of the content of sources and authors, according to Tables 32, 33, and 34, the indicator of "lack of comprehensiveness " is of great importance. Since the services of digital libraries are based on the provision of information, the most important thing in this regard is the quality of the information provided. Information should be timely and sufficient and should be suitable for users' needs. This result is in line with the results of Samiei & Farzadi's research (2019), which pointed out the importance of evaluating the richness and value of digital resources. Ngwum et.al (2020) has concluded in his findings that the quality of information is one of the most effective indicators in improving the quality of digital library services.

In the group of authors' rights risks, according to Tables 26, 27, and 28, the lack of legislative activities and legal inconsideration regarding access, copying, and publication of resources have a high probability of occurrence and low effect intensity, and the organization's ability to respond to them is not optimal. The results of this research regarding the high importance of the lack of legislative activities are aligned with the results of Hielmcrone 's research (2012) which showed the importance of legal issues in the field of publishing digital cultural heritage rights. Doroudi & Jamshidi (2021) showed that the author's right is one of the indicators that it is not in good condition in digital libraries and the results of other researchers such as Wang`s (2021) were consistent with this study.

Practical suggestions

- Frequent performance evaluations and strengthening the reward system should be conducted
- Hardware and software equipment of digital libraries should be supported.
- Training courses to improve technical and scientific skills, as well as personal and perceptual skills should be held.
- Similar applicable principles and standards should be used in different systems in order to integrate the systems. Several metadata standards should be used for optimal input, output, and storage.

– Digital libraries should communicate the information security policy document by mentioning long-term and short-term goals. The management is required to ask employees, contractors, and third-party users to implement security-based established policies and procedures of the organization.
– Training and informing employees about the policy and procedures of the organization in the field of information security should be carried out.
– A punitive process should be devised and enforced.
– The passive defense techniques should be employed with the participation of security teams to fight against the attacks of hackers and to identify the security vulnerabilities in the systems of digital libraries.
– In order to prioritize the digitization of resources, careful decisions should be made depending on the type of digital library and the needs of the users of the intellectual content or scientific value of the resources, increasing the access to information and the possibility of searching and retrieving the resources.
– The comprehensiveness of information sources should be evaluated and a wide range of rich topics suiting the needs of users, should be covered.
– The contents of educational courses should be updated.
– There should be legal solutions so that in case of violation of a right, the libraries can take decisive legal actions.
– The existence of copyright management systems can be a good solution to respect copyright holders' rights. This database system should contain information about the works of authors and other rights holders. The user explores the accessible information and rights and submits the permission request online without any human intervention, and receives his response from the system, which is one of the characteristics of the expert system.
– There should be protocols, coding systems, identification systems, metadata standards, organizational and legal issues, and semantic knowledge bases such as ontologies and knowledge organization systems such as SKOS.

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