Proposing a paradigm for the management of digital images of the NLAI(National Archive of Iran) according to the Open Archival Information System(OAIS) Reference Model

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Abstract:

Purpose: *The present research is dealt with a paradigm for the management of digital images of the NLAI(National Archive of Iran) according to the Open Archival Information System(OAIS) reference model .*

The methodology : *The present research is quantative and applies the method of library case study in literature and a descriptive and analytic method in data analysis. The statistic community involves 32 experts and authorities on digital preservation who are acquainted with OAIS reference model and of whom twenty persons agreed to fill out the list.*

Finds*: Eventually given the experts' views, 89 elements out of the 135 elements existing on the check-list were presented to propose the paradigm for the management of the digital images of the Iran's National Archive .*

Importance of the research *: Digital images rank as important records which notably contribute to the fulfilment of users` information demands .Since hitherto no research has been carried out into the management of digital images of the Iran's National Archive in accordance with the OAIS reference model , this research has attempted to propose an optimal paradigm for the management of digital images of the Iran's National Archive according to the OAIS by providing a checklist.*

Introduction

Many of information centers have today taken some measures as to digitize their resources. Along with the technological progress, we can witness the emergence of different and various formats on a daily basis and new softwares and hardwares replacing the old ones and this is regarded as a grave challenge in terms of long-termed access to the content of digital resources, thus the enforcement of digital life-cycle which is supposed to guarantee the preservation and long-termed access, is of great account. A large number of libraries and national archives has employed the OAIS reference model in order to design and establish their digital archives. At the moment, this reference model is the only official standard in the area of digital preservation which has been confirmed by the international organization of ISO standardization in 2003. This system is an archive consisting of an individual and systematic organization whose responsibility is to preserve information and make it available to the community in question and which is capable of backing up specialized activities of different archives. This system has established a paradigm or a general framework to set up and maintain an information repository for long-termed preservation and access to digital material. [6]. This paradigm embraces all the stages of digital life-cycle including ingest, archival storage, data management, administration, preservation and access programme and has use for all types of digital repositories. The Library of Congress within NDIIPP, the National Library of Holland with DIAS, Digital-preservation-oriented projects such as(CEDARS)in England, Preserving and Accessing Networked *Documentary Resources of Australia(PANDORA), Networked European Deposit Library(NEDLIB) in unified Europe and the National archives (TNA) and UK Data Archive (UKDA) in England and the other National Archives have made use of this reference model for the preservation of their digital resources .*

The queries of this research

1. Which elements do the experts find of the greatest importance in the adoption of OAIS reference model for the management of the digital images of Iran's National archives?
2. Which elements do the experts find of the greatest importance in the archival storage of the OAIS reference model for the management of the digital images of Iran's National archives?
3. Which elements do the experts find of the greatest importance in the data management of the OAIS reference model for the management of the digital images of Iran's National archives?
4. Which elements do the experts find of the greatest importance in the administration of the OAIS reference model for the management of the digital images of Iran's National archives?
5. Which elements do the experts find of the greatest importance in the preservation planning of the OAIS reference model for the management of the digital images of Iran's National archives?
6. Which elements do the experts find of the greatest importance in the access of the OAIS reference model for the management of the digital images of Iran's National archives?

History of the research

Each research is based on the results of previous studies which are looked into at two thresholds : within Iran and abroad.

In my PhD dissertation entitled " A survey of the status of the digital preservation of the resources of the IIPC members and proposing a feasible paradigm for the NLAI" I have looked into and analysed the OAIS reference model as the only standard of digital preservation at digital repositories and have also proposed to implement this standard in the software of digital libraries. [5]

Beedham and his colleagues(2004) in a research entitled "Assessment of UKDA and TNA compliance with OAIS and METS standards" have looked into the six major sections of the OAIS reference model and METS and then have explained their application in digital archives including TNA and UKDA. [2]

Semple(2004) in his research entitled "Developing a digital preservation strategy at Edinborgh university library" has surveyed the following: an overall view of the development of the initial project involving digital preservation at Edinborgh university library, integration of METS and the OAIS reference model and not to mention the mechanism of automation of digital preservation operation within the system of Edinborgh university library`s digital objects. [7]

Anderson and his colleagues(2006) in a research entitled "Digital images archiving nstrategies, existing metadata for digital images, and the life-cycle of digital images within the OAIS reference model and trusted digital repositories.(TDR) [1]

Nordland(2007) in his PhD dissertation entitled "The long and short of IT:the international development research center as a case study for long term digital preservation strategy" has dealt with the challenges of the archivists and managers of records in the management of the long-termed preservation of digital records. In this dissertation, the international development research center has been studied and surveyed as a sample in various areas of long-termed digital preservation including the strategies and standards of digital preservation, a stable digital repository, web-archiving and etc. The results of the research in this dissertation have led to the adherence to the OAIS reference model for the maintenance of information resources at archives. [4

The finds of this research go to show that the OAIS reference model is presently the only official standard in the area of digital preservation whose application in digital repositories will bring about the following: a homogeneity in the management of existing digital resources in our country, saving time and money in the implementation of digitizing systems, facilitation of sharing information and also of access to information. Therefore the research is intended to propose accordingly a paradigm for the management of digital images of Iran`s National Archive which is the lawful and principal organization in charge of collection, preservation processing and information science of the historical and national records.

Methodology and the steps taken to carry out the research

As regards the essence of , the present research is a survey.(descriptive and analytic)That is to say, primarily the OAIS reference model was looked into and studied to determine the prominent activities within the six major sections of the reference model including: ingest , archival storage , data management, administration, preservation programme and access[3]. After the determination of these activities, an inventory was made out to comprise data including 135 closed questions according to Likert-type scale(5choice) covering the six major sections of the model namely: ingest(23questions), archival storage(21 questions), data management(21 questions), administration(28 questions), preservation programme(25 questions), access(16 questions). To assess the authenticity of the researcher`s inventory, the method of content authenticity has been applied, so after the compilation of the inventory, the services of the experts and authorities on archiving and fellow members of staff were engaged to assess the authenticity of the inventory in question. To assess the reliability of the inventory, Cronbach Alpha coefficient was applied. In this research, the reliability of the inventory has been calculated using Cronbach Alpha coefficient and dividing the OAIS reference model into six major sections as follows:

Table1.The quantities of Cronbach Alpha method as divided into six major sections

	six major sections OAIS reference model	Cronbach Alpha method
1	Ingest	0.754
2	Archival storage	0.744
3	Data management	0.853
4	Adminstration	0.865
5	Preservation planning	0.848
6	Access	0.718

\As it can be discerned the quantities of Cronbach Alpha at any of the 6 divisions exceed 0.7 which stands for the proper reliability of the inventory.

Data analysis

After having collected the existing data on the check-list made out by the researcher, this data was analysed with the aid of descriptive statistics including the rate of accumulation frequency, median,

standard deviation, applying the SPSS software. The results are shown below in the tables.

1.The most prominent elements in the ingest section of the OAIS reference model

Prior to the ingest, the contract of giving data over (negotiations with the authors of works over submission agreements) is signed and then the activities of this section will be carried out as follows: reception of subordinate information package(SIP), guaranteeing the quality of subordinate information package, producing archival information package, extraction of descriptive information from archival information package and harmonious updating.

Of 23 outstanding elements at the ingest of the OAIS reference model, 14 elements have been singled out as the most important elements at the ingest with 4,4.5,5 median and over 80 accumulation frequency rate as shown in table 2.

Table2.The most important and outstanding elements at the ingest section of the OAIS reference model

1.ingest		
Receive Submission	Delivered via electronic transfer(e.g.FTP)	
	Loaded from media submitted to the archive	
	special access controls be placed on the contents	
Receive a SIP	Confirmation of receipt a SIP	FTP
Quality Assurance	Cyclic redundancy Checks(CRCs) or checksums associated with each data file	
	Identify any file transfer or media read/write errors	
Generate Archival Information Package(AIP)		
Generate Descriptive information /metadata	Cataloging records	
	Index files	

2.The most important and outstanding elements at the archival storage section of the OAIS reference model

The activities of this section include: reception of archival information package from the ingest section and adding it to permanent memory, hierarchical management of repository, substitute media, determination of the importance rate of the methods controlling regular and special errors, improvement of recycling and data supply.

Of 21 outstanding elements at the archival information section of the OAIS reference model, 11 elements have been identified as the most important and remarkable elements at the archival storage with 4, 4.5, 5 median and over 80 accumulation frequency rate as shown in the table 3.

Table 3.The most important and prominent elements at the archival storage section of the OAIS reference model

2.Archival storage		
Receive AIP from Ingest and moves the AIP to permanent storage	Select the media type , prepare the devices or volumes and perform the physical transfer to archival storage volumes	
Manage Storage Hierarchy	Special levels of Storage Hierarchy	3 forms :On-line, Off-line and Near-line
Replace Media	Select a replace storage	
	Methods of migration	3 forms: Refreshment , Replication and repackaging
Error checking	Cyclic Redundancy Checks (CRC) or checksums	
	Combined error detection and correction	
Disaster Recovery	Including data back-up , off-site data storage ,data recovery ,etc	
Provide data	Provides copies of stored AIPs to Access	

3.The most important and prominent elements at the data management section of the OAIS reference model

The activities of this section include: management of the archive`s information database, inquiry, providing a collection of reports concerning the set of replies and updating databases(putting explanatory new information or archival management data)

Of 21 prominent elements at the data management section of the OAIS reference model , 16 elements have been identified as the most important and outstanding elements at the data management section as shown in table 4.

Table 4. The most important and prominent elements at the data management section of the OAIS reference model

3.Data management		
Administer database	Creates and maintains descriptive , structural , preservation , right , technical metadatas	
	Metadata Encoding and Transmission Standard (METS)	
	Provides internal validation(e.g. referntial integrity)	
Perform Queries	Generate a result set	
Generate Report	Usage statistical for accesses to archive holdings	
Receive Database Updates	Updates descriptive information for new AIP	
	Provides system updates and review updates	Operational statistics
	Review updates	Periodic reviewing and updating of information values(e.g. contact names ,and addresses)

4.The most important and outstanding elements at the administration section of the OAIS reference model.

This section provides services and practices for the whole operation of the archival system and supervises the whole operation of the archival system. The management tasks include: drawing the contract of giving the data over(negotiating with producers over submission agreements), structural management of hardware and software system, exerting control over physical access, developing archive standards and policies, activating accumulated requests, consumer(user) services.

Of the 28 prominent elements at the administration section, 23 elements have been identified as the most important and outstanding elements at the administration section with 4 and 5 median and over 80 accumulation frequency rate as shown in table 5.

Table 5.The most important and prominent elements at the administration section of the OAIS reference model

4.Adminstration	
Negotiate submission Agreement	Tracks negotiation status,written submission agreements and maintains schedules
Manage system Configuration	Maintains integrity of system configuration
	Audits system operations, performance and usage
Archival Information Update	Mechanism for updating the contents of the archive
	Updates sending a dissemination request to Access
	Updating the contents of the resulting DIPs and Resubmitting them as SIPs to Ingest
	Receives change requests ,procedures and tools from manage system configuration
Affecting Physical Access Control	

Establish standards and policies /Procedures	Develops formats of storing the information standards(e.g.TIFF,JEPEG,…)
	Provides approved standards ,procedures and migration policies
	Develops multiple preservation strategies

5.The most important and outstanding elements at the preservation programme section of the OAIS reference model.

This section supplies services and practices which are meant to control the OAIS environment. It is also obliged to come up with comments to ensure long-termed access to stored information within the OAIS, even if the auditing environment and system is not usable. The tasks of the preservation programme are as follows: having control over the destination community, having control over technology , developing preservation standards and strategies, developing encapsulation projects and migration programmes.

Of 25 outstanding elements at the preservation programme section , 14 elements have been identified as the most important and prominent elements with 4, 4.5 and 5 median and over 80 accumulation frequency rate as shown in table 6.

Table 6.The most important and remarkable elements at the preservation programme section of the OAIS reference model

5.Reservation planning	
Monitor Designated community	Interacts with repository users and content provider
	Provides reports to the Develop Preservation Strategies and standards function
	Provides requirements alerts
Monitor Technology	Monitors emerging technologies in order to maintain and improve the architecture
	Monitors computing platforms(i.e.hardware and software)to identify technologies which could cause system obsolescence
	Monitors information standards including metadata standards and data interface standards
Develop Preservation Strategies And standards	Migration , Transmission , Emulation, Technology Preservation
Develop Packaging Designs and Migration Plans	Receives archive approved standards and migration goals
	Develops new IP designs and detailed migration plans and prototypes to implement administration policies and directives

6.The most important and outstanding elements at the access section of the OAIS reference model.

The tasks of this section include: coordination of access activities(methods of user`s interaction with the archive, the request type, make the resources available, assessment of users` authenticity to access the resources), production of dissemination information package(DIP) and delivery of responses to the user.

Of 17 outstanding elements at the access section, 11 elements have been identified as the most important and prominent elements at the access section with 4, 4.5 and 5 median and over 80 accumulation frequency rate as shown in table 7.

Table.7.The most important and remarkable elements at the access section of the OAIS reference model

6.Access		
Coordinate Access Activities	Provides a single user interface to the information holdings of the archive	Via computer network
		Online service
	Distinguish consumer requests(including query requests ,report requests and orders)	
	Determining the existence description ,location and availability of information stored in the OAIS	
	Allowing consumers to request and receive information products	

	Access status(Authorized user access	User type/status
		User e-mail
Generate DIP		
Deliver Response	Handles both on-line and off-line deliveries of responses(DIPs ,results sets ,reports and assistance)	

The proposed paradigm

So far about 80000 images have been digitized at Iran`s National Archive. The National Archive of Iran needs to apply some strategies for digital preservation so that posterities will be able to access this digital heritage. Since the responsibility of preservation and long-termed access to digital resources lies with the reference model, and it has been applied by many libraries and national archives for long-termed preservation of digital resources, therefore the research has designed an inventory based on the six major sections of this model containing

135 closed questions according to Likert-type scale.(5 choices) The inventory in question was given to the experts on the field to determine how important each element was and ultimately 98 elements were found really important of which 14 elements involved the ingest section(table2), 11 elements involved the storage section(table3), 16 elements involved the data management section(table4), 23 elements involved the administration section(table5), 14 elements involved the preservation programme section(table 6), 11 elements involved the access section(table 7).

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