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A PROPOSAL FOR BUILDING AN INTEGRATED DIGITAL LIBRARY OF MATERIALS RELATED TO PETRA CITY USING THE GREENSTONE SYSTEM: USERS' PERSPECTIVES

The study aims to examine the possibility of employing the Greenstone system to create a digital tourism library for the city of Petra. In this context, the study has derived three objectives such as; briefly explaining the stages of building a digital library using the Greenstone system, investigating students' opinions about the characteristics of the Greenstone system, investigating students' opinions about the materials and information that should be included in the digital library. The study adopted a survey-based methodology involving 50 students from Al Hussein

Bin Talal University. The questionnaire contained 31 questions, grouped into two sections. The results showed that the Greenstone system is appropriate to build a digital library, especially when solving some of the existing problems, and there is a high enthusiasm towards the establishment of the Petra Digital Library and it will greatly help researchers and tourists in obtaining information, which helps in developing the virtual tourism.

Keywords: Digital Library; Greenstone System; Jordan; Management; Al Hussein Bin Talal University; Petra City; Tourism.

Introduction

Petra is an ancient and historical city located in Ma'an Governorate in the south of the Hashemite Kingdom of Jordan (Hmood et al., 2018). It is well-known for its rock-carved structure and historical water-traction canal system (Universities in universe, 2021). It is known as the "pink city" because of the colors of its twisted rocks (Shniekat et al., 2021). In 1985, Petra town was selected as one of the Seven Wonders of the World in 2007 by UNESCO World Heritage (Comer, 2012). Recently, Petra is taken into consideration as the maximum appealing area for vacationers in Jordan, internationally. It is likewise one of the maximum essential traveler locations for international leaders (Alrwajfah et al., 2021). The ancient city of Petra was built by the Nabatean civilization. The archaeological city has tourist importance in Jordan (Ortloff, 2005). Prospective archaeologists have discovered statues of the gods (Aphrodite and Cupid), which are important and valuable discoveries because they provide more evidence about the ancient city of Petra in Jordan (Glueck, 1956). They were found by a mission from North and East Carolina Universities (Perry, 2016).

With the beginning of the orientalist journeys to the Arab world in the 19th century, Petra was discovered in 1812 AD by the Swiss orientalist Johann Ludwig Burckhardt, who had learned the Arabic language and studied Islam in Syria (Suwaed, 2016). His book was printed in 1828 titled "Tours in Syria and the Holy Land" which contains pictures of Petra (Ben-Arieh, 1972). The city has religious and historical significance for the three Abrahamic religions, and the Jews believe that it contains the most valuable secret, which is known as the Ark of the Covenant, which contains the Ten Commandments that God gave to Moses (Plate, 2015). In addition to the presence of Aaron's cane in it, there is a shrine of Aaron in Petra (Tuttle, 2013). The Jordanian city of Petra was chosen among the list of the seven "new" wonders after a controversial popular vote that lasted for months, with the participation of 70 million people (Marcovitz, 2009).

Center for Documents and Manuscripts at the University of Jordan

The center for documents and manuscripts established at the University of Jordan undertook the task of collecting documents, manuscripts, records of Islamic courts, and endowments in the Levant and newspapers. It also collected reports, maps, trips, novels, files, notes, and photos of Petra city to preserve and document them according to the scientific principles. It includes the following (Centre for Documents and

Manuscripts, n.d):

- The original manuscripts (800) available in the center includes those that combine the manuscript with the old stone edition. They were photographed micro-filmically.
- Illustrated manuscripts are in two forms: Photostatic containing 300 manuscripts and film photocopies (microfilm) containing 30,000 manuscripts.

All these manuscripts were obtained from the following countries (Centre for Documents and Manuscripts, n.d):

- The United States of America: Libraries: Princeton, Michigan, Harvard, Yale, Columbia, Chicago, American Medical Library, Washington, Yale Medical Library, New York Library, Newberry Library – Chicago, Detroit Museum. Canada: Miguel University.
- United Kingdom: All medical manuscripts kept at the Institute: The Wellcome Historical Medical Library, Chesterpiti Library, Mangana Library, as well as manuscripts photographed from the British Museum and the British Library, Oriental and African Studies Library / University of London, University of Cambridge Library, Bodleian Library – Oxford. Belgium: University of Louvain Library.
- Netherlands: Leiden. Germany: Mauritanian manuscripts kept at the University of Hamburg, State Library – Berlin, Tübingen University Library. Switzerland: Arabic manuscripts in the Hebrew University Library.
- France: Paris National Library. – The Turkish Republic: Libraries of Shahid Ali, Fateh, Damad Ibrahim, Asaad Effendi, Noor Osmaniye, Bashir Bubu, Atef Efendi, Bagdali Wehbe, Koprillo, Lalli, Sulaimaniyah.
- Iran: University of Tehran. India: Batna Library. Palestine: Most of the manuscripts available were photographed in the following places: Jerusalem, Nablus, Hebron, Jaffa, and Acre.

Recordings in Contemporary History of Jordan

The recordings in the contemporary history of Jordan include the video and pictures of the documents of the Noble Sanctuary in Jerusalem from Saint Katrina's Library, Sinai (Centre for Documents and Manuscripts, n.d):

- Pictures of a group of papyrus preserved at the University of Heidelberg in Germany, and the Albertina Museum / Vienna – Austria (Photostat).
- Pictures of all the financial documents related to the Levant in the sixteenth and early seventeenth centuries (200,000) snapshot.
- Copies of British documents related to the Arab Orient until the year 1951 AD. – Copies of the documents of the Ottoman Foreign Ministry.
- Copies of the American documents related to the region until 1943.
- Pictures of French documents related to the Arab East.
- Pictures of German documents related to the Levant.
- Pictures of a section of the Spanish documents (Salamanca).

- The Ottoman records of the municipality of Nablus.
- A group of rare photos taken by travelers during their trip to the Levant and Egypt.
- Collection of documents on Iraq during the Hashemite period (picture from Germany and the United States of America).
- Archive Editions collection of documents related to all Arab Asian countries.
- British administration reports on Jordan and Palestine during the mandate period.
- A set of mission documents for the Eastern Church, which was based in Jerusalem, on Jordan and Palestine.
- Part of the Hejaz Railway documents.
- Documents and notes for some figures that lived in the late Ottoman period and the beginning of the era of the emirate.

Greenstone digital library system

The Greenstone digital library system is a free open-source software for building and retrieving information collection. It comprises of effective full-text searching and metadata-based browsing facilities that are easy to use. Moreover, they are easily maintained, augmented, and rebuilt. The system is extensible as it contains software “plugins” to support different document and metadata types (Witten et al., 2001). It may be also to accumulate locally produced collection of information or build a repository (Jose, 2007). Numerous documents and meta-data standards are implemented into Greenstone (Mayer & Rauber, 2006). The Greenstone digital library can deal with documents in PostScript, Excel formats, PDF, Word, HTML, PowerPoint, and PostScript, metadata in ProCite, CDS/ISIS, MARC, and Dublin Core; and images in GIF, PNG, JPEG, and TIFF formats (Witten & Bainbridge, 2005). Demands are created by multimedia in several formats including MIDI, QuickTime, and MP3 for documenting and creating conversion facilities. For example, users' meta-data aspects can be changed from one metadata scheme to another by developing options interactively as they embed documents from one collection to another (Parvez et al., 2012). On the other hand, they can either utilize a default mapping to convert MARC records to Dublin Core or define their crosswalk file. Dynamic digital library standards are further stimulated (Witten et al., 2001). Web mirroring software is also embedded in Greenstone so that complete sites can be downloaded via the HTTP protocol, to a predefined depth, and consumed into a collection (Bainbridge, 2021). From an Open Archives Initiative server, meta-data can interactively be consumed, and any Greenstone collection can be ingested over the Open Archives Initiative Protocol for metadata harvesting (Buchanan et al., 2005). Greenstone collections can be disseminated into the METS meta-data transmission standard and encoding, and METS collections can be embedded into Greenstone. An alternative has been integrated that facilitates end-users, specifically librarians even non-computer specialists, for exporting a collection from Greenstone and importing it into DSpace program (Parichi & Nisha, 2015).

It is necessary to establish digital libraries in scientific institutions through open-source systems, considering the high costs of establishing digital libraries using commercial software. It is a good option when budgets are low (Amollo, 2013). Digital libraries are very important in supporting scientific research as it helps researchers to access a vast amount of information with minimal effort and time. A Digital library is a collection of digital objects, including text, video, and audio, along with methods for access and retrieval, and for selection, organization, and maintenance of the collection (Witten et al., 2000). Jose, (2007) recommended the creation of digital libraries in all scientific institutions using open source systems as a good economic option in low economic budgets. Open-source software means that computer software is used, studied, modified, or improved without restrictions (Lougee-Heimer, 2003). It is also possible to copy and circulate it with or without modifications. Often this software is free, but it may require a fee sometimes. The most important element is that they are made available with a free license and public with the publication of their source code. Open-source software must have four freedoms (Colford, 2009).

- Freedom of use of the system for any purpose.
- Freedom of study and amend the system.
- Freedom of copying the system to anyone else who wants it.
- Freedom to develop the system and improve it to show it to others (freedom of improvements).

The source code of systems must be available to all for ensuring effectiveness of these four freedoms, especially, modification, development, and improvement (Stallman, 2002; Lakhani & Von Hippel, 2004). Likewise, any beneficiary of these systems or any developer or designer will not need to ask permission from anyone to exercise these four freedoms. He/she can use the system that suits him/her for any purpose without the need to inform any party to do so. The Greenstone system is an open-source global system and it is characterized by its flexibility in organizing all forms of digital information sources and supports most of the world's languages (Han, 2004).

Examples of digital library projects:

Virtual Manuscript Library of Switzerland: Since 2005, e-codices have been digitizing manuscripts from all regions of Switzerland. During the first two years of the project, 130 manuscripts from the Abbey Library were published online on the CESG website. “Virtual Manuscript Library of Switzerland” e-codices offer free online access to medieval and early modern manuscripts from public and church-owned collections as well as from numerous private collections. E-codices has been integrated into Swiss universities' national program “Scientific information” for the establishment of digital infrastructure. E-codices works cooperatively worldwide with several hundred specialists who are performing research on Swiss manuscripts (Virtual Manuscript Library of Switzerland, n.d).

World Digital Library (WDL): This collection contains cultural heritage materials and documents gathered during the Digital Library project, including thousands of materials contributed by organizations worldwide and content from Library of Congress collection. Launched in 2009, the World Digital Library was a project of the U. S. Library of Congress, with the support of UNESCO, and contributions from libraries, archives, museums, educational institutions, and international organizations around the world. The WDL sought to preserve and share some of the world's most important cultural objects, increasing access to cultural materials and significant historical documents to enable discovery, scholarship, and use (World Digital Library, n.d). The National Digital Library of Korea is located on Banpo-ro in Seocho-gu, Seoul. It is also known as a "dibrary", it was opened in 2009 after years of construction starting in 2002. The budget for the library was 102 million USD. The size of the library is 38,013.39 square meters, containing 8 floors. These floors included space for the collection and user services of digital resources, offices and, books. Facilities allow access to over 800 libraries and other institutions around the world, including the Library of Congress, and more than 264 million pieces of content. The TV studio and user-created content (UCC) studio contain camcorders and lighting facilities, allowing users to produce, edit and display their own UCC sounds and images. Access is available to all international users (National Digital Library Opens New Doors, n.d).

The National Digital Library Project (NDLP) was launched in 2005. The National Library of China (NLC) is the largest collector of traditional Chinese materials. Collections of the NLC totaled 26,980,000 materials. These huge collections enable the NLC to provide information service to the central government and other governmental organizations, educational, scientific, and research institutions. The National Digital Library Project includes the following objectives (National Digital Library) (Dawei & Yigang, 2010).

- collecting, producing, and preserving Chinese digital materials to establish the largest Chinese digital information preservation database;
- constructing the hardware and software platform to support the life cycle management of digital materials;
- providing high-quality Chinese digital resource services both at home and abroad, through the Internet, to build the biggest Chinese digital resources service base; and
- building a resource delivery and service system that uses the NLC as the operational core, and uses other major domestic libraries as its supplemental service locations, so as to support other major regional and special digital libraries.

Significance of the study

This study examines the possibility of creating an integrated digital library with high-quality services through the open-source Greenstone program for materials of Petra city and tourism. The importance of the digital library is due to the importance

of Petra city itself. In addition, the importance of the neglected materials of the city. The establishment of a digital library will make them available to all researchers in the world. This will support scientific research in university and society, as well as support tourism and contribute towards its development. Greenstone is important in creating a structured digital library that includes a very powerful search and retrieval engine as it has the ability to link with smart and big data applications; moreover, it is a free, open-source system that should be exploited and monetized.

Study Aim and Objectives

The study aims to examine the possibility of employing the Greenstone system to create a digital tourism library for the city of Petra. Three objectives are derived:

- Briefly explain the stages of building a digital library using the Greenstone system.
- Investigate students' opinions about the characteristics of the Greenstone system and its suitability.
- Investigate students' opinions about the materials and information that should be included in the digital library.

Literature Review

The interest in design science research has been elevated as core to information systems studies over the past two decades. The objective of a design science research project is to encompass the limitations of organizational and human abilities by designing novel and dynamic artifacts illustrated by models, instantiations, methods, and constructs (Cronholm & Göbel, 2016). From a wider perspective, digital science research intends to integrate knowledge of how things can and must be arranged or constructed for achieving a predefined series of objectives, often by human agency (Bisandu, 2016). For instance, design knowledge in information science paradigm encompasses knowledge for structuring and constructing a database system, for aligning information systems with organizational strategy, for modeling business procedures, and for delivering data analytics for effective decision-making (Arnott & Pervan, 2016).

Design science research in information systems has been encompassed for creating substantial societal and economic influence. Design science research, beyond the information system field, is a core research paradigm in numerous other areas such as business, economics, architecture, engineering, and other information technology-associated paradigms for the development of new solutions to appropriate design issues (Hevner et al., 2019). Design science research is fundamentally positioned for making both practice and research contributions to the digital innovation field with its emphasis on the design and deployment of innovative artifacts. Digital disruption is the authenticity of digital technologies in the outcome and procedure of innovativeness (Baskerville et al 2018).

Combinations of physical and digital elements are emphasized in digital disruption for producing new products. Digital innovation research, contrary to process innovation

research, has emphasized service and product innovation via digital technologies. Digital innovation is fundamentally becoming an innovative paradigm and research emphasizes upon the fields of innovation, organizational design, information systems, strategic management, and entrepreneurship (Djamasbi et al., 2016). The field of digital innovation includes information digitization, innovation management with a greater variety and reach of disruption across organizational limitations, digitally-enabled generation, and new digital technologies. It has been observed that digital innovation is viewed across a wide range of disciplines as essential importance (Vom Brocke et al., 2017). Seshaiyah & Veeraanjaneyulu (2009), explained the building of an institutional repository using the Greenstone Digital Library system. The study examined the characteristics and benefits of Greenstone in building and distributing digital library collection. The study showed that this system was produced by the New Zealand Digital Library that provides a new way to organize information and publish Online or on CD. Special features include its suitability for both Windows and Unix, effective full text searching and metadata-based browsing facilities, and the collection contains texts, pictures, music, audio, video, etc. Software requirement includes Windows with IIS, Java 2 Runtime Environment, Web browser, ImageMagick, and GSDL 2.70. The steps for software installation were also specified

Wittens et al. (2001), provided information on an open source digital library system, Greenstone, as a comprehensive system for creating and presenting groups of millions of documents, including text, images, audio and video. Collections can be easily maintained and automatically rebuilt. Greenstone builds full-text indexes from the document text and from metadata elements such as title and author. Indexes can be searched for specific words, logical combinations, phrases, and results arranged by relevance or ordered by metadata element. It automatically creates all search and browse structures from the same document. Unicode is used all the time, allowing any language to be processed and displayed in a consistent manner. The digital library software will not become comprehensive enough to meet the needs of the world with the richness and flexibility that users deserve and is only provided through international collaborative efforts.

Sonkar et al. (2005), discussed the issues related to building a digital library of newspaper extracts and applying the “Greenstone Digital Library” system in developing this collection. The study concluded that the digital library would provide a comprehensive set of services on the web as a global search library. Greenstone offers dozens of collection and represents the latest in digital library research using Greenstone as a medium. It helps to create different types of groups like sound. Video collection, images, texts, and multimedia, the collection includes a great extra effort to digitize thousands of newspaper clippings; while, GSDL offers a dynamic platform for knowledge organization and retrieval.

Anuradha & Sivakaminathan (2009), discussed the implementation of available open-source digital library system that facilitate indexing and searching of full-text documents in various formats. An effort has been made to enable the full-text search

feature in a widely-used open source library automation package by integrating it with the open-source digital library system. Koha is widely used, among the open-source ILAP. GSDL is a very common DLS. Both systems meet library standards such as SRU / W, Z39.50, and import MARC records. Search and retrieval are used through the URL (SRU) function available in both Koha and GSDL to facilitate Koha's full-text search. The SRU request is then sent to the GSDL from Koha to search for full text. Greenstone is a complete collection of software for building, publishing, and distributing digital library collection, either online or on CD. It complies with many library standards such as SRU / W, Z39.50, and the import of MARC records. These features in Greenstone make it a very good choice to integrate with the Library Automation Package for full-text indexing and searching. It was produced by the New Zealand Digital Library Project at the University of Waikato and developed and distributed in cooperation with UNESCO and Human Info NGO.

Begum et al. (2012), indicated that Greenstone Digital can be used to build open source library collections. The problems highlighted by the study are analyzed to determine their potential source in the social context of the Greenstone development environment. However, the present study discusses the characteristics of open source software development affecting the usability of the resulting software products. A vital contradiction must be experienced for achieving an exact understanding and realization of design science as an information system research paradigm. Design is both a product and a process. It explains numerous artifacts and processes in the information system world. A problem-solving paradigm has been supported through this platonic design view that constantly transforms perspective between designed artifacts and procedures for similar complicated issues (Rathee et al., 2020).

The design process is a combination of professional activities that generate an innovative product. The assessment of the artifact then offers feedback information and a better comprehension of the issue for improving both the design process and quality of the product. This build-and-assess loop is usually simulated a number of times prior to the final design artifact being created. The design science researcher must be aware to evolve both the design artifact and process as part of the research throughout this creative process.

Methodology

The study used an experimental approach by creating an experimental digital library to examine the suitability of the Greenstone system, where a group of students (50) from the library department at Al Hussein University created an experimental digital library searched and retrieved materials, and then their opinions were taken. Then, this study used the survey method to investigate students' opinions about the characteristics of the Greenstone system and its suitability, and their opinions about the materials and information that should be included in the digital library. The study was conducted at Al-Hussein Bin Talal University in the year 2021.

The questionnaire contained 34 items, grouped into two sections: Questions about the user's opinion of the digital library created using the Greenstone system (17); Questions about the materials and information that should be included in the digital library (17).

The questionnaire was based on Likert scale ranging from strongly disagree to strongly agree. The response levels were categorized as follows;

- Low level of approval, if the arithmetic mean ranges between (1–2.33).
- Intermediate level of approval, if the arithmetic mean ranges (2.34–3.67).
- High level of approval, if the arithmetic mean ranges (3.68–5).

Applied Experimental Method

Short Stages of Building Digital Library using Greenstone (These stages were implemented and examined by library students at Al-Hussein Bin Tala University University). A screenshot of the stages will be made for the Greenstone system that has been downloaded from the system's official website (Greenstone Digital Library Software. (n.d).

The First Stage: Creating Documents

- Create a folder for each type of document, for example, grouping Word processor documents into a separate folder, as well as for PDF documents in a separate folder for them, and so on.
- The files are named based on the objective content and language of the text, provided that the file name reflects the subject of the document, for example, "the history of Petra," "the geography of Petra," "tourism," the economy, or "social life", and can add numbers for files in same subjects.

The Second Stage: Download the System and Initial Settings

Download Greenstone to your computer and take a set of steps to configure the system settings to suit the language, font size and system style requirements as shown in figure 1.



Figure 1: *Configuring system settings*

The Third Stage: Defining Digital Library

From the main screen of the system click on File and select New to create a new digital library collection (Figure 2).

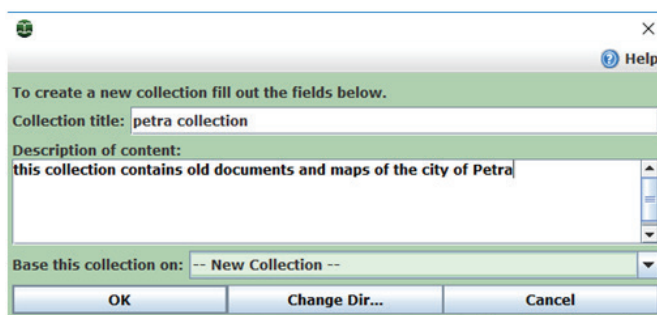


Figure 2: *Creating new digital library collection*

Then title the collection which is the name of the digital library, and then in the description of the contents, a simple definition is given to the library to be created which is an optional element, and then click on “OK”. Where the library name that appears at the title of the collection will become the name through which the library content will be accessed.

The Fourth Stage: The collection

The required documents are loaded by opening the folder in which they are stored and are moved to the group folder using the mouse pointer to pull the file from its position to the group as shown in the following screen:

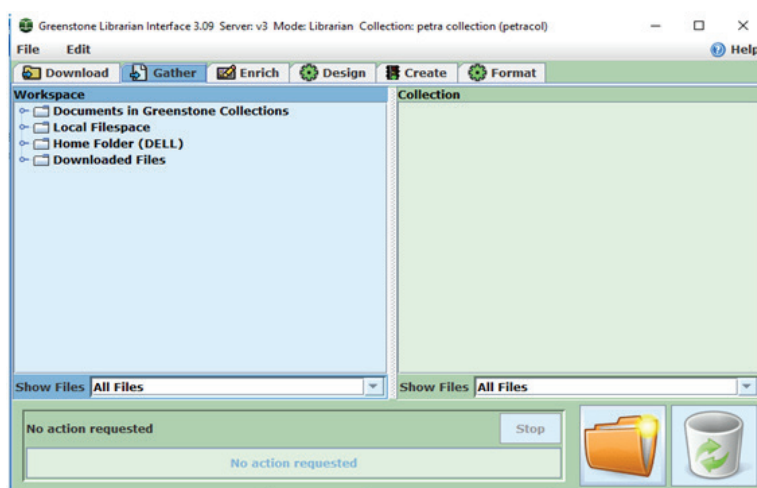


Figure 3: *Loading of required documents*

The fifth stage: Selecting Metadata and Enriching

This stage determines the metadata standard and indexing the documents as shown in figure 4. One can select the International Dublin Core Metadata.

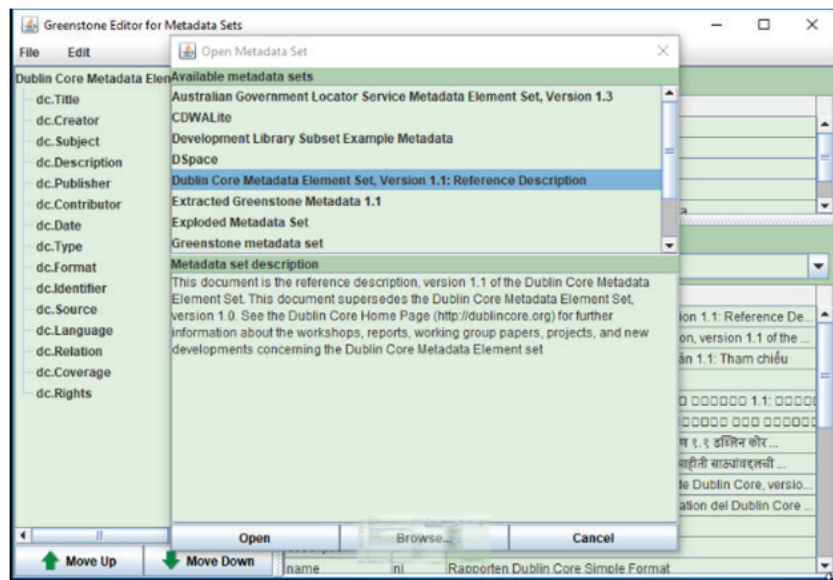


Figure 4: *Metadata standard and indexing the documents*

As shown in figure 5, the documents are enriched by adding metadata, which displays a tree representing the group on the left and data descriptions on the right and allows adding metadata to each document or groups of document. The documents that were copied during the first stage come with an applicable metadata appendix. If the document is part of the Greenstone group, then the previously defined metadata will be transferred to the new group. Of course, the new group may have a different metadata standard or perhaps a subpart of defined metadata. Enrichment allows setting metadata values to documents in a collection. For example, new values can be added to the existing value totals for any element. If the values for the element have a hierarchical structure, the hierarchy can be extended in the same manner, at this stage, the document can be linked to the smart applications or big data applications.

Sixth stage: Design

A set of operations are performed, in which the most important is choosing the plugin or processor that fits with the type of document. It is important to choose the plugin or processor, as the documents that will be worked on are a word processor and pdf files. The plug to be chosen is WordPlug and pdf plug as shown in figure 6.

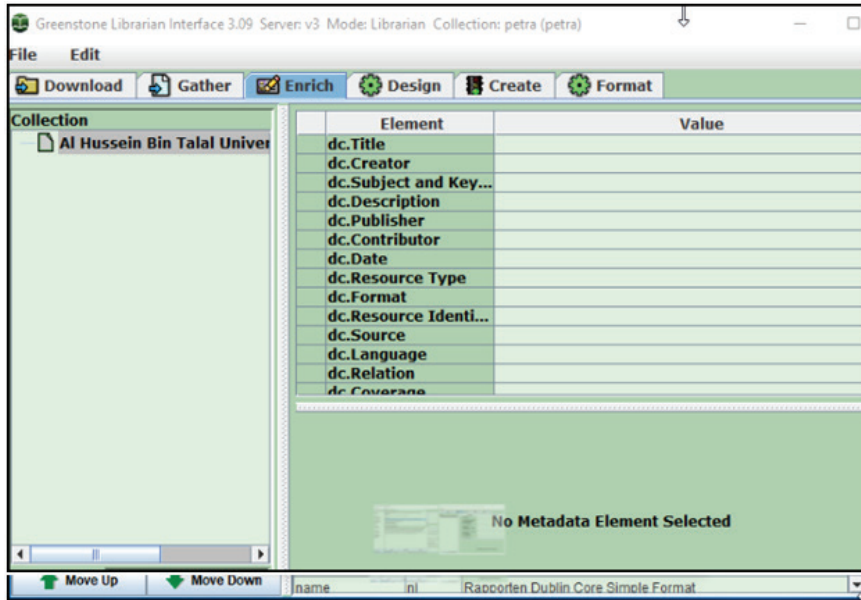


Figure 5: *Enriching documents by adding metadata*

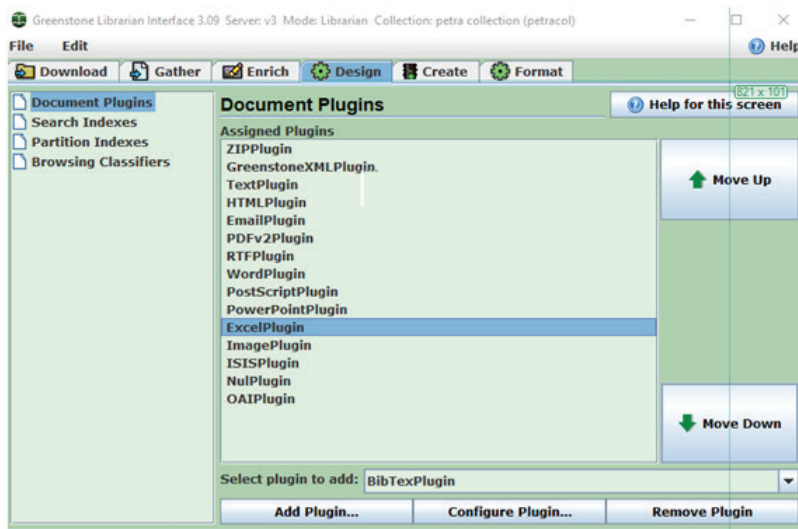


Figure 6: *Choosing the plug*

After selecting the appropriate plugs, it is re-equipped to comply with the style of documents (Figure 7). There are various options at this stage, the most important of which is to select the input language and choose a pattern for the letters that are appropriate for the content of documents.

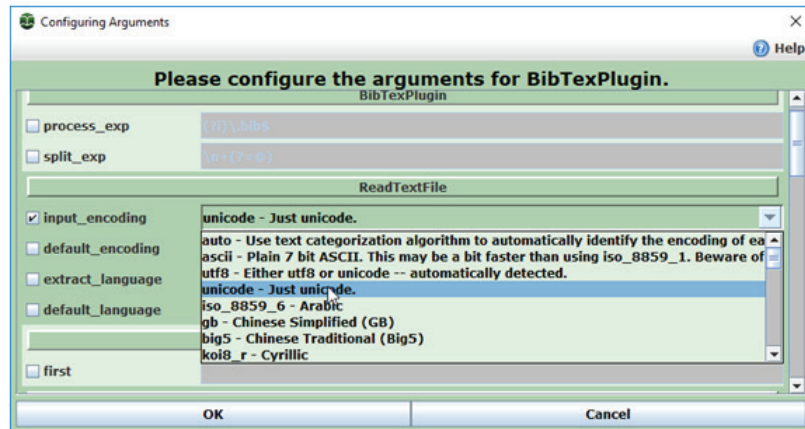


Figure 7: Re-equipping style of document

After clicking on OK, one chooses to go back to the previous screen to control the way to search the content of documents, there are three default options of search: in the text, title, and source. It is possible to delete any of them and add an index that matches our requirement, such as the topic or author index (Figure 8).

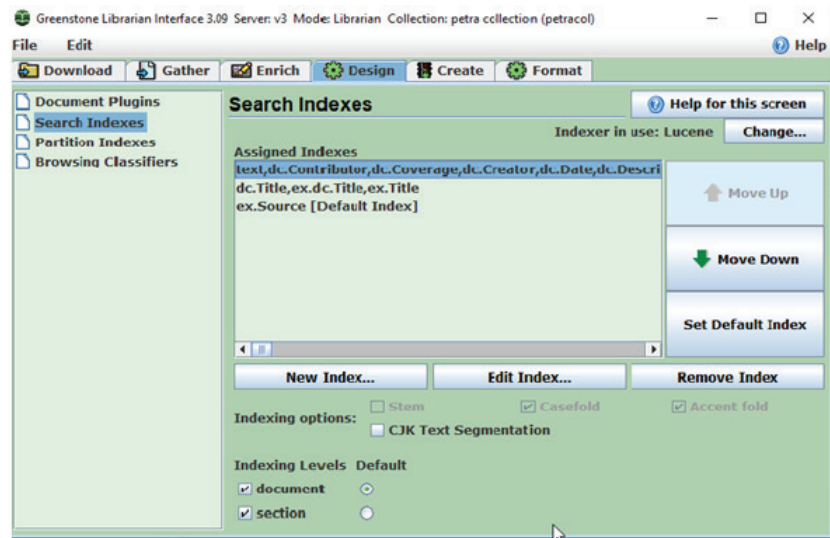


Figure 8: Deletion of matching index

From the same screen, one can move to the partition index, and this aspect is linked to the database. Then choose the method on which to navigate the data. There are two default options, which are alphabetically arranged by addresses and by resources, and new lists could be added as shown in figure 9.

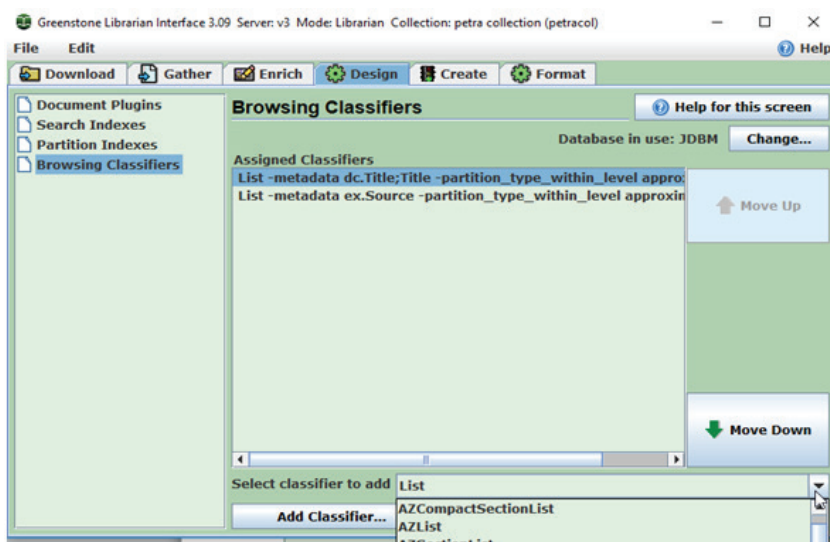


Figure 9: Addition of alphabetically ordered sources

The seventh stage: Building the Library

After completing the selection of browsing workbooks, one can move to create screen through which the digital library is built according to the characteristics that were previously selected as shown in figure 10.

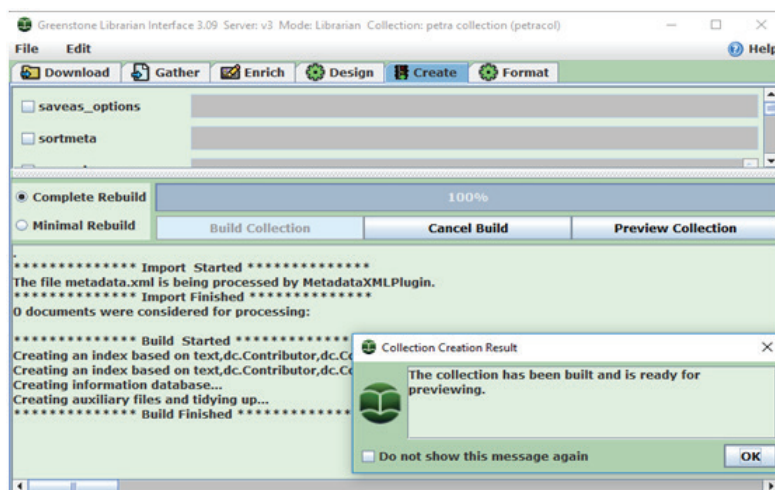


Figure 10: Building digital library based on the characteristics

By clicking on the group building option, the system processes the texts of the documents to convert them into HTML format, and then catalogs the content for retrieving purposes according to the previously selected indexes once the phrase

“Build Finished” appears. The system provides the ability to verify the efficiency of the digital library created by choosing to “preview the collection” from the screen itself to show us the research interface as shown in figure 11.

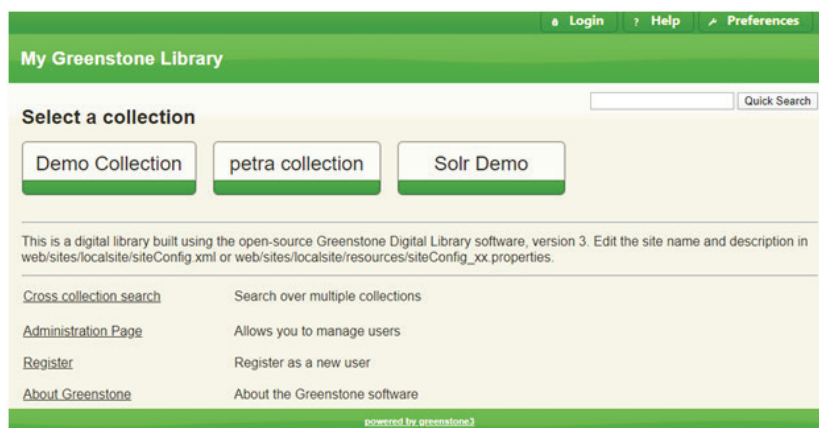


Figure 11: *Verifying efficiency of digital library*

This screen is the research interface of the digital library in which the research field appears and some instructions that will help users to carry out searches on that screen to write words to find in our documents (Figure 12).



Figure 12: *Helping users in searching procedure*

The presence of the document tag is noticed on the screen, which can be browsed directly. The name of the file can be downloaded to a personal computer or other storage location for printing purposes. Any document can be clicked to browse the full text where the distinction of the search term is noted. The digital library is updated by performing one or all of the following operations after verifying the success of

the construction process;

- Add new document, provided the rebuild is performed to encrypt the content.
- Choose new browsing methods.
- Choose new headlamp.
- Switch the interface language.
- Search options in the digital library

The simple research is divided into;

- Key words.
- Some parts of the document, such as title or introduction.

The advanced search is divided into;

- Boolean search with its known coefficients (And, Or, Not).
- NEARX to define the maximum word length.

When the digital library construction is complete, one can keep it on computers, as the system stores its files in a special folder and convert them to a CD-ROM that can be easily moved to any location.

Results

Table 1 shows that all paragraphs (1–14) obtained high degrees of approval, and the opinions were positive towards the Greenstone system and its suitability. In addition, the Greenstone system has good features for building a digital library from students' point of view. The Greenstone system supports working interfaces in different languages, including Arabic, and it allows building digital libraries with textual content for documents from different languages; it allows building full-text digital libraries; provides the ability to browse in a way similar to browsing the Internet; supports threaded text and multimedia technology; deals with various types of documents and papers; it can be modified to suit the user's needs; provides a mechanism to download text files from the Internet directly; allows the content of the digital library to be transferred to CDs and gives it the possibility of self-running; it allows publishing digital libraries on the Internet; provides document search feature using Boolean operation

Also, Table 1 shows that paragraphs (15–17) obtained low degrees of approval, since the filing process is in a central way and should add any new document in a pre-existing set and during the implementation process, the system executes the process on all the contents of the set of documents. This process takes a long time, especially whenever the number of documents and the size of its storage space increase. Also statistics are not available in the Greenstone system, and the process of sorting or viewing documents is limited according to the orders the user executes and the fields requested.

Table (2) shows that all paragraphs obtained a high degree of approval, as their opinions were positive about the information that should be included in the digital library created using the Greenstone system. Paragraph 16 (The information in the digital library should be constantly updated) got the highest approval degree = 4.52.

Table 1

**Students' opinions about the characteristics
of the Greenstone system and its suitability**

	paragraphs	Strongly Agree	Agree	undecided	Disagree	Disagree Strongly	Arithmetic mean	level
1	The search interface is clear and easy	15	30	4	1	0	4.18	High
2	It is possible to change the language in the search interface and the librarians interface	20	20	10	0	0	4.20	High
3	The possibility of searching the full text of the document	15	26	8	1	0	4.10	High
4	Boolean logic operators can be used in the search strategy	16	22	10	2	0	4.04	High
5	The digital library is easy to build by Greenstone software	13	24	6	4	3	3.8	High
6	It is possible to store all forms of information sources (text, image, audio, video)	14	25	8	2	1	3.98	High
7	The system does not require much time and effort to learn	13	27	7	2	1	3.98	High
8	The system is easy to install from its website	23	20	6	1	0	4.30	High
9	Possibility to print results of search	24	19	4	2	1	4.26	High
10	Possibility to save results of search	25	22	1	1	1	4.38	High
11	The system supports international cataloging standards	17	20	8	9	0	4.14	High
12	Supports all file formats The system	19	22	8	0	1	4.16	High
13	possibility of sharing digitized resources across other libraries	11	25	14	0	0	3.94	High
14	Greenstone system is appropriate for building a digital library	16	22	9	2	1	4.00	High
15	Statistics are available in the Greenstone system	0	0	10	30	10	2.00	low
16	The process of adding any new document is done separately from the previous group	0	0	8	27	15	1.86	low
17	The process of adding any new document is fast	0	0	8	27	15	1.86	low
	Total						3.72	High

Table 2

**Students' opinions about the materials and information
that should be included in the tourism digital library.**

paragraphs	Strongly Agree	Agree	undecided	Disagree	Disagree Strongly	Arithmetic mean	level
1 The digital library should include historical information about the archaeological sites in the Petra city	17	28	4	1	0	4.22	High
2 The digital library should contain general information about the archaeological sites in Petra city	16	29	4	1	0	4.20	High
3 The library should include pictures for Petra city its archaeological sites	19	30	1	0	0	4.36	High
4 The digital library should include videos about the archaeological sites in Petra	17	28	4	1	0	4.22	High
5 The digital library should contain information about the weather in Petra city	14	25	6	4	1	3.94	High
6 The digital library should contain information about hotels and places of residence in Petra city	17	24	4	5	0	4.06	High
7 The digital library should contain information about parks and entertainment places in Petra	22	25	0	2	1	4.30	High
8 The digital library should contain information about the roads and the geographical terrain of Petra city	24	25	1	0	0	4.46	High
9 The digital library should contain information about shopping places in Petra	21	23	4	2	0	4.26	High
10 The digital library should contain information about the places of service provision in Petra city	23	24	1	2	0	4.36	High
11 The digital library should include information about restaurants and cafes in Petra city	17	21	4	5	3	3.88	High
12 The digital library should include information about	23	23	2	2	0	4.34	High

libraries and information centers in Petra city								
13	The digital library should contain information about people's opinions about Petra city	15	20	4	8	3	3.72	High
14	The digital library should contain information about the places nearby, Petra	22	24	1	2	1	4.28	High
15	The library should fully meet the tourist and the researchers knowledge needs	23	26	1	0	0	4.44	High
16	The information in the digital library should be constantly updated	26	24	0	0	0	4.52	High
17	The establishment of this library is important because it helps to disseminate information about Petra city and works to develop virtual tourism	28	22	0	0	0	4.56	High
Total							4.24	High

Paragraph 10 (The digital library should contain information about people's opinions about Petra city) received the lowest approval degree = 3.72.

The digital library should include historical, pictures, videos, and general information about the archaeological sites in Petra city. The digital library should contain information about weather, hotels, parks, entertainment places, roads, shopping places, libraries, places of service provision, restaurants and cafes, people's opinions, places nearby Petra, and information centers. The library also should fully meet the tourist and the researcher's knowledge needs. All information in the digital library should be constantly updated. The establishment of this library is important because it helps disseminate information about the city of Petra and contributes to the development of normal and virtual tourism.

Study Implications

This digital library project contributes to preserving and sharing Petra's most important cultural objects, increasing access to cultural materials and significant historical documents to enable discovery, scholarship, and use, providing high-quality digital resource services. At this time of the pandemic, internal and external tourism has stopped, so this study proposed digital library that provides virtual tourism and gives opportunities to researchers and people wishing to explore all possible information about the region. This proposed digital library project will contribute to preserving and sharing Petra's most important cultural objects, increasing access

to cultural materials and significant historical documents to enable discovery and provides high-quality digital resource services. The study recommends to take advantage of the Greenstone system to build the Petra digital library of the Materials in the Center of Manuscript at the University of Jordan as they are distinctive but neglected and not managed in terms of storage, processing, publishing, and retrieval. These works are important for local and international researchers. The study also shows the stages of building a digital library using the Greenstone system.

Conclusion

At this time of the Covid-19 pandemic, all travels, internal and external tourism has stopped, so this study proposed a digital library that gives researchers and people wishing to explore the region all possible information. When searching for any information in this library about the Treasury or the Siq for example, in Petra city, the results will give a link that leads to the virtual roaming in three dimensions and can move inside the ancient city and see its rocks and what is written on it, and all possible information about the place. The digital library will provide text, audio, pictures, videos, advertisements, comments, opinions about the place, and hotels by the important feature of big data applications that collect data from all different servers and databases and presents it to the researcher in one package. The proposed library will be linked with applications such as map data technology and sensor networks such as satellite imaging, road sensors, climate sensing, and air pollution, security applications related to Covid-19, and social network data such as Facebook, Twitter, and LinkedIn that analyze information and give ideas about advertisements that may attract users. Open-source software has made it possible to facilitate the creation of digital or virtual libraries. These systems, with their various features and advantages, have become a strong competitor to commercial systems owned by international companies. The Greenstone system has a relatively simple structural architecture, in addition to the feature of linking with various applications that help in virtual roaming and obtaining all possible information about the place.

This digital library will help the development of virtual tourism. The study showed that the Greenstone system is appropriate for building a digital library from users' perspectives, and there is a high enthusiasm towards the establishment of Petra Digital Library which will greatly help researchers and tourists in obtaining information. The establishment of a digital library at the Library of Al Hussein Bin Talal University in Jordan will increase access to publications about Petra City and other information resources that cannot be duplicated in print form. It is expected to link the Library with other entities through a network to share metadata between universities. Therefore, this project will increase the rank of the university. The study recommended encouraging digital library projects and conducting studies on the Greenstone system to verify its efficiency and effectiveness in managing digital libraries.

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Competing Interest

The author declares no competing interest.

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Data Availability

Data can be available on reasonable request

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ПРОПОЗИЦІЯ СТВОРЕННЯ ІНТЕГРОВАНОЇ ЦИФРОВОЇ БІБЛІОТЕКИ МАТЕРІАЛІВ, ПОВ'ЯЗАНИХ З МІСТОМ ПЕТРА, З ВИКОРИСТАННЯМ СИСТЕМИ GREENSTONE: ПЕРСПЕКТИВИ КОРИСТУВАЧІВ

Дослідження має за мету вивчити можливість використання системи Greenstone для створення цифрової туристичної бібліотеки для міста Петра. У цьому контексті дослідження має такі цілі: коротке пояснення етапів побудови цифрової бібліотеки за допомогою системи Greenstone, дослідження думок учнів щодо характеристик системи Greenstone, дослідження думок учнів щодо матеріалів та інформації, які мають бути включені до цифрової бібліотеки. У дослідженні було прийнято методологію, засновану на опитуванні, за участю 50 студентів з університету Аль Хусейна Бін Талала. Анкета містила 31 запитання, згрупованих у два розділи. Результати показали, що система Greenstone підходить для створення цифрової бібліотеки, особливо при вирішенні деяких з існуючих проблем. Створення цифрової бібліотеки Петра значно допоможе дослідникам і туристам в отриманні інформації, що допоможе розвивати віртуальний туризм.

Ключові слова: цифрова бібліотека, система Greenstone, Йорданія, управління, університет Аль Хусейна бін Талала, місто Петра, туризм.