

Bridging the Information Divide of the Maldives through Library Automation and Digitisation

Aminath Riyaz

Coordinator, Maldives Digital Library Project, Maldives Library Association

Nitesh Rijal

Chief Executive Officer, Nepzilla Solutions Pvt. Ltd

Shiva Ram Shrestha

System Administrator/Senior Programmer, Healthnet Nepal

Fathimath Nashfa

Assistant Librarian, The Maldives National University

BACKGROUND

Information divide can be defined as the gap between those who have access to information sources and those who do not have an acceptable level of access. This disparity in access to information is experienced between developed and developing countries, and also within countries in terms of urban and rural areas. This is more prevalent in developing countries given the shortage of local publications, high cost of acquiring information sources, coupled with the low priority of information provision in the face of other pressing economic needs (Credé & Mansell, 1998). In some respect, the information divide is more prominent in island nations like the Maldives given the geographic dispersion divided by the ocean.

The Maldives is made up of 1192 Islands, with 196 of the islands populated (MPND, 2007). The provision of equitable access to the 196 individual island units, separated by the ocean, is a challenge the country faces in all spheres of development. It is more prominent in the provision of information sources (Riyaz, 2009).

The modern information communication technologies (ICTs) are believed to be a promising solution in reducing the information divide, with its ability in removing the barrier of geographic boundaries. The introduction of ICTs has also opened up much wider means of

uncontrolled communication which help in the open flow of information (Samad, 2001). ICTs facilitate access by bringing information more readily to the consumers and by flexible search possibilities within huge repositories of information. However, the proliferation of ICTs also opens up the debate about digital divide whereby the costly infrastructure required to reap its benefits hinders the maximum use ICTs in narrowing the information divide (Wedgeworth, 2004; Gross, 2005). It is a foregone conclusion that, despite the high costs associated with building national infrastructures, the cost of not doing so is likely to be much higher for developing countries as ICTs open up potential channels of information access (Credé & Mansell, 1998).

The uptake of ICTs in the Maldives is promising with virtually no difference between the urban and rural areas. The Maldives information culture study (Riyaz, 2009) demonstrates there is virtually no difference between the use of ICTs and information sources where it was made available; the disparity exists in the access to information sources.

Traditionally all services have been centred on and around the capital, Malé, with information sources also centred in this area (Gross & Riyaz, 2004). The Maldives has only one state-owned public library and only one University library; these are located in Malé with three small branches of the University library located in the outer region. There are 43 privately owned small public library collections registered at the National Library, with a continued service being provided only from some of them (Shiham, 2012). Many of these libraries may or may not be providing a community service, functioning, or accessible to the public. And, given the geographical dispersion of the islands and transportation difficulties, the public library in Malé is not readily accessible to the rural community. The provision of reading material, including newspapers, to the outer regions of the Maldives is limited due to the absence of a regular transport infrastructure (Riyaz, 2009).

The Maldives Library Association as well as the National Library of Maldives has continuously explored ways of reaching the dispersed population. One initiative in this regard has been the offer of a mobile library service, which to the most part has not been fruitful owing to

the high cost of organising a regular mobile library movement given the high cost of arranging transport coupled with shortage of human resources (Riyaz, 2009). The holdings of the library collections spread throughout the Maldives, especially in the 221 school libraries of which 193 are located on other islands (Shiham, 2012), are not easy to ascertain given the absence of a searchable catalogue of its holdings.

In view of these difficulties, the MLA with the support of the MGN initiated a country-wide library automation and digitisation project. This was later joined by the National Library of Maldives, the Educational Development Centre under the Ministry of Education, and the National Centre for Information Technology.

MALDIVES DIGITAL LIBRARY PROJECT

The Maldives' libraries, until recently, was operated manually to the most part; with a library automation of circulation and cataloguing components at the Maldives College of Higher Education¹ (MCHE) Library implemented in 2007 and at the National Library of Maldives in 2011. The MCH Library initiated the creation of digital library collections in 2006; this gaining momentum only in 2010 with the establishment of the Maldives Greenstone support Network (MGN).

The creation of the MGN was a collaborative effort between the National Library of Maldives, the Maldives National University Library, the National Centre for Information Technology, the Maldives Library Association, and the Department of Heritage. The network was formed through a grant received by the National Library from the University of Waikato, New Zealand, towards the establishment of a national node to coordinate in the formation of a regional network for the implementation of Greenstone Digital Library Software (GSDL). The regional network, Digital Library Network of South Asia (DLNetSA), was officially formed at the "Regional Meeting of Coordinators of GSDL National Nodes in South Asia" held from 23 to 25 July 2010 in Kathmandu, Nepal. The main purpose of the creation of these networks was the creation of digital library collections of South Asian local material to be made publicly available, using local language where applicable. With the formation of the DLNetSA, it

¹ The College elevated to the status of a University in February 2012 as the Maldives National University

also recognised Koha ILS as the ideal software to be used as the software of choice within the region for library automation. As such, DLNetSA was formed with the objective of creating an operational and sustainable digital library network with a focus on providing support for integrated library system and digital library activities using GSDL & Koha ILS.

The MGN, through DLNetSA, organised and conducted a training of trainers during September 2010 in the Maldives on the implementation of both these software. Twenty five participants were trained and through this training, a small local team emerged within the Maldives Library Association with the aptitude to follow-up on the implementation of the software in the Maldives. Even at the outset of the creation of the local node, MGN, the Maldives National University (MNU) Library embarked on the creation of *Faithoora* digital library (Riyaz & Shiham, 2010). *Faithoora* is the most prominent literary work of Maldivians in the local language, published by the Academy for Dhivehi Language². The MNU library launched the *Faithoora* digital library, with password access. It has not been made publicly available given the hesitation on the release of copyright to host the collection online to the wider public by the publisher (Riyaz & Nashfa, 2011).

Through this initiative, a country-wide library automation project was commenced by the Maldives Library Association (MLA) in February 2011, as the 'MLA Koha Pilot Project'. This Pilot Project of 2011 was an attempt to understand the complexity of such an endeavour and to find efficient solutions to overcome the challenges faced in a non-obligatory setting.

This initiative was later embraced by the National Library of Maldives and resumed as Maldives Digital Library Project in August 2011, also with the support of the Educational Development Centre & the National Centre for Information Technology. The aim of the project was to automate the physical library collections of the Maldives and to make it accessible online as much as possible. Another component of the project attempts to create digital library collections of local

² Prior to 2011, the Academy was known as National Centre for Linguistic and Historical Research

publications to provide equitable access to the limited material by the geographically dispersed Maldivian communities.

The specific objectives of the Project are:

- To computerize the cataloguing and circulation functions, using a cost effective system, for a better efficiency in providing value added library services.
- To develop computerized Online Public Access Catalogue (OPAC) that can be searched by the public from remote terminals.
- To computerize the circulation service of the libraries so that checking in and out, issuing, renewing and holding services can easily and efficiently be handled with sufficient managerial record being generated.
- To lead to the creation of union catalogue of the Maldives Libraries that can facilitate searching of library holding across all the libraries, thereby leading to resource sharing and interlibrary loan systems.
- To facilitate the creation of digital library collections accessible through a web portal.

By the end of June 2012, twenty libraries have been added to this online digital library network; with six local collections of full-text material prepared and uploaded for the general public.

LIBRARY AUTOMATION USING KOHA ILS

The libraries of the Maldives have been operated on a manual basis to the most part, with only the University Library and the National Library known to be using an integrated library system. The software in use in both these institutions is proprietary software *Liberty3*, provided by the Australian company Softlink. The lack of library software in the other libraries can be attributed to the shortage of professional staff, the lack of know-how, coupled with the high cost of securing proprietary software.

Discussions with the University Library and the National Library's experiences in the use of this software demonstrates limitations in terms of financial aspects and on the flexibility of the software for internal needs, and also highlights the high cost of initial installation as

well as the annual maintenance fee. Through the initial situation analysis carried out about the libraries who joined the project as well as who showed an interest in joining the Koha project, it was found that a couple of small libraries were using custom made software prepared in MS Access; these software were dysfunctional given the inflexibilities in the system design as well as lack of follow-up and maintenance. A few of the libraries use MS Excel spreadsheet for its accession list and this is used by the library staff as a quick search on the titles; this to the most part is dysfunctional as a search tool. The rest of the libraries only have a manual list of the holdings with very brief information on the titles held.

The take up of the MLA Koha Pilot Project identified the cost effective implementation option of the open source software as well as the support mechanisms in the form of online groups, also backed by the support of the DLNetSA. This support mechanism is of essence to a country like Maldives which lacks a local professional support group with the required information technology know-how as well as library and information science background.

The next section of the paper will look at both software in some detail and will outline the progress of the Maldives Digital Library.

ABOUT KOHA ILS

Koha is freely available open source software for library automation, in other words it is fully Integrated Library System (ILS). The development of Koha is sponsored by libraries of varying types and sizes, volunteers, and support companies from around the world.

THE ADVANTAGES OF KOHA ILS

The advantages as outlined by the Koha Library Software Community (<http://koha-community.org/about/>) include:

- **Full-featured ILS.** Koha ILS is in use worldwide in libraries of all sizes, Koha is a true enterprise-class ILS with comprehensive functionality including basic or advanced options. Koha includes modules for circulation, cataloguing, acquisitions, serials, reserves, patron management, etc. Interfaces are all based on standards-compliant World Wide Web technologies–XHTML,

CSS and JavaScript—making Koha a truly platform-independent solution.

- **Free Software / Open Source.** Koha is distributed under the Free Software General Public License (GPL) version 2 or later.
- **No Vendor Lock-in.** It is an important part of the free software promise that there is no vendor lock-in: libraries are free to install and use Koha themselves if they have the in-house expertise or to purchase secure support or development services from the best available sources. Libraries should be free to change support company and export their data at any time.

Distributed under the General Public License, Koha has no vendor lock-in, no set term contracts, and no restrictions on changing support or exporting data at any given time. As a Koha user the library is in control of the ILS with the freedom to tailor the ILS specifically to individual requirements, collection, budget and patrons. Another advantage is the security of knowing that there will always be technical support for Koha, since it isn't tied to a single manufacturer or vendor.

Other benefits of Koha as open source software are that bugs can be dealt with as soon as they are logged, and users have open and constant dialogue with the developers that lead to a positive and collaborative environment. This is a driving force of the Koha community and leads to higher customer satisfaction rates than often found in traditional ILS's.

Koha is continually updated, so libraries can choose to benefit from new features frequently, rather than having to wait for major all-in-one version releases of the current system.

THE COMMENCEMENT OF THE MALDIVES DIGITAL LIBRARY PROJECT

The MLA Koha Project was met with a number challenges given the financial limitations on the Maldives Library Association (MLA). Also, given the lack of a local support mechanism with the technical knowhow of the software, mainly with its Linux platform, the MLA had to seek overseas expertise and assistance which proved to be a costly endeavour. Hence, the MLA sought support from the National Library of Maldives (NLM) since the development of libraries falls

under the mandate of the Library. The NLM pledged administrative support and negotiated with the Education Development Centre (EDC) of Ministry of Education in securing financial support in implementing the system in school libraries. A number of presentations had to be made about the software and the proposed project to the policy making body of the Ministry for this to be endorsed. This process took over seven months to materialize into a memorandum of understanding between the NLM and EDC, and NLM and MLA in the creation of digital library collections and automation of library catalogues for selected libraries as per EDC requirements.

The securing of expert assistance possessing the know-how of both Koha ILS and GSDL, also with the experience of integration of both was sought first through the DLNetSA. However, the cost of the proposed implementation charges proved to be higher than could be covered by the MLA, hence it was later put forward openly for the international community. Interests was shown from Nepal, Pakistan, as well as New Zealand; with the most economical offer made by Nepzilla from Nepal.

The understanding between Nepzilla and MLA were:

- Data conversion from .csv to Koha for the selected libraries.
- Setup of individual Koha databases for the libraries.
- Provision of combined search facility across the project libraries
- Online support to the MLA Koha project coordination team.
- Physical on-site hands-on training and support to the MLA Koha project coordination team for a duration not less than 2 weeks.
- Physical on-site Koha training to the library staff of the project libraries. The training to be held centrally in Malé, Maldives to a maximum of 25 participants.
- Assistance and advise on Greenstone Digital Library software and its integration with Koha

THE IMPLEMENTATION OF KOHA ILS IN MALDIVES' LIBRARIES

At the commencement of the Project in 2011, eleven libraries were selected, 10 School libraries and 1 College library – with 9 of these on other islands. These include:

1. Aminiya School, Malé
2. Baa Atoll School, B. Dharavandhoo

3. Dhaalu Atoll Education Centre, Dh. Kudahuvadho
4. Gaafu Dhaalu Atoll Education Centre, G.Dh. Thinadhoo
5. Gnaviyani Atoll Education Centre, Gn. Fuvah Mulah
6. Hamadh bin Khalifa Al Thani School, L. Gan
7. Jalaaludheen School, H.Dh. Kulhudhufushi
8. Lhaviyani Atoll Education Centre, Lh. Hinnavaru
9. Maafushi School, K. Maafushi
10. Maldives Polytechnic, Malé
11. Muhibbuddin School, S. Hithadhoo

A situation analysis was carried out to ascertain the collection size, situation with the current library catalogue, and the technical infrastructure and human resources at the disposal of the library for the project. The overall finding of this situation analysis demonstrated that there was Internet accessibility with varying specifications, from 2 libraries with dial up access, and the rest with broadband access. It also reported that the libraries had a computer at the disposal of the library. It was also found that 12 libraries did not have any form of computerised records of its holdings. These were not able to ascertain given the geographic dispersion of the islands coupled with the high costs associated with the transport.

At the outset it was decided that data migration is not the best option given the lack of computerised records. However, to kick-start the project, all the libraries were asked to prepare a list, in the specified format by MLA, of library holdings of 50-100 items for migration. The fields included in the spreadsheet are: Accession number, Section, Classification number, Author/Editor, Title, Edition, Place of publication, Publisher, Year of publication, ISBN, Notes. These were matched against appropriate fields in Koha database. This would enable the setup of the databases on the server. The main reason why data migration was not the ideal option was the difficulty in migrating records at the item level, which would mean even with the migrated data, the individual records would have to be physically added by the library staff, thereby creating added burden of doing double the work. Hence, it was advised that the technical team will set up the databases for individual libraries and make it searchable across all the libraries setup on a single server; the cataloguing component to be completed by the library staff in each of the libraries, at their pace.

However, this arrangement proved to be dysfunctional as the information provided on the situation analysis checklists was later found to be inaccurate or misleading to some extent. It was found that some libraries did not have a dedicated computer for the work, some did not have reliable internet connection, and some had dial-up internet connection only for the school and not to the library.

At the initial stage in 2011, the 11 project libraries were setup on a simple PC converted to a server. This was the best option given the limited funds at the disposal of the MLA even through the financial support from the EDC. The technical expert from Nepzilla completed the on-site installation and integration of the databases with the MLA technical team during September 2011 followed by a training of Koha ILS conducted in Malé, for two staff each from the project libraries.

The project later received a server from the EDC for this work. This server was setup, dedicating the earlier temporary PC server as the backup. Within the next few months, the server faced security problems given the lack of a proper firewall protection. This created problems at the end of the project libraries in the rural setting in adding catalogue records as the server was unstable and unavailable most of the time for the preceding few months until March 2012. To solve the server problems, the NLM negotiated with the NCIT whereby an agreement was reached to move the server to NCIT to be maintained and firewalled by them. This necessitated the setting up of the server with the databases again, as formatting was required to meet NCIT requirements.

Additional libraries were added to the project in May 2012 after the server issues were stabilised. The 10 libraries added in 2012 include 8 School libraries, 1 College library and 1 research library. These are:

1. Haa Alif Atoll Education Centre, HA. Dhidhdhoo
2. Hulhudhuffaaru School, R. Hulhudhuffaaru
3. Academy for the Dhivehi Language (Dhivehi Research Library), Malé
4. Dharumavantha School, Malé
5. Iskandhar School, Malé
6. Villa College, Malé
7. Muhyiddin School, Vilimalé
8. Vilufushee School, Th. Vilifushee

9. Gaafu Alif Atoll Education Centre, GA. Villingili
10. Addu High School, S. Hithadhoo

Even for these libraries, the earlier method of data migration was utilised; whereby the migration of at least 50 records in the brief format as specified earlier. Instructions on how to add records and other system specifications about the software was provided during the training held in June 2012.

DIGITAL LIBRARY COLLECTIONS

The second component of the Maldives Digital Library Project is the creation of digital library collections. Through this project, the MLA has been successful in creating six digital collections of local material. These include:

- *Faithoora*: the most prominent literary work of the Maldivians published regularly for over 20 years in the local language.
- Maldives thesis collection: a project initiated to bring together research done at postgraduate level by Maldivians.
- EDC textbook collection: textbooks produced locally for primary and secondary grades taught across the formal school curriculum
- EDC teacher's guides: Teaching guides produced by the Ministry of Education
- *Jamaa'athuge Khabaru*: A freely distributed local newsletter by the Centre for Continuing Education, Ministry of Education, in the local language
- Local book collection: An attempt to collect and provide full-text access to local books either in English or the local language.

The initiation of these collections over the last year is a remarkable achievement as prior to this there were no other digital library collections widely available. There are online collections made available from various organisations on their individual websites but these do not offer a combined search possibility. The digital collection in the Maldives Digital Library are created using GSDL software.

GSDL SOFTWARE

As stated by the producer of the software (<http://www.greenstone.org>), Greenstone is a suite of software for building and distributing digital

library collections. It provides a new way of organizing information and publishing it on the Internet or on CD-ROM. The software is produced by the New Zealand Digital Library Project at the University of Waikato, and developed and distributed in cooperation with UNESCO and the Human Info NGO. It is open-source, multilingual software, issued under the terms of the GNU General Public License. The aim of the Greenstone software is to empower users, particularly in universities, libraries, and other public service institutions, to build their own digital libraries.

There are other open source digital library software like DSpace and Fedora. However, the reason why GSDL has been selected as the software for this project is mainly because the project came up as an offshoot of the Maldives Greenstone Network's initiative. Other reasons include GSDL's customisable local language option that support right to left languages that are a prominent feature of South Asian countries. Moreover GSDL is easier to be integrated with Koha ILS being widely implemented in Maldives Libraries.

Other functional flexibilities of the software as outlined by Kumar, Makhija, Kumar, & Singh (2005) are:

- It suits both Windows (3.1/3.11, 95/98/me,NT/2000) and Unix (Linux, Sun OS) any of these systems can be used as a web server.
- The administration function build in it enables the items to authorise new users to build collection, protect documents so that they can only be accessed by registered users on presentation of password.
- It build collection with effective full-text searching and metadata-based browsing facilities.
- Collection containing millions of documents, up to several gigabytes can be built. Full-text searching is fast because compression is used to reduce the size of the indexes and text users can browse the list of authors, titles, date, class no., etc.
- Plug Ins can be written to accommodate new document types, the collection can contain pictures, music, audio, video clips, etc. It also supports multilingual documents. Collection can be updated and new one brought online any time without bringing down the system.

- The Z39.50 protocol is supported for accessing external servers and for presenting Greenstone collection to external clients.

MALDIVES DIGITAL LIBRARY

The Maldives Digital Library is made up of the combination of the online library catalogues created using Koha ILS and the digital library collections created using GSDL. The purpose of creating a union platform for the individual libraries coupled with the digital library collections is to provide for resource sharing between the libraries of the Maldives. Information on the current project and individual links to library OPACs are available on the Maldives Digital Library platform <http://library.egov.mv>; and the union catalogue search across all the libraries and the digital library collections is available at <http://library.egov.mv/unioncatalog>.

In the initial phase in 2011, the integration of both these components were carried out using dBWiz to be later replaced by VuFind in 2012. dBWiz can be used as federated search engine to search through multiple koha databases from one point. The interface for dBWiz was less attractive, and its development and support has been discontinued by its originator Simon Fraser University.

ABOUT VUFIND

VuFind on the other hand could do much more than dBWiz, but initially had a small problem with Koha as there was no driver for Koha. It needed some development in the community to finally get a working Koha driver for VuFind. The driver was written by Altaf Mahmud from BRAC University, Bangladesh (Hasina, 2011) and modified to suit to multiple Koha environment by Shiva Ram Shrestha, Nepal. VuFind is designed to browse through all of the library's resources including the OPAC, archives and electronic journal databases.

VuFind is a library resource portal designed and developed for libraries by libraries. The goal of VuFind is to enable users to search and browse through all of the library's resources by replacing the traditional OPAC to include:

- Catalogue Records
- Digital Library Items

- Institutional Repository
- Institutional Bibliography
- Other Library Collections and Resources

VuFind is completely modular, which enables the implementation of just the basic system or all of the components. Since it is open source, it is possible to modify or add modules to best fit the needs of the individual libraries. A wide range of configurable options allow extensive customization without changing any code.

The following features of VuFind as outlined in <http://vufind.org> are noteworthy.

- **Search with Faceted Results:** The search system allows for the user to search from a basic search box and then to be able to narrow down the results by clicking on the various facets of the results.
- **Live Record Status and Location with Ajax Querying:** The search results page is able to display the live status of a record through the use of AJAX by querying the catalogue at that exact moment. And since it is done through AJAX after the results have loaded, the page will not slow down for any reason.
- **"More Like This" Resource Suggestions:** When viewing a record, the user will be offered suggestions of resources that are similar to the current resource.
- **Save Resources to Organized Lists:** The user has the ability to save the resources from both the search results page and from the record view page to their own customizable lists. The lists can be retrieved at any time and will always be there for the user. This helps to eliminate the need for desktop based citation management software that tends to be too difficult for basic users.
- **Browse for Resources:** The user has the ability to browse the catalogue allowing them to explore what the library has rather than only being able to see a very narrow spectrum of results.
- **Author Biographies:** The user can learn more about the author with contextual information and see all of the books that they have written in the library.

- **Persistent URLs:** Allows the user to bookmark their queries or records to allow permanent access to a page they were once on.
- **Zotero Compatible:** The users can save and tag any records with Zotero or any other COinS based application so they can store their records in one place.
- **Internationalization:** The interface has translations available in multiples languages. Creating translations for individual needs is also easy, including new English translation if there is a need to change some of the wording used in the interface - it makes the UI that much easier to customize.
- **Access to the Data:** Open Search, OAI, Solr: VuFind has many APIs to interact with the search, data and many other features. One library can syndicate their record data with other institutions via an OAI server. Search can be conducted using VuFind's algorithms via OpenSearch. and for complete access to the indexed data, and interact with Solr, VuFind's backend search and index engine.

CHALLENGES, SUCCESSES AND FUTURE OF THE PROJECT

COMPLETION OF THE UNION CATALOGUE

It took time for the digital library to take momentum. However, the MLA believes it a successful project as this is the first time library automation and digitalisation has been carried out country-wide, also in a cost effective manner. Koha ILS has been set up on 21 libraries across the country with 20 of these libraries searchable online as a union catalogue over the government network. The only private College library in the project, for now, is hosted on an internal server on the College network. Data migration has been carried out for all the records that were received from the libraries. The figures are given in *Table 1*.

Library at:	OPAC URL	Number of (items held and) records migrated
Academy for the Dhivehi Language	http://drl.library.egov.mv	(11,000) 1,200
Addu High School	http://ahs.library.egov.mv	(*) 100

Aminiya School	http://asm.library.egov.mv	(27,000) 2,465
Baa Atoll School	http://bas.library.egov.mv	(*) 1,348
Dhaalu Atoll Education Centre	http://daec.library.egov.mv	(15,000) 27,039
Dharumavantha School	http://dsk.library.egov.mv	(8,000) 7,000
Gaafu Alifu Atoll Education Centre	http://gaaec.library.egov.mv	(10,000) 100
Gaafu Dhaalu Atoll Education Centre	http://gdaec.library.egov.mv	(10,951) 50
Gnaviyani Atoll Education Centre	http://gnaec.library.egov.mv	(10,284) 50
Haa Alif Atoll Education Centre	http://haaec.library.egov.mv	(*) 100
Hamad bin Khalifa Al Thani School	http://hsl.library.egov.mv	(6,000) 50
Iskandhar School	http://isk.library.egov.mv	(42,112) 100
Jalaaludheen School	http://jsk.library.egov.mv	(*) 50
Lhaviyani Atoll Education Centre	http://lhaec.library.egov.mv	(22,137) 66
Maafushi School	http://msk.library.egov.mv	(*) 50
Maldives Polytechnic	http://mpol.library.egov.mv	(2,408) 1,244
Muhibbuddin School	http://mss.library.egov.mv	(10,155) 14,883
Muhyiddin School	http://msv.library.egov.mv	(*) 5,000
Hulhudhuffaar School	http://hsk.library.egov.mv	(*) 100
Vilufushee School	http://vsk.library.egov.mv	(*) 715
Villa College	http://villa-library:8000 ³	(*) 234
Total		(175,047) 61,944

*Table 1: Details of the project library collection size and its URL for the online public access catalogue (the figures in bracket are the size of the physical collection as was stated on the checklists by the individual libraries. The * indicates no information was provided)*

³ Villa College Library's OPAC is currently, accessible only through the internal network of Villa College

It is noteworthy that a total of 61,994 records exist on the libraries under this network at its inception. The completion of the catalogue would require considerable effort by the library staff and will require appropriate support mechanism from the institutions itself. A preliminary follow-up of the work from the libraries show that this follow-up component is not progressing at a desirable speed owing mainly to the shortage of professional staff in the libraries. None of the project libraries have any personnel with professional training or education in the area of library and information studies.

THE INFRASTRUCTURE ISSUES

As was found with the follow-up work after the creation of the Koha ILS databases for the 21 libraries, there are technical difficulties at the individual library level. These range from the lack of dedicated computers, slow speed of Internet accessibility, and the lack of dedicated staff with library and information science background. Also of significance is the shortage of support mechanism to overlook the country-wide project; this also owing to the limited local professional network. These are issues that need to be further strengthened to reap the benefit of ICTs at the disposal of the nation.

OVERCOMING THE DIFFICULTY IN LOCAL LANGUAGE SEARCHING

The creation of digital collections in the local language has its shortcomings owing to the lack of optical character recognition (OCR) of the local font Dhivehi. Dhivehi OCR is a work in progress, and until this is achieved, full-text searching on scanned documents added to the GSDL collection is not possible. To overcome this issue, the Digital Library Project utilises the section tagging feature of GSDL to enable some search functionality at least at the title level of article content.

OVERCOMING THE COPYRIGHT HURDLE

The securing of authoritative full text material that can be freely shared online is another area that needs to be addressed to reap the benefits offered through digital library software. As has been experienced by this project, the only local scholarly serial publication of literary value that has been existence for some years is the *Faithoora*. However, so far, the project does not have the right to share the full-text publicly. The digitisation component has progressed to a large extent notwithstanding this hurdle, in the hope of coming to an

agreement with the publisher to release of backdated issues at the least. This development is being pursued at present.

THE RELIANCE ON A NUMBER OF SOFTWARE FOR LIBRARY NEEDS

The holdings of libraries differ considerably ranging from monographic items both online and physical holdings, serial collection, and consolidated packages journal databases. These basically require cataloguing, archiving and e-library tasks as the minimal library requirements.

No one software is set to perform all of the required tasks, hence the need to choose a number of software to perform individual tasks. As such the Maldives Digital Library utilises the following:

- Monographic Records (books, catalogue, maps, tapes. serials. etc) -- Koha
- Fulltext material (thesis, newspapers, etc) -- GSDL
- Consolidation of subscribed online Journals (EBSCO, HINARI, etc), local digitised collection as well as the Online Public Access Catalogue of library holdings -- VuFind

The key is to be able to integrate them to be searched from one place. Both Koha and GSDL integrated to VuFind so that it can be searched from there. The continuity of this project would require personnel with the know-how of the individual software as well as in the integration of them.

COST-EFFICIENCY

The open-source software approach versus purchasing of proprietary software is recommended especially for countries with limited financial resources to invest on proprietary software. Furthermore, as experienced through this project the functionalities offered by Koha, GSDL, & VuFind is not any less than what is offered through the only proprietary software, Liberty3, tested by participants of this project. On top of this, the cost efficiencies of the open source option are significant.

A comparison of the proprietary software, Liberty3, and Koha ILS shows that the individual software cost and annual maintenance is much lower for Koha than Liberty 3, with Liberty3 initially costing over US\$ 150,000.00 for the Maldives National University with

continued annual maintenance fee of approximately US\$ 17,000.00 while Koha ILS for 20 libraries cost the MLA less than US\$ 15,000 (this cost includes the technical fees, administrative costs of the project, and transport to individual libraries for follow-up work). It has to be noted that as evidenced from the expression of interest for the MLA's request, securing technical expertise from overseas even for open source software is costly. The solution offered by Nepzilla, through the friendly terms, cannot be matched by any other Koha expert group.

The current project is administered through a group of volunteers from the MLA at no charge for the work. However, even if the project was to continue as a profit making venture, it would cost much less to use open source software compared to proprietary software.

FUTURE SOFTWARE DEVELOPMENTS

The project is an ongoing one with a plan to add more libraries each year. Some of the aspects that can be further explored are:

1. Make it easy for the library users to search and browse through the collection. It can be of different types but through a single point.
 2. Social OPAC (SOPAC) is an emerging area where research is being done, this can be adopted in future, if stable.
 3. Currently, VuFind requires data to be dump manually. It might be possible to automate the process using scripts in future and also have a perfectly working driver for Koha.
 4. Software like DSpace and Fedora promises to offer better solutions over GSDL. In future, these features could be used to advance GSDL.
 5. Automating the process of adding new libraries, and releasing the multiple library installer as a LIVE DVD for other users.
- In terms of this specific project for the Maldives, data migration at the item level, with multiple items, is something that needs to be explored further. The slow speed of internet access, coupled with the lack of professional library staff to do original or copy cataloguing has proved to slow down the data entry to the OPACs. The possibility of creating brief records through data migration as earlier outlined will help overcome this difficulty.

CONCLUSION

ICTs facilitate access by bringing information more readily to the consumers and by flexible search possibilities within huge repositories of information. The Maldives has an almost same level of ICT diffusion throughout the Maldives with almost all the islands having access to affordable Internet connectivity. Open source software has provided the small island developing state of Maldives with an economically viable solution to its library automation and digitisation. If all the small libraries were to automate their library collections using proprietary software, for one it will be a costly endeavour and two it will be difficult to achieve resource sharing as a unified search across all the individual library catalogues might not be possible.

Also of significance is the shortage of library and information professionals in the Maldives, as such concentrating on specific software for common needs provides the pooling of needed expertise in adapting, customising and developing it to the needs of the community. At the same time, the use of software that is widely used in the region provides support from more expert groups.

Through the Maldives Digital Library Project, the MLA in partnership with the National Library, the Educational Development Centre, and the National Centre for Information Technology has successfully implemented the Koha ILS in 21 libraries of the Maldives. These libraries include 2 College libraries and eighteen school libraries, with fourteen of the school libraries located in the outer regions of the country. Additionally, 6 local digital library collections have been created using GSDL, more are planned. Combined search is facilitated across the libraries on Koha ILS and the digital library collections on GSDL using open source software, VuFind which facilitates federated search options.

The work is continued as a consultancy service of MLA. This includes initial preparation of data entry, assistance in the retrospective data conversion from .csv format to Koha ILS, and advice and assistance on installation and customization of the software for individual library's needs. The Maldives Library Association receives technical support from counterparts in Nepal in the successful execution of this project.

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