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Analysis of Creation Scientific Library System with MARC21

THESIS

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Abstract

Automation solutions come to centralization and internalization in every part of processes in different spheres. The reason is that the philosophy of humanity changed to “win to win”, assist each other, be a team and develop systems that give effectiveness, focus and open source. In this reaserch work analyzed CIS Library systems and their formats, advantages and disadvantages from development part. In the result identified 4 criterias in the development of the corresponding software in the creation of the Library System. For a more detailed analysis of problems between different formats, we used OCLC WSKey and found authority tags. Analyzed timeline of creation of basic modules of library system and influence in each other, accent was in analyzing and implementing cataloging modules with comparing desktop and web software and the additional task possibility of transferring metadata with XML files between different formats. In future work was testing and comparison of analysis.

Аңдатпа

Қазір әр түрлі саладағы процестердің автоматтандыру шешімі орталандыру мен интернацияландыруға келе жатыр. Себебі адамдардың ойлану филасофиясы өзгерді, мысалы екі жақтың да жақсы нәтижемен қалуы, бір-бірінің дамуына көмектесе алауы, топпен жұмыс жасау және тиімді, фокус жасалынған және ашық жүйе құруды маңызды деп санайды. Бұл зерттеу жұмысында ТМД елдеріндегі кітапхана жүйесі, қолданатын MARC форматы, артылықшылықтары мен кемшіліктері туралы анализ жасалынды. Нәтижесінде сәйкес келетін кітапхана жүйесін құру үшін 4 критерия анықталынды. Ал толығырақ анализ үшін OCLC WSKey қолданылынды және авторитетті тегтер анықталынды. Жүйені құру бойынша уақыт ұзақтығын көрсететін анализ жасалынды және модулдердің бір-біріне әсер ететін факторларын анықталды, соның ішінде катологизация модуліне, оның десктоп немесе веб версиямен айырмашылығын анықтауға аса мән берілді. Қосымша XML файлдарымен жұмыс жасау және ақпараттарды форматтар арасында алмасу бойынша ұсыныстар жасалынды. Алдыңғы жұмыстарда тест және салыстыру жұмыстары жасалынады.

Аннотация

Сейчас решения автоматизации сводятся к централизации и интернализации в каждой части процессов в разных сферах. Причина в том, что философия человечества изменилась, к методу “win-to-win”, помогать друг другу, быть командой и разрабатывать системы, обеспечивающие эффективность, направленность и открытый исходный код. В этой исследовательской работе были проанализированы библиотечные системы СНГ, их форматы, преимущества и недостатки со стороны разработки. В результате определены 4 критерия при разработке соответствующего программного обеспечения при создании Библиотечной системы. Для более детального анализа проблем между разными форматами мы использовали OCLC WSKey и нашли авторитетные теги. Проанализирован график создания базовых модулей библиотечной системы и влияние друг на друга, акцент был сделан на анализе и реализации модулей каталогизации со сравнением настольного и веб-программного обеспечения и дополнительной задачей возможности переноса метаданных с файлами XML между различными форматами. В дальнейшем работа была тестированием и сравнением анализе.

Acknowledgements

During the period of research work, I realized how important it is to analyze yourself, to know who created, your own intention, who made you become at this moment, to know where I can take energy, where to direct willpower and creativity. The research work helped me know what is happening in the world of automation in the field of the library and how I can influence it. Many thanks to the library team - Anar Abilakimova, Babur Rustauletov, Arsen Zhugunusov, Zhan Zhaxylyk in the automation department, who have been together throughout the entire RD period, and to the supervisor - Ardak Shalkarbay-uly who motivated, gave the best advice, and simply discussed computer science and other philosophy topics. Thank you, dear ones, who are in my life, for your pure love - my parents, friends and soulmates. I am very grateful to Allah for what I have, thank you for the experiences and hope for a better future.

Contents

1. Introduction

1.1 Motivation

The main difference of our current state from history is that humanity is involved in productivity solutions in personal life and business by automation. As said by Bill Howard, virtual solutions have become a tool that boosts. As proof the most important processes are solved by automation and computer science insights. One of the subcategories is software solutions in educational institutions' processes, if more detail student service center, educational methodological center and libraries, etc. From the list library management solutions influence the overall for all library-related problems and this allow libraries to become more effective, productive, efficient in their tasks, as well as drive member engagement. The library technology industry has reached a new level of maturity led by companies with significant development potential. Software open source technology was part of the library scene in 2006. In the USA 15.2 percentage ILS implementations are based on open source (Koha 6,9 percentage, Evergreen 8,3 percentage)[1] and constitute 7.6 percentage implementations academic libraries. Koch introduced around the world, including widely used in many developing countries; Evergreen - developed for a consortium of public libraries - is mainly used in the US and Canada. The reason why we need software for library system are:

- Increase Efficiency
- Improve Organization
- Increase Engagement

Integrated Library System consists of two interfaces, one for employers, and the other - for the staff of the library.[2] In a library system, the work of the

user / member / divisions' experts and the library staff is different. The user can search for a book, view a list of books available in the library, it can produce a book, update the book, can hold a book, can print a list of numbers, can edit your information (information about the patron). Publicly available online catalog, circulation, some functions under serial control can be performed by the cartridge. But employees can store bibliographic (books, CD, DVD, magazine, etc.) record is actually a library of materials record in the database, can create a patron in the database, order a book, buy a book. Acquisition, cataloging,[3] some serial management functions, the management of all of them are operated by the library staff.[4]

For these reasons analyzed and identified the most influential library management systems, such as OCLC WorldCat, Koha, Apollo and others.[5] For given systems, it analyzed two big environments: (1) library application, relational database, (2) metadata[6], for a searchable classification system. The first part for developers is not a big problem, because we have different solutions to store and use metadata. But the second part should be analyzed for the Kazakhstan Library System. If generally formal metadata classification for collecting includes the initial parameters, like a format, tags, subtags, language, version, intended platform, filename and location, we should not forget about informal metadata that development tools used. Formal metadata can be easily developed in the structure part, but informal metadata is not understandable for users in searching. In all cases we can give good examples in solutions and usage of formal and informal metadata in online cataloging - WorldCat is a very well known integrated library cataloging system.[7]

It should be borne in mind, however, that while most libraries have developed or migrated to integrated systems, some subsystems are available as separate systems in their own right: for example, systems for managing serials or multimedia collections.[8] It is easy to assume that all libraries will be transferred or migrated to an integrated system, but there is a small library, special libraries are usually small, which can not afford to buy a complete library management. For that reason developers can provide analysis for create, exchange and support metadata of cataloging between formats, such as MARC21, UNIMARC or RUSMARC.[4]

MARC 21 stands for Machine Readable Cataloging. This database is a general data format, which is used in many programs. The usefulness of the format MARC

21 lies in the fact that we can manage any library through their own library, if the entire library uses the format MARC 21. In MARC 21, there are a few rules for writing data. For example, if we want to preserve our system of data base name of the author, Robert, we need to use "100 1 .a Robert», this format is .100 tag for this field. Each field has a tag number.[9]

MARC 21 Format for Bibliographic Data is a format that has its own requirements for transfer data elements required to search, use and manage various types of bibliographic material. The MARC 21 format defined for working with different other formats, developed other solutions for integration for metadata. MARC 21 specification is defined for books, serials, computer files, maps, music, visuals, and mixed material. [10] By fully integrating with other formats, it is supported by them and found ways to get data for different types of materials.

More than twenty five years ago, researchers began their question by asking 271 bibliographic experts to see how automation and digitization can change their work. [11]

In their research result, they found correlation of automated system usage and time efficiency. After this work, they started a big community to collect data from experts and share with others. Before I used other MARC formats, but it wasn't a good solution for all other librarians. For example Call Number is book's place information and in new MARC21 format this Call Number in 050 tag.

The MARC 21 format represents several kinds of bibliographic types such as continuing resources, printed and handwritten text materials, maps, music, computer files, visual materials, and mixed materials. As we have already noticed, each type of material has different headings, names, topics, notes, publication data and information about the physical description of the item. If you look in more detail, then:

- BK (Books) - this type of material for users can read printed version or electronic and etc.
- CR (Continuing resources) - publications and textual material, that can be continoued for long time, examples are newspapers, periodicals and etc.
- CF (Computer files) - this materials are services or systems, computer softwaares.

- MP (Maps) - paper or electronic materials, that can help to use for geographic tasks.
- VM (Visual materials) - materials, for usage in project media, 2D or 3D graphics, objects and media.
- MX (Mixed materials) - all other materials, that can be specific materials, such as archival versions.

The following Figure 1.1 shows part of 008 - Fixed-Length Data Elements-General information all the data items of a field in order, and it associates each character position and definition (name) with the material type (s) for which it is valid (V).

		Validity by Material Type						
Character Position		**BK**	**CF**	**MP**	**MU**	**CR**	**VM**	**MX**
00-05	Date entered on file	*V*	*V*	*V*	*V*	*V*	*V*	*V*
06	Type of date/Publication status	*V*	*V*	*V*	*V*	*V*	*V*	*V*
07-10	Date 1	*V*	*V*	*V*	*V*	*V*	*V*	*V*
11-14	Date 2	*V*	*V*	*V*	*V*	*V*	*V*	*V*
15-17	Place of publication, production, or execution	*V*	*V*	*V*	*V*	*V*	*V*	*V*
18	Illustrations (code 1)	*V*	.	.	.	.	.	.
18	Undefined		*V*	.	.	.	.	*V*
18	Relief (code 1)	.	.	*V*	.	.	.	.
18	Form of composition (code pt. 1)	.	.	.	*V*	.	.	.
18	Frequency	.	.	.	.	*V*	.	.
18	Running time (digit 1)	.	.	.	.	.	*V*	.
19	Illustrations (code 2)	*V*	.	.	.	.	.	.
19	Undefined	.	*V*	.	.	.	.	*V*
19	Relief (code 2)	.	.	*V*	.	.	.	.
19	Form of composition (code pt. 2)	.	.	.	*V*	.	.	.
19	Regularity	.	.	.	.	*V*	.	.
19	Running time (digit 2)	.	.	.	.	.	*V*	.
20	Illustrations (code 3)	*V*	.	.	.	.	.	.
20	Relief (code 3)	.	.	*V*	.	.	.	.
20	Format of score	.	.	.	*V*	.	.	.
20	Running time (digit 3)	.	.	.	.	.	*V*	.
20	Undefined	.	*V*	.	.	*V*	.	*V*
21	Illustrations (code 4)	*V*	.	.	.	.	.	.
21	Undefined	.	*V*	.	.	.	*V*	*V*
21	Relief (code 4)	.	.	*V*	.	.	.	.
21	Type of continuing resource	.	.	.	.	*V*	.	.
21	Music parts	.	.	.	*V*	.	.	.
22	Target audience	*V*	*V*	.	*V*	.	*V*	.
22	Projection (code pt. 1)	.	.	*V*	.	.	.	.
22	Form of original item	.	.	.	.	*V*	.	.
22	Undefined	.	.	.	.	.	.	*V*
23	Form of item	*V*	*V*	.	*V*	*V*	.	*V*

Figure 1.1: The example of valid tags for materials list

The list of validity by material types: books, computer files, maps and others are so different, as shown Figure 1.1 prove for this importance in creating system with character positions in MARC.

But in other format's Call Number is not divided to LC requirements, such as Subject Area, where librarian should enter just one or two letter from the rule of subjects, author's first letter and number from the rule of authors table, publication year and version metadata.

When using a call number to locate a book on a shelf, consider each component

of the call number in turn before moving on to the next segment. Each element of the call number is read in a way of different letters — Class, alphabetically, number of classes as an integer (with possible decimal expansion), and a cutter as a decimal fraction.[12]

Koha has been demonstrated as an OOS that can give access to change and improve software. They proved the openness of the library system at a high level with last versions 21.01, where users can test OPAC and staff interfaces. Many experts contend, however this platform gives easy access to information, automation of modules and can see various aspects. [13]

The MARC21 format transferring data with given access from different platforms, the first task is preparing XML (extensible Markup Language) file with structure. If we will answer for question, why they used XML file for new format, (1) it is suitable and flexible for this format, (2) electronic resources are also in XML, (3) has powerful transforming language, (4) possible to use in another formats.

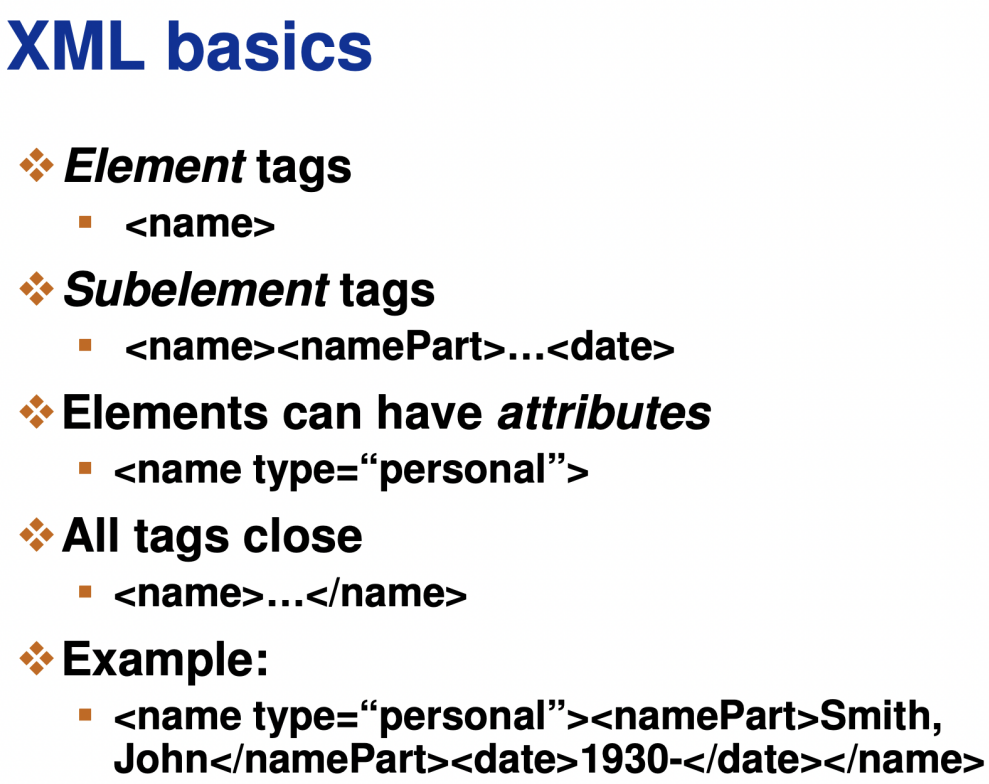


Figure 1.2: The Congress of Library XML basics for MARC format

As we can see the main basics of XML give order in creation new system, for other systems can not be difficulties in metadata transferring.

1.2 Aims and Objectives

In this research, we will analyze other Kazakhstan Universities' Library systems to help increase their quality on an international level, if more detail help in entering metadata and assist in saving resources by automation processes. Most users can come to the library and can't find searched books from shelves or the given platform can't give exactly understandable information from cataloging.

WorldCat is one of the open resources for some materials to get metadata, for other Kazakh, Russian and other materials that need to be catalogued. But as we know in Kazakhstan Library Systems have different formats, we try to give solutions for these difficulties.

In development part we try to solve ways to transfer metadata and at the same time we will give answer for next questions:

- Which metadata is important and have to fill in cataloging?
- How is it possible to fill correct metadata?
- Why must Kazakhstan libraries start to use the MARC21 format?
- How is it possible to convert metadata to other MARC, RUSMARC and other formats?

Additionally, in creation analysis will be given to characterize system vital and compulsory parts in each Scientific Library System process and relevance of new format usage and influence of in modules, like an acquisition, service, report. The objective of research is to assist in working with metadata of materials, give high quality software solutions for librarians in managing, transferring and saving time.

1.3 Thesis Outline

This paper is divided into five sections: the first Introduction chapter gives a brief overview of general information about current automation state of library systems in the world and describes research questions. The second section examines analysis of difficulties in the Library Management System of Kazakhstan

universities and in MARC format usage. In the third section a case study analyzes an automation solution in cataloging with MARC21 format and methods to implementation. A new methodology is outlined in the fourth section about development, logical structure and results. Our conclusions are drawn in the last Conclusion and further work chapter.

2. Problem Statement

Before all modules or other format difficulties, library management should understand its own digital point and how rapidly it is ready for changes. This is more about usage of new technology,[14] and understanding simple requirements of software solutions. In creation Library System analyzed user efficiency can be given comfort in usage and has been well accepted by libraries. The second case, in library managing, cataloging or other actions should be structural in entering metadata. Additionally, The Client issue is an important example for libraries. Landauer's[15] added own research work on user-centered design applies to online catalogs. Librarians must not only take an active role in designing systems, but in interesting users' perspective in developing online catalogs.

2.1 Overview for Kazakhstan Library Systems

The technological developments advances in many categories are growing not linear but highly exponentially. But in Asian library systems stopped at one point. Because usage of old formats and not user friendly platforms is normal for librarians. There are list of Library system and their formats in Kazakhstan:

1. KABIS - is the first using a lot system that uses RUSMARC format.
2. IRBIS - is the second using a lot system that uses old MARC format.
3. MegaPro - is the third using a lot system that uses the old MARC format.
4. NU Library System - is used only in Nazarbayev university, which uses UNIMARC format.

The first library system that takes first place from the usage in CIS is KABIS.[16] This system can't give access to analyze and use for other platforms before filled

data, it can give access to just the monitor in the desktop version. For online librarians it was not a good decision for the last few years for given cost. The last statistics show the usage of this system in Kazakhstan is[8]:

- 200 social libraries;
- 68 high level educational libraries;
- 15 science-research institutes' libraries;
- 100 college libraries;
- 20 Nazarbayev School libraries;
- 250 school libraries;

The IRBIS system [17] is an automation solution, but formats are fully compatible with international formats UNIMARC, USMARC and Russian communicative formats. The system is designed to work in local area networks of any type without limiting the number of users. This system is used in some Kazakhstan areas, such as Pavlodar, Karaganda, Aktode, Shymkent regional libraries.

The russian product "MegaPro"[18] is Limited Liability Company "Data Express" was founded in 2011. The company was created by well-known specialists - the authors of the local version of the automated information and library system "MARK", the network version of the AIBS with MARC format, AIBS "MARC-SQL". Now the list of universities that use this platform: Kazakh Britain University, KAZGUU, Satbayev University, NARXOZ University, Gumilev University, etc.

AIBS "MegaPro" is developed on the basis of open standards and data formats. It implements a three-tier architecture "thin client - application server - DBMS" based on web technologies. Features and resources are accessed through a standard web browser.

The following browsers are used to work with the MegaPro AIBS modules: Internet Explorer; FireFox; Google Chrome.

2.2 Introduction for general task

To identify general task for this research work, given analyzed problems list for current state of Kazakhstan Library Management systems:

- There are no integrated system for common channel usage to metadata, systems can't give structural or nonstructural data;
- The short solution cases can't give to add changes;
- The outsource systems need additional payment for new functionalities;
- The big and important part is not user friendly interface;
- The systems can't give access to opportunities for some users;
- The most of systems can't give user oriented functionalities, such as virtual chat and etc;
- Additionally, systems are not prepared user flow guide or tours;
- They can't provide the high quality support or quality is not satisfied to the amount;

If collect all ideas of this task list we can see big picture for general task, in CIS we don't have Library Management System, where we can not share cataloging metadata each other librarians.

The another part is OCLC WorldCat[19] can't ingredient in own data all CIS material metadata, it can be the big problem for cataloging part, but reciepe ways we should identify. [20] Also it is important to give data that has access to edit and share others.

The main aim of the system is not just developing, it is more about automation of right functionalities for right librarians and users. The highly importance of investigation can influence for thinking of academic sphere researchers and improvements their works. That is why the analysis and development part answers for the infrastructure of transferring data between library systems.[21]

2.3 Problem Analysis in Development Side

OAI gives the opportunity for users to use a single search interface to all data and PMH helps to read input interfaces with native end-user interface. The main characteristics for Metadata Converting[22]:

- The first requirement for data format recommended to be DC and MARC. If we want to transfer from RUSMARC, UNIMARC or other formats, it will be a big difficulty for us.
- The second requirement is identifying mandatory metadata from the 4000+ tags, which can be discussed by librarian experts.
- The third requirement is choosing a platform to implement, it will be better if the chosen protocol is HTTP. [23]

OAI-PMH supports dissemination of metadata to be readable, that means entered data should conduct all ID, format tag and metadata parts.

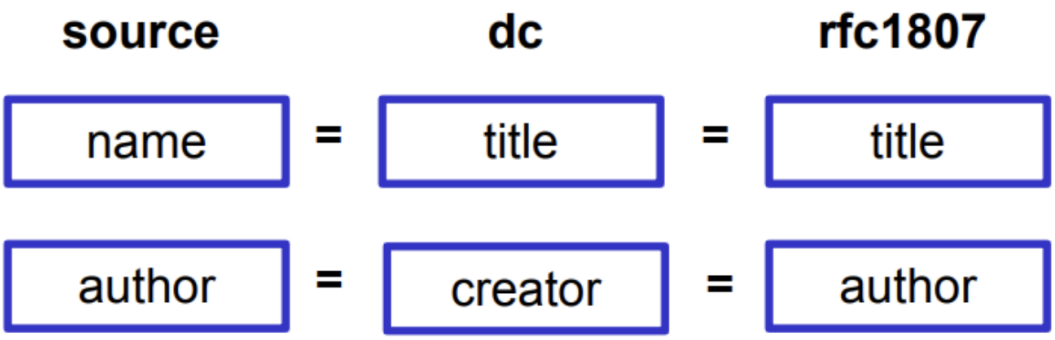


Figure 2.1: Metadata Creation between Formats

As shown in Figure 2.3 there should be algorithm of data, first and second lines are given as correct example, third line is not readable:

1. <dc: creator>Duke, Adam</dc: creator>
2. <dc: creator>Nash,Adam</dc: creator>
3. <dc: creator>Duke, Adam; Nash,Adam</dc: creator>

It is a functional representation of the metadata. These features may be related to the types of metadata (discussed in the next session):

1. Discovery: descriptive metadata
2. Navigation (of an object and its components): structural metadata
3. Access control: rights metadata

Every interaction between an external user and the system will become a use case. One important point about use cases is that they do not explain how the functionality described will be accomplished. For example, the use case never stipulates that the data should be stored in XML or in a relational database, or that certain features of the search tool should be used. Avoiding implementation issues simplifies the requirements phase and the creation of use cases. As an accurate description of a functional requirement, it does not matter, at this stage, how this requirement is met (which programming techniques to be used, which software tools, etc.).

Those are later decisions made by software developers. At this stage, the system is considered a black box, and the functional requirements describe only the interaction between this box and users.[7]

2.4 Problem Questions with "5 Whys" technique

To give a clear answer for these research questions, I used the "5 whys" technique from Sakichi Toyoda, the Japanese industrialist and founder of Toyota Industries, who developed this technique in the 1930s.

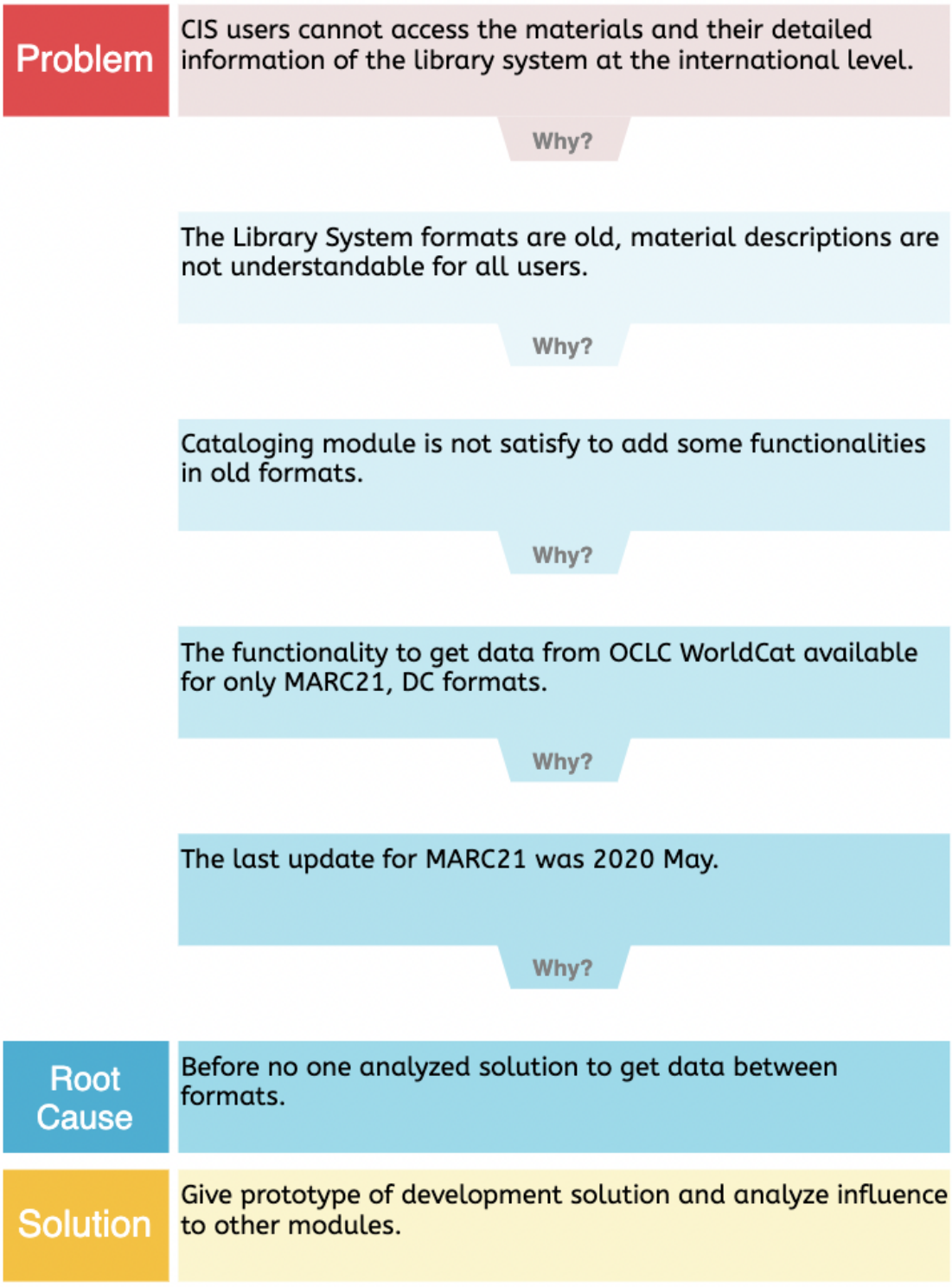


Figure 2.2: "5 Whys" technique for research question

As shown in Figure 2.4, from the general problem, we identified the root cause and solution, that by giving the prototype of development solution we can implement it for current Library systems and give analysis of influence to other modules.

In the last years this problem has interested all library system creators, such as OCLC, Koha, Apola. But at the same time other functionalities raised the assumptions of librarians, that is why they want centralization of cataloging. This expectations effect for other library systems to increase and automate their activities to provide better modules.

3. Review of Problem Solution

From the problem statement part we identified the root cause and general solution. That given root cause analysis in CIS Library Automation Systems are not developed metadata transfering solutions, that case methods assists to find algorithms of solution to prepare prototype.

3.1 Overview for Problem Solution Methods

Keys can accept some explicit users, are correlated with one or more explicit API services, and are desired through the portal. However, the Metadata API is somewhat uncommon in that the service key only afford access to the API and authentication requests made to the server, for getting information about the API, you must have two versions: 1) a WorldCat.org account to request a WSkey, and 2) a WorldShare end-user account with cataloging module and metadata permissions usually managed locally. With valid service keys, users will be able to send requests to the server without the correct cataloging permissions.

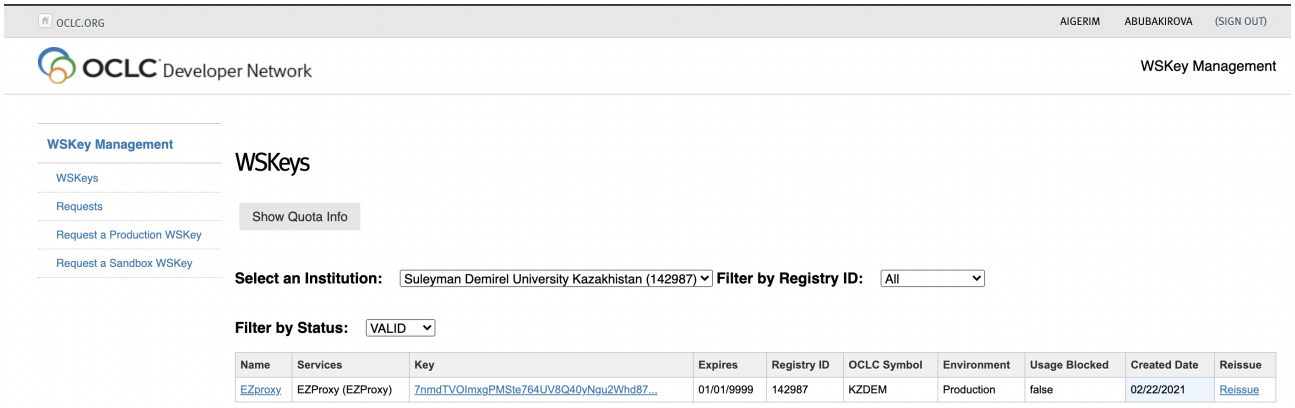


Figure 3.1: WSKeys for Suleyman Demirel University[24]

As shown in (Figure 3.1), we get WSKeys, the ability to request and after we

start research on how we can get this metadata with the given API. We found the OAI-PMH protocol can give us records for automating the cataloging data process.**yx**

3.2 The methods in automation solutions

From the different library systems that analyzed before, automation solutions gives next 4 methods in creation new system:

1. This will be first automation integrated system in the CIS, it gave high quality in cataloging, acquisition, service and report modules in international level.

2. When we will add MARC21 format to our database structure, it will be easy to use our data for other international companies or universities.

3. The system can focus on getting data from OCLC WorldCat, that can increase efficiency of cataloging.

4. The main advantage will be collecting all modules to one platform, where users, librarians can work everywhere.

For a more detailed analysis of problems between different formats, we found the latest versions of WorldCat, which gave the possibility of integration with the system for receiving data. OCLC allocates users a complementary, non-transferable, non-exclusive worldwide authorization for integrating the system with a set of proprietary APIs in consonance with the API explanation solely to include content and data from WorldCat or OCLC WorldShare Platform in the application. To develop, test and support applications, and provide Developer Application ante up with the ability to agility access data provided by the API for use through the Application Gallery, OCLC WorldShare platform, or the development web page.

The another solution is transferring data between different formats. Before analyzed CIS Library system formats were MARC and DC, for future possibility of transferring data, we need solution from LCC report.

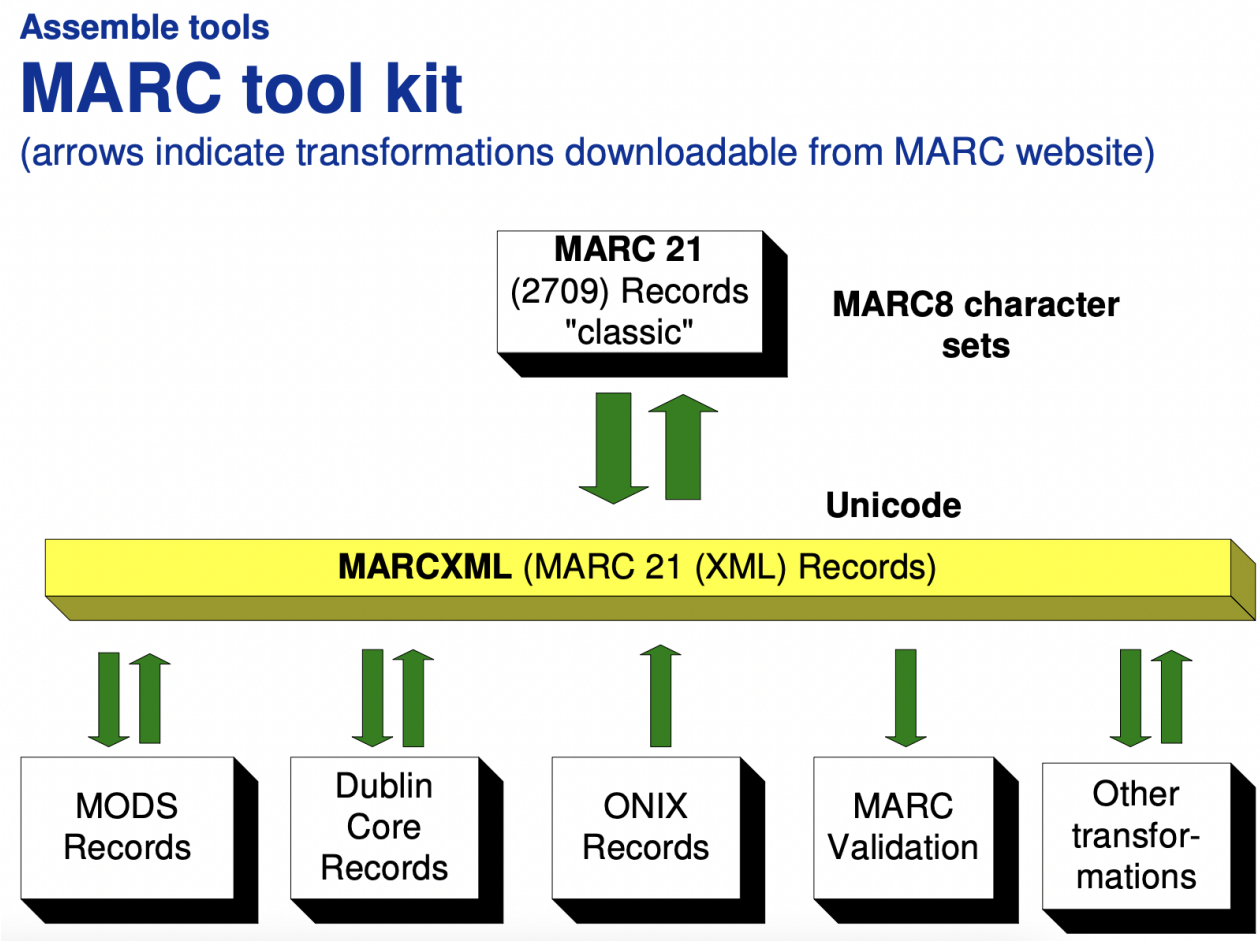


Figure 3.2: The possible ways to get data between formats

The given solution by LCC as shown in figure 3.2 are not totally for our research question. Libraries have long been interested in using publisher information as the basis for catalog entries to improve efficiency. The publisher's move from proprietary local formats to Onix made this proposal more realistic by reducing the overhead of supporting multiple translations in MARC. The NBAs responsible for maintaining the CIP program often accept Onix files as notification of upcoming editions from publishers. Detailed information on the Onix and MARC 21 collations created by OCLC and the Library of Congress can be found on the EDItEUR website.[25]

Metadata can be conveyed in three fundamentally different ways. It can be embedded in specific documents to which it refers, metadata contained in auxiliary files, or extracted automatically from the text content of the documents themselves. The latter category expands on the traditional definition of the term metadata, but it does so in a way that is conducive to our requirements.[6]

3.3 Cataloging Importance in Library System

For cataloging this information librarians use a lot of time, more clearly 1 book takes 1 day. If your library has 50 000 books then to cataloging metadata you should spend your 137 years on it. Automation solutions for filling correct metadata development part can give the 2 ways:

1. authority: list of types, variants in data, such as language of material,
2. parsing data from WorldCat.

Sample authority records are situated on records from the Library of Congress Name Authority File (LCNAF). Several systems are prepared so that records can be edited to add other fields in the subtags containing local information. They are MARC fields 100 (Main entry - Personal name) (NR), 110 (Main entry – Corporate name) (NR), 111 (Main entry – Meeting name) (NR), New indicators in MARC field 246 (Varying form of title) (R), change in subfield (Display text) (NR), New MARC field 336 (Content type), MARC field 337 (Media type).

About this WorldCat[26] we can give some introduction information with real cases, that means we get developers zip code from this organization. We will give the main advantages and disadvantages of this database. Linking to the library directories assists the user know the metadata of the materials, ready to serve the user. With database software, it is very easy and quick for employees to appropriate numbers for calls to add new books. In this section, there will not be duplication of work on the preparation of the catalog card.

ICTs have revolutionized library indexing practices. With OPAC users to access library catalogs on their desktop on campus. This reduces the cost of maintaining the catalog. This service has a significant impact on information and communication technology in the automation department.[27]

3.4 Cataloging Format Transferring Solution

From the list of solutions from OCLC Directories[28]: 1. Express service can provide a simple web interface solution for cataloging copies. It can be retrieved

from an existing cataloging entry without duplication or waste of resources. Conversely, a catalog item file can be exported for others using OCLC Connexion Server.[11]

2. Another solution is the Z39.50 cataloging service, MARC records for cataloging for library access, editing and sharing of records on their local systems. This second service is available to libraries in a cataloging format. There are several functions inside this service:

1. Search and find, examine MARC records

2. Search and find, explore LC names and topics, author notation, authority file records

3. Bibliographic records include non-Latin scripts.

Total IT Solutions Pvt. Ltd provides various library products that are fully integrated with the Z39.50 server / client.[2] They provide a user-friendly interface using the Z39.50 protocol for searching and exchanging bibliographic data in electronic documents and cataloging the online library in various formats such as ISO, MARC21, MODS 3.0, Dublin Core, etc. Z39 integration.[29]

Protocol 50 helps their automation software perform single keyword searches, combination keywords / strings / logical searches, and cross-index searches across multiple servers, and can retrieve records from library catalogs / consolidated catalogs and other electronic resources available worldwide.

Library of Congress Protocol Z39.50 made it easy for cataloguers to batch download multiple MARC bibliographic records in batch with one click. The catalog copying process is gaining momentum, in the general environment several online services (Web Dewey, Classification Web, Catalog Calculator)[30] have also been launched LOC, OCLC. ITC has radically changed its functional approaches and processes for catalogers; the process of copying a catalog becomes a routine function in any library around the world, it saves money, time and duplicates work.

Limitations of Z39.50[31]:

1. Lack of a consistent structure for reporting local ownership and accessibility data, which is critical to the end of most end-user searches, meaning the user does not want to know that there is a copy in the remote library of

a given item in its catalog, but whether the item itself is available and in what place.

2. Loss of trademark, so that the sender can not guarantee confirmation on the display of end users.

3. This may make the Z39.50 approach unacceptable for some commercial companies.

4. Complexity and therefore high overhead in use.

3.5 CIS Library system integrations

As the monopoly company is known, the KABIS software is intended for full automation and systematization of the acquisition and processing of the library stock, the creation of databases of electronic catalogs, full-text documents, and the provision of information retrieval on them.

The system is implemented in compliance with the current standards of the Republic of Kazakhstan and the CIS on librarianship. The program implements full support for the Kazakh alphabet, which greatly simplifies the work when creating electronic catalogs in the national language.

Since they cannot fail to comply with international standards and formats, only data is required from them. If unstructured data is provided, then you will have to create everything from the beginning and duplicate the data.

From our previous analysis another IRBIS system provides full integration into corporate library systems and technologies based on support for Web technologies and the Z39.50 protocol[24] and full compatibility with the international formats UNIMARC, USMARC [32] and the Russian communicative format and tools for maintaining and using Authoritative files. To start integration with this system, we can show source code for transferring metadata.

And in the same way, the same solutions can be for the automated integrated library system (AIBS) "MegaPro" - a new generation software tool for solving complex automation and resource management problems, fully implemented on the basis of modern web technologies.

In addition, there is a trend in modern library systems towards a modular architecture based on software components and well-defined application program-

ming interfaces (APIs); this allows for much faster software updates. This refers to the open source software movement discussed below.

One would expect that the adoption of such industry standards would facilitate the inseparability of modules from different library systems; however, this did not happen in practice. However, the emergence of complex collaborative information environments using library portals based on "web services" is important.[3]

It should become apparent in the course of this report that the market for library systems, as well as developments in library systems, are:

1. driven by internet trends and the software industry, not by the library and information community

2. given global economic imperatives.

4. Development of Library System with MARC21

The main feature of the system architecture is the mutual independence of the interaction of components with users and storage of components, as well as retrieving bibliographic records from the database.

4.1 Sequential scheduling method

To create the logical structure of the development part, we need to analyze MARC21 data including and possibility of implementation problem solutions. As we know library system with MARC 21 format collects a different variance of data including:

- Bibliographic data
- Community information
- Holdings data
- Classification
- Authority data

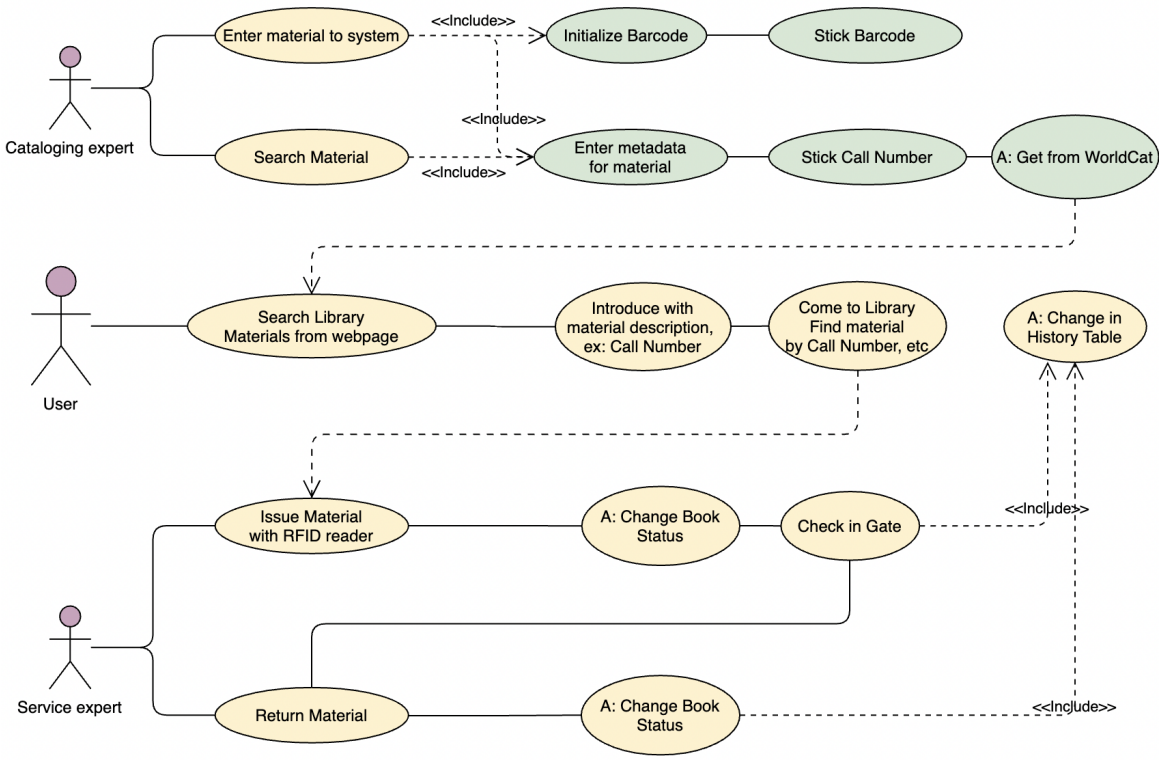


Figure 4.1: Logical Structure of Library System Development

The given types of data and structure as shown in Figure 4.1 we can develop analyzed solutions and as we know MARC format structures are the same, but the main differences are in saving control fields, subfields, datafields and their meanings. from previous examples all formats developed and supported by OCLC in the US can influence for all creation of system as shown in the below.

The first and main functions in this system start from the cataloging experts, which they influence for all other functions, because current state of CIS Library Systems are not oriented for user, from this part we can analyze and say that service part also can not be high quality. Cataloging with MARC21 assists to control order of materials and increase the level of users and usage of libraries on an international level.[33]

Our important part is user functions. When we focus on creating a system for users, who can search materials with simple and advanced types or by keywords, author, title, publisher, ISSN/ISBN, call number - it can increase probability of usage of materials. After customer flow guide assists understand the library system opportunities and functions, such as what means every element variance of call number.

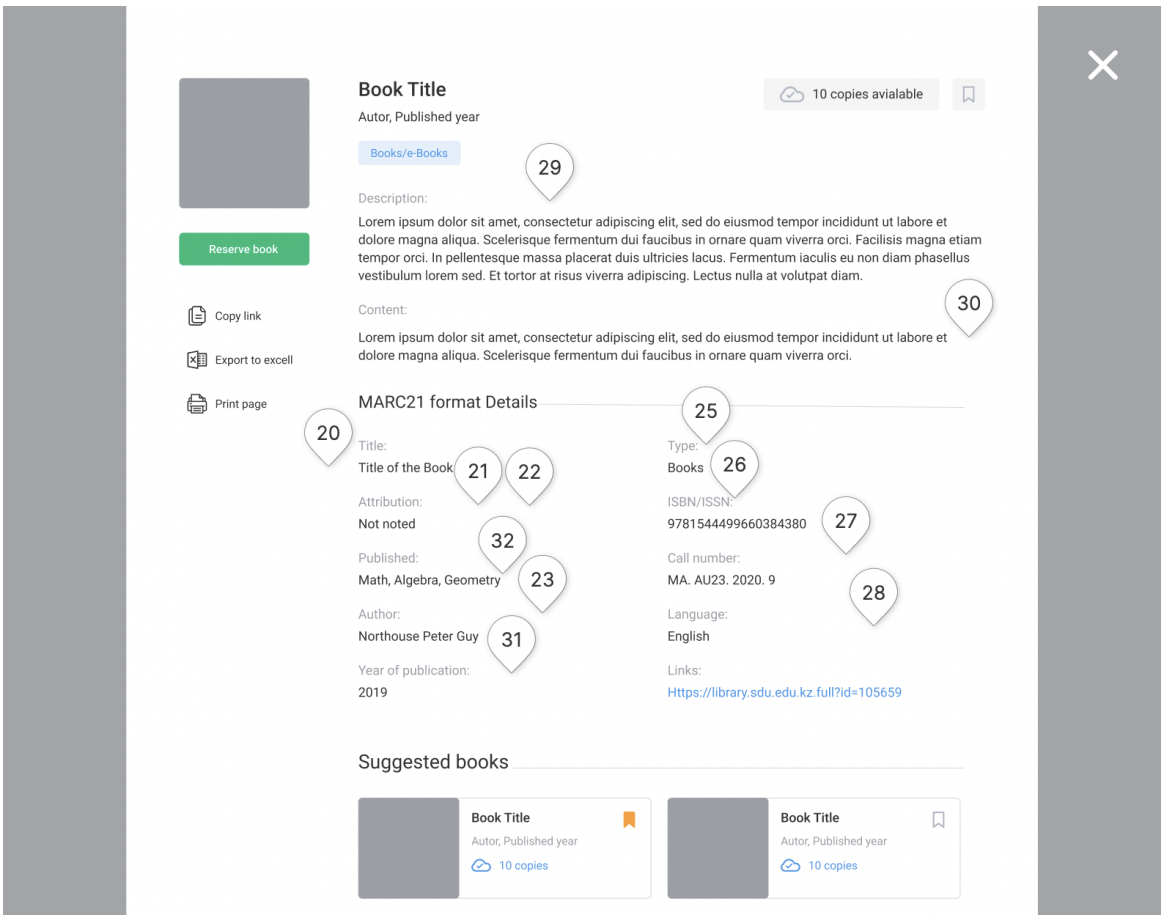


Figure 4.2: MARC21 cataloging details from user side

For material detailed information, analyzed and identified the list of metadata, such as shown in the Figure 4.1: (29) 520.a; 520.b - Description of material, (30) 505.a - Content of material, (20) 245.a - Title of the material, (21-22) 245.c - Attribution, (32) if 260.b - publishing company if 650.a, 650.x - subject terms, (23) 100.a - if you mean the first author, 600.a - for the 2nd+ authors, (31) 260.c - Year of Publication, (25) 650.v - Type, (26) 020.a - ISSN/ ISBN, (27) 010.a - Call Number, (28) 546.a - Language. After introducing material with detailed information, users can come to the library and start the issue process.

The third part is service functions, where development work is divided into software and hardware tasks. The software development tasks are search user, issue, return materials and show history of user. The hardware development tasks are RFID reader, gate check, change status.

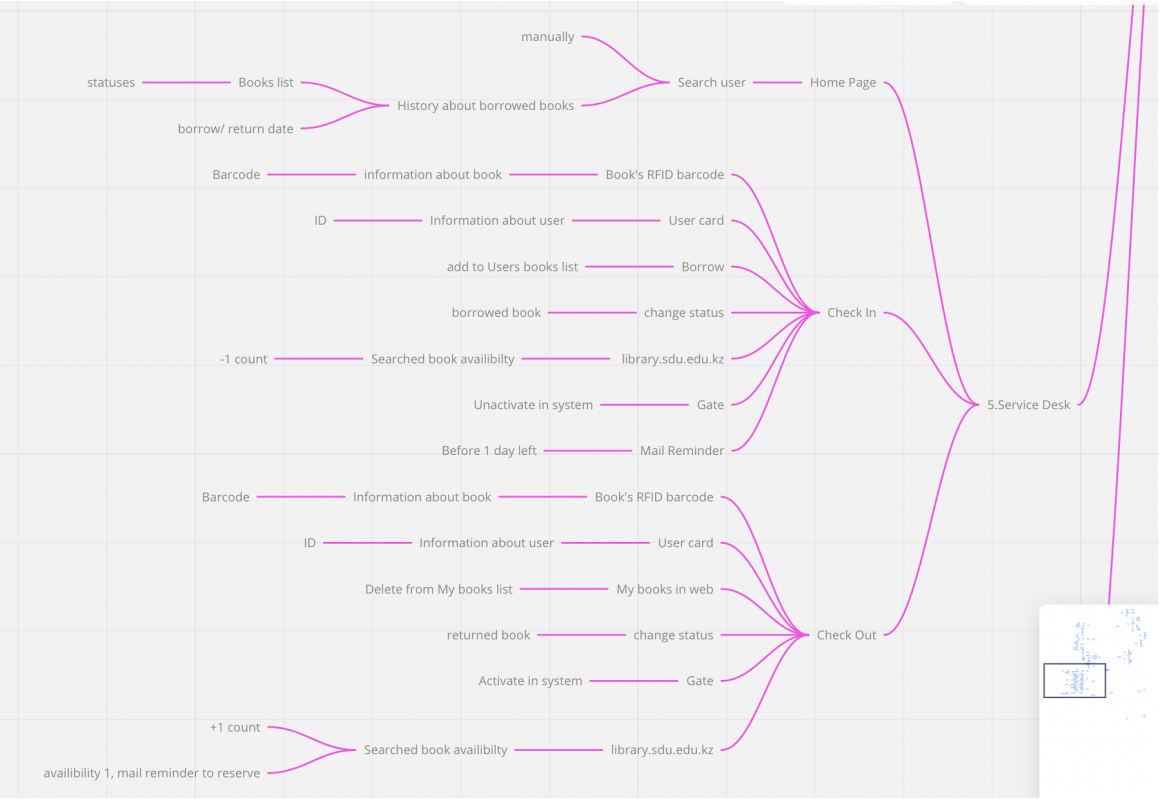


Figure 4.3: MindMap for Service Desk User Stories

In the Figure 4.1 analyzed the basic and important user stories, such as search user by manually or RFID Scan, Gate activation and inactivation from system [34], issue and return tables and material statuses. In hardware solution of service desk, the following main priorities were identified:

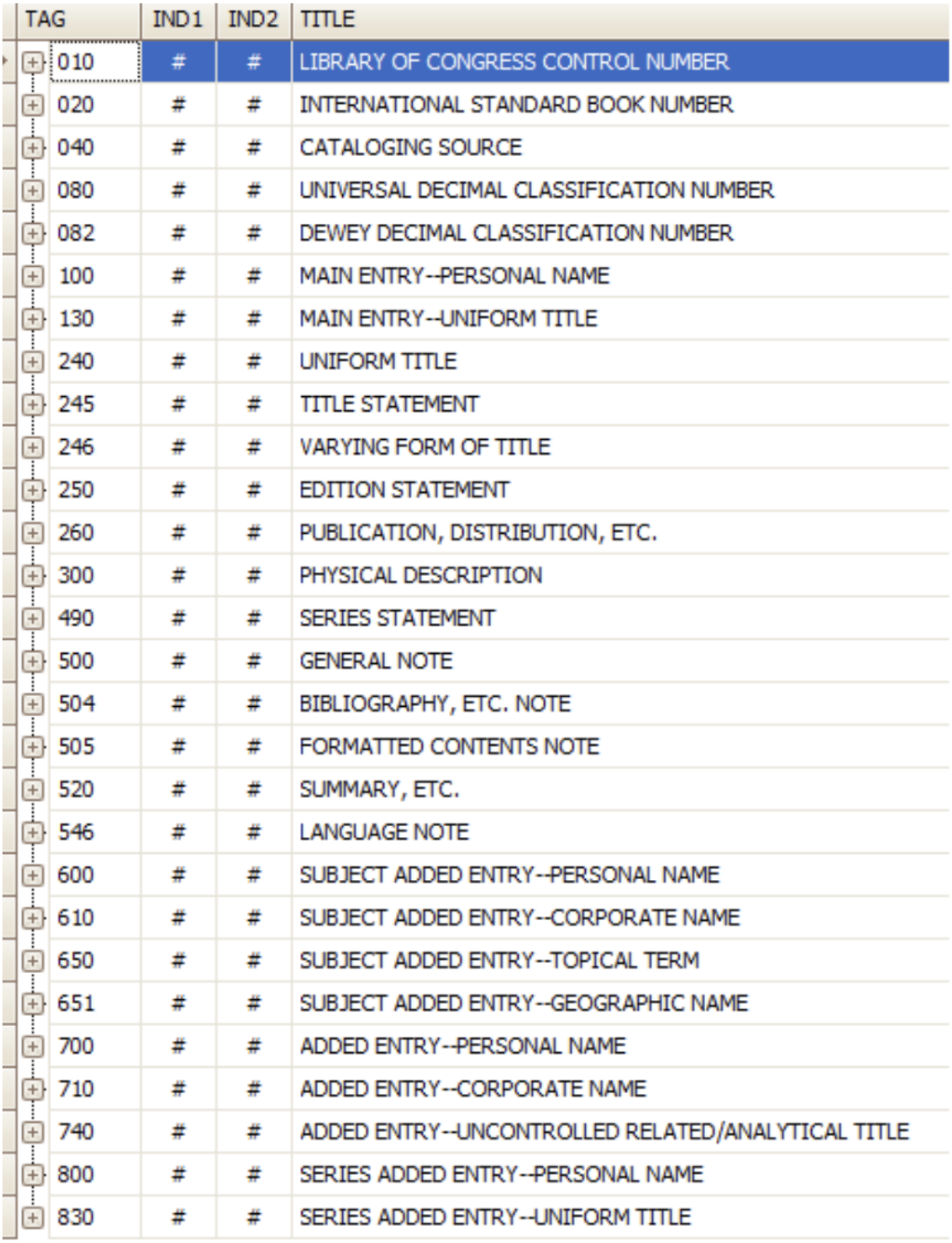
- Provide an "easy" search environment for users.
- Extend at least basic information about library operation, how gates work, how to issue or return materials.
- Give information about availability of material on the web page.
- Provide an efficient and flexible automation solution.
- Use the limited space more efficiently.

4.2 Analysis of Automation Solutions

Many sources of MARC-21 catalogue records are available free for use and download by other libraries worldwide. It makes good sense therefore for Indian li-

braries to use these resources within their library's. There are several advantages in doing this [34]:

- The efficiency of cataloguing is greatly improved and therefore the cost of cataloguing can be considerably reduced.
- Metadata imported from an authoritative MARC source ensures more completeness and accuracy in library catalogues.
- Use of authority files with MARC sources enhances the consistency of library catalogues.
- Exchange of a library's catalogue records is possible with other libraries via a common standard format.
- Moving from one integrated library management software (ILMS) to a more sophisticated one is more easily accomplished than if a library has to move from a non-standard structure to a standard one such as MARC21.



TAG	IND1	IND2	TITLE
010	#	#	LIBRARY OF CONGRESS CONTROL NUMBER
020	#	#	INTERNATIONAL STANDARD BOOK NUMBER
040	#	#	CATALOGING SOURCE
080	#	#	UNIVERSAL DECIMAL CLASSIFICATION NUMBER
082	#	#	DEWEY DECIMAL CLASSIFICATION NUMBER
100	#	#	MAIN ENTRY--PERSONAL NAME
130	#	#	MAIN ENTRY--UNIFORM TITLE
240	#	#	UNIFORM TITLE
245	#	#	TITLE STATEMENT
246	#	#	VARYING FORM OF TITLE
250	#	#	EDITION STATEMENT
260	#	#	PUBLICATION, DISTRIBUTION, ETC.
300	#	#	PHYSICAL DESCRIPTION
490	#	#	SERIES STATEMENT
500	#	#	GENERAL NOTE
504	#	#	BIBLIOGRAPHY, ETC. NOTE
505	#	#	FORMATTED CONTENTS NOTE
520	#	#	SUMMARY, ETC.
546	#	#	LANGUAGE NOTE
600	#	#	SUBJECT ADDED ENTRY--PERSONAL NAME
610	#	#	SUBJECT ADDED ENTRY--CORPORATE NAME
650	#	#	SUBJECT ADDED ENTRY--TOPICAL TERM
651	#	#	SUBJECT ADDED ENTRY--GEOGRAPHIC NAME
700	#	#	ADDED ENTRY--PERSONAL NAME
710	#	#	ADDED ENTRY--CORPORATE NAME
740	#	#	ADDED ENTRY--UNCONTROLLED RELATED/ANALYTICAL TITLE
800	#	#	SERIES ADDED ENTRY--PERSONAL NAME
830	#	#	SERIES ADDED ENTRY--UNIFORM TITLE

Figure 4.4: Desktop application for cataloging data with tags with MARC 21

As shown in Figure 4.2 this is a desktop version of collecting data from WorldCat, there are tags, sub tags and titles. When we started out with the desktop application, 15 catalogers couldn't get their work started at home, it was a little difficult due to localization, yet secure. After developing the cataloging module web application, it was a good solution for online experts, but there is another part that for complex functions it is not a good solution. To understand this, go

back to the Microsoft Office example — the web application software version is a scaled down version. In other words, you might have to compromise on some features. In the last changes, we can say web application is the best version for our functionalities.

More recently the development of XML and its advantages over HTML have made XML as the lingua franca of data on the web. XML representation of data in a computer has several advantages:

- There is clear demarcation between content and display unlike with HTML.
- Each application area (e.g., banking, e-commerce, libraries, chemistry, geophysics, etc.) can define Markup tags specific to their area.
- The XML tags and their definitions in each application area are agreed upon internationally (or as W3C standards) and these definitions are all provided as what is known as a Document Type Definition (DTD). The DTD is accessible at a web site and all XML documents in the area are validated against such DTDs to ensure consistency of data transmitted across the web.
- XML data is textual data and is therefore not subject to the quirks of proprietary software such as word processing.
- The XML data is readable by computer programs irrespective of the operating system platform being used by a computer that connects to the data over the web. In a sense therefore XML data is future-proof.
- Due to the widespread use of XML in web-based systems, there are standard open source computer programs (freely downloadable from the web) that can handle (search, index) such data.
- Many library-related metadata standards such as MARC-21 and Dublin Core have already developed DTDs for the storage of data in XML form and for inter-conversion of data, e.g., there is a DTD which allows MARC-21 data to be converted into MARC-XML form using a DTD that has been developed by the LoC and vice-versa.
- Of special interest to libraries: XML's fixed character set is Unicode (and its extensions), which allows diacritics, special characters, and non-Roman data

to be handled like ordinary text. HTML was heavily oriented to English and did inhibit its use in other languages.

- Due to Unicode and platform neutrality, XML offers the greatest promise of data longevity (or future proofing), as hardware, software, and network protocols continue to change.

- XML also provides for the unambiguous identification of complex data structures that can be treated as objects, well suited for bibliographic data.

Figure 4.5: XML format for MARC 21 in Call Number

The development of XML can be useful to give users the same algorithm of search from the library; it means a centralized library can give access to different opportunities in functions. As shown in Figure 4.2 as an example, the Call Number is divided to tags: 010.c, 010.n, 010.s and etc.

5. Result of Software Solution Development

The realization phase consists of a reflective transformation, a database of participants, statistics generation, operations and technical explanations - learning for librarians and end - users.

5.1 The steps of entering bibliographic data

Flashback: The changing process documentary or bibliographic data about an existing warehouse into a machine-readable [10] form is known as flashback. This processing of technical abides with bibliographic physical processes and data entry. Steps for entering bibliographic data:

1. Classification. In the library classification, materials are classified with the subject of their content. The classification system used and followed is Dewey Decimal Classification, Edition 21 (the most popular scheme worldwide). Here, the subjects are mainly divided into ten main sections (First summary). Each subdivision is again subdivided into ten subdivisions and again into ten, depending on the depth of the subject (second and third summaries). [10]

2. User database: Preparing the user database using library management software was demanding. As with a book with a unique accession number, the member must also have its own specific identification. Since the only unique number for the student was the admission number, it was chosen. Student / Staff ID. Student IDs have also been used as library membership cards. One side of the card contains a barcode of the student's admission number along

with instructions. On employee ID cards, the employee's serial number is encoded with a barcode, as well as his / her personal data. Distribution control: the user must bring ID cards to the library at the time of issuance, return, renewal and booking. [10]

3. CheckIn / CheckOut of books: when the user walks to the counter of the dissamination with the selected book from the shelf, the barcode reader reads his / her ID. The system will then show the details of the participant, such as name, class and division, category, previously released or refundable books, along with dates. The book data is then automatically entered by the barcode reader by reading the barcode label on the cover page of the book. The issuance process is completed by marking the due date on the due date receipt. When a book is returned, its barcode label is read by the barcode reader, and details such as due date, small details, etc. appear. [10] Now the librarian can "return" the book by selecting the desired graphic options.

4. Serial control: the database entered information about the periodicals that the library subscribed to, such as title, frequency, topic, output and volume / issue number, publication date and date of receipt. It is easy to search in OPAC. Additionally, in the OPAC user can search by regex for advanced cases. Multimedia: Information about collections of CDs, ACDs, VCDs, DVDs, etc. are loaded into the database. [10] The name, manufacturer, output data, subject, language, format and duration of the media are entered. Barcode labels (part number) are affixed to CDs for distribution. Library statistics: Periodic library statistics show the functional performance of stocks and services. The main statistics that can be obtained from the systems are: (i) Monthly stock information (by subject, by format) (ii) Participant information (students and staff) (iii) Weekly / monthly circulation data (by grade) , for members) (iv) Renewal / booking details (v) Overdue and minor details (vi) List of new additions (vii) Details of written off and canceled documents Inventory verification: Annual inventory verification can be easily done by reading book barcodes and comparison with the main database.[35]

The use of computers to automate library routines is especially useful for the

following reasons: much of the work done in libraries is repetitive, tedious, and mechanical in nature, requiring accurate updating of the records in the files. [35] The same bibliographic record in the library is used to perform several operations. Each operation can relate to separate copies of the header. The bibliographic record created at the time of ordering a document is first used for purchasing, then for technical processing and subsequently for library OPAC[36], distribution, binding, etc.

Automation provides decentralized access to bibliographic records for multiple users.[22] The branch library employee can check the order status without saving duplicate files or without asking. The user can check if the book is on loan or is available on the library shelf.

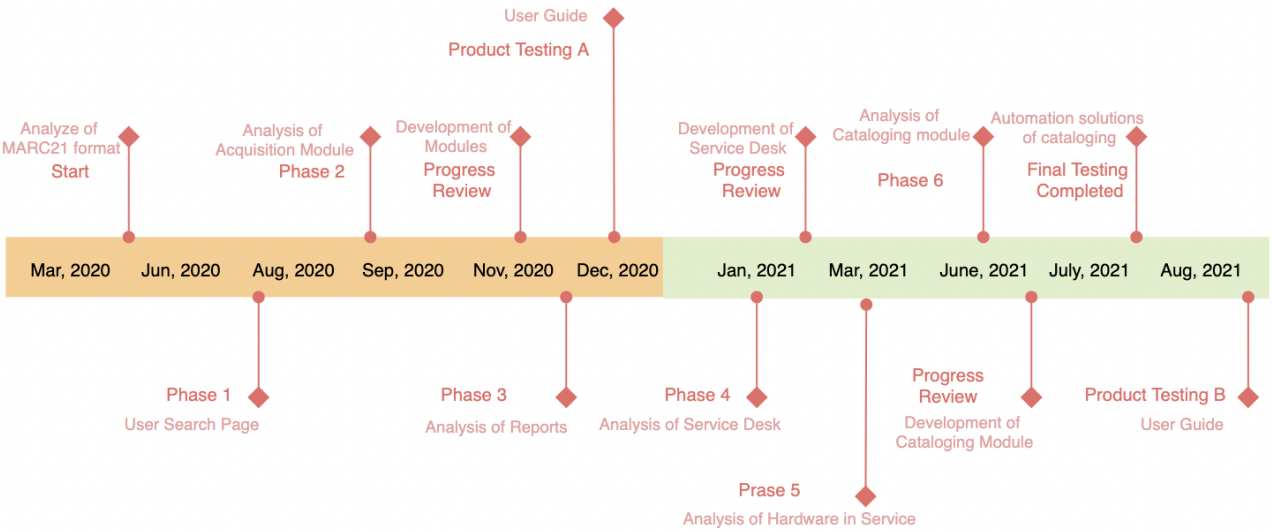


Figure 5.1: Timeline of Software System Analysis and Development

The use of information technology in libraries leads to an increase in the effectiveness of all management processes, because as shown in the Figure 5.1 Timeline can be a good example to prove how important analysis parts with phrases and progress review, product testing and spent time to automate all processes. For more information we can see divided two category colors, where 3 phases are made in 8 months and other 3 phases implemented in 6 months. It gives us a timeline for creation of basic modules and subsystems in a new format for cataloging. As more example we can analyze the PULAIS mainly includes the following subsystem:

1. Picking Subsystem (PULBAS), implemented on a PC. Main functions: ordering books, identifying duplicates, registering books, statistics, searching, displaying and printing, processing data, controlling book sellers, accounting and maintaining various databases, etc.

2. Serial subsystem (PULSCS) implemented on a PC. Main functions: ordering serial numbers, registering, receiving claims, searching, statistics, displaying and printing, controlling sellers, keeping records and databases, etc.

3. Subsystem of cataloging (PULBIB), implemented on VAX 750. Main functions: online cataloging (editing) of books and serials, search, statistics, authoritative check and control, display and print of a map, worksheet and bookletter, maintenance of various databases , processing and transmission of various data sources, etc.

4. OPAC subsystem (PULPAS), implemented on VAX 750. Provides the user with 12 search keys: title (books and series), author name, conference or organization author name, topic, title keyword, ISBN, ISSN, call number, LCCN, CODEN, DB check number, and defined and logical logic combine the search.

5. Circulation Subsystem (PULAIS) implemented on VAX 750. Main functions: circulation processing, internal job processing, circulation status inquiry, user database management, simple MARC processing, behind the scenes support and copy processing, daily recording and recovery, etc.

Pre-written acquisition-specific software and acquisition application modules supported by integrated library systems can minimize the worst-case implementation problems associated with custom software development, but the library must have access to the required hardware and system software components. Turnkey systems consisting of pre-configured combinations of hardware and software are available as both purchase-specific products and integrated systems. In the latter group, combining acquisitions with cataloging and distribution in a single system offers several advantages, including the ability to establish a pre-bibliographic record at the time of ordering an item. [4]

5.2 Result of MARC21 format influences in Development

One of our authors Tsai (2007) developed a conversion program and we explain this process as shown below.[10]
Step 1: collecting data. This includes collecting field tag, subfield tag, and coded value data according to character length and control characters as prescribed in the ISO 2709 standard.
Step 2: convert character encoding. This is done by looking at the original text encoding and using the iconv or Perl Encode tools to convert double-byte character sets such as Big5 to UNICODE UTF-8 character encoding format.
Step 3: new definition. This is done by referring to ISO 2709 to override the character length of field tags and subfield tags and encoded values in the callout.
Step 4: write down the conversion result. Save new MARC callout, field tags, subfield tags, and encoded values to an iso file. At the stand, we tested two MARC formats and proved that libraries must define the MARC structure before importing their data, and the result showed that there is no difficulty for any MARC formats to work correctly on Koha.[10]

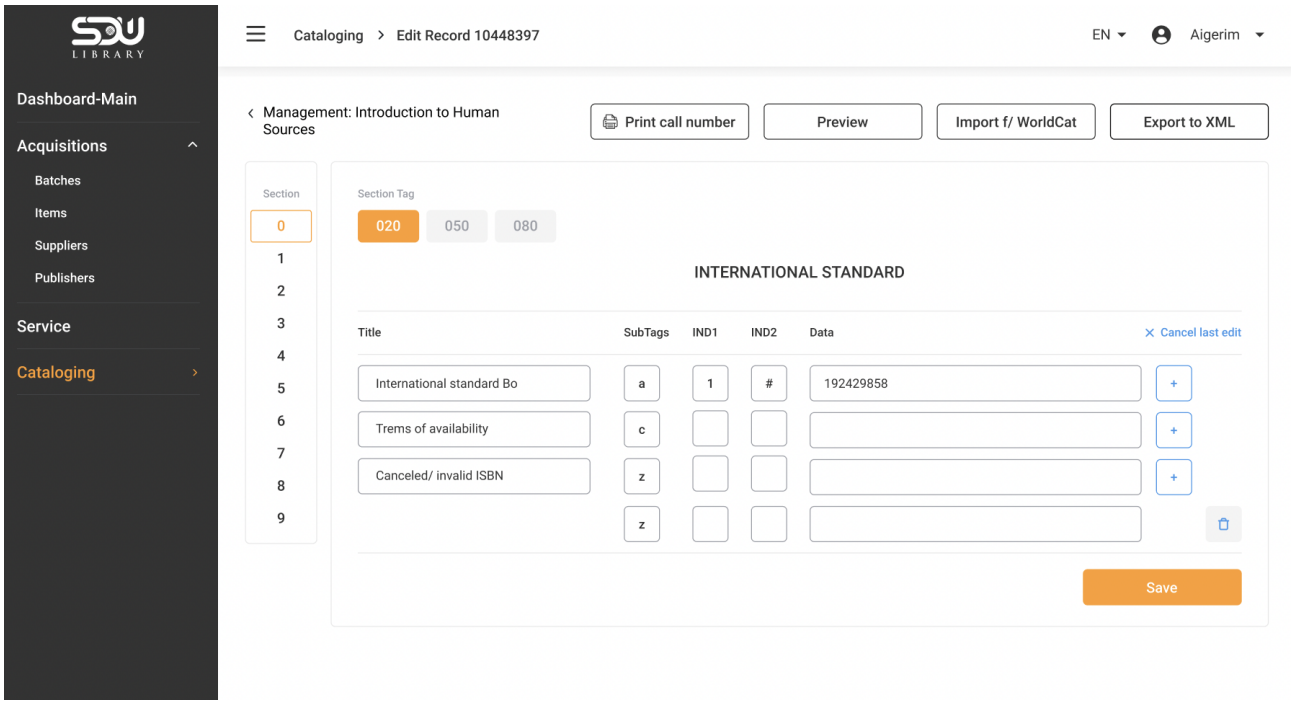


Figure 5.2: Cataloging with MARC21 solution prototype

When records are exchanged between two or more organizations on a regular basis, such as between shared cataloging services as shown in the Figure 5.2 and on-premises systems, these arrangements become manageable. Likewise, when libraries move from one library automation system to another, they can plan and implement a one-time data transfer. However, today's requirements are much more complex. Ideally, libraries would like to view several bibliographic databases as constituting an online virtual digital library in real time. Such a structure would allow libraries to exchange records on a random, ad-hoc basis, and would enable searchers to search one or more external digital libraries as if they were all one single resource. Only recently has it become possible to maintain common client-server relationships between information systems. The most advanced standard is z39.50, which is being implemented for online catalogs[37] and other bibliographic search systems.

Before to start cataloging in configuration part, automation should:

- Identify which MARC format will be used in library system, in our case it was MARC21 last format;
- Testing of chosen bibliographic type and data transferring can be possible;
- Find list of authority metadata list, as example we showed before analysis;
- Identify A-Z databases, user sources in web page;
- Prepare XML files for other formats;
- Set up the WorldCat or Z39.50 or other platforms to search for cataloging (and acquisitions)

As a result, we can observe that the staff of the librarian should be well trained in the general management and maintenance of the automated system. They are trained by the software vendor and must constantly update and give their wishes in the functionalities, according to the changing needs of the users and the latest technologies. In this case, librarians are trained and they themselves are trained on the automated library system (mainly circulation, new format explanations, OPAC search, book search, etc.). These skill development programs can be arranged during library periods. Special time slots should be scheduled

for employees.[38] The important thing is that other librarians also need to be at the same pace to develop the system and use the new format.

6. Conclusion and further work

6.1 Conclusion

This work is an answer to the question of how to improve the efficiency of library systems in educational and public organizations of the CIS to improve imaginary metadata for other cataloging modules, specially developed software will allow other librarians to automate their internal operations. In part of the solution, we have defined authority tags, how to use files of different formats in each other.

We have prepared a prototype of a cataloging page where a user can submit an XML file for use by other library systems, preview it for experts, print the call number and analyze how to get data from WorldCat, etc. All of these functions have been tested and have a good impact on performance.

First, it helped centralize and internationalize our CIS systems. When analyzing the creation of the Library System, some criteria were found in the development of the corresponding software:

1. Cataloging formats must be identified, it can be any versions or types of MARC;

2. Library administrators should be open to providing their metadata about materials, but CIS library systems are open source.

3. To develop basic modules, it is necessary to analyze 5 basic modules: such as OPAC, Acquisition, Cataloging, Service Desk and Reports.

4. The web software should allow the library to create its own rules in the admin module.

6.2 Further work

The main actual future tasks are:

1. Testing the transferring of metadata between formats in CIS library systems for kazakh or russian materials.

2. Compare the effectiveness of get data from other international cataloging open source platforms, find time difference between original and ready cataloging.

3. Analyze the how many CIS organizations are ready for collaborations.

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