



## Capstone Experience: Multimedia Request Automation

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### Mr. Raul Soto Jr

# **A Capstone Experience: NULS Multimedia Request Automation**

## **ABSTRACT**

*Libraries at universities support their faculty, students and staff in their academic and research endeavors by providing easy access to a vast collection of printed and multimedia materials. The university library uses, in general, a library management system (LMS) that provides easy access to a countless array of resources both onsite as well as online users. At our university the library staff, in addition to standard library resources, also maintains a large collection of multimedia equipment and provides related services to library users. The multimedia services include recording of lectures, interviews, events, etc. under different settings as well as use of equipment and human resources. In current setup a request can be submitted, processed and managed manually by the library staff, whereas users demand a faster and a more efficient way of submitting multimedia requests as it would produce faster turnaround times for scheduled projects. Therefore, a group of students was assigned the task, as their capstone project, to evaluate, develop and deploy an automated system to handle the flood of multimedia requests being received by library staff. In this paper we report a capstone experience gained by undergraduate students. The students were required to design and implement a web based system for not only handling the requisitions for multimedia equipment and/or services but also the entire approval process until the multimedia project is complete. This paper reports the experience students had and shows utilization of the knowledge that they gained from programming, Human Computer Interaction, System Analysis and Design and other similar courses during their program.*

## **INTRODUCTION**

Founded in 1971, National University (NU) is an independent, nonprofit institution of higher education. Since its establishment, the university has dedicated itself to providing educational opportunities to a diverse population of working, adult learners. NU, the second largest private non-profit university in California, has over 23,000 mainly non-traditional students: students with average age over 30 and heavily weighted with students from traditionally underrepresented groups, including women and minorities. Most students, whether at the undergraduate or graduate level, are reentering an academic environment after having been out in the working world for some time. Like any other university, NU is always considered a center of excellence with main objectives to provide education, conduct research, in addition to providing public service to its constituents [1]. Similarly, National University Library System (NULS) supports all educational and research activities of students, faculty, and staff of all of the affiliates of the National University System. Our library uses a Library Management System (LMS) that provides easy access to a countless array of resources both onsite as well as online to all of its authorized users. In addition, library staff also maintains a large collection of multimedia equipment and provides related services to all library users. The multimedia services include recording of lectures, interviews, events, etc. under different settings as well as use of equipment and human resources. The Library's knowledgeable and dedicated staff is always available and ready to help achieve educational and research

needs of all of its users [3]. However, currently NULS has been using a manual, paper-based process for handling these requests, which absorbs a lot of time and resources. By offering faculty members and other users a means of requesting any of these services through an online portal, NULS can reduce the time it takes to process such requests, resulting in a quicker turnaround time for the requestor. This automation would also provide the library staff with an efficient way of controlling and managing requests, eliminating a need to archive files in file systems (e.g. file cabinets, shelving) within the facility, resulting in a more efficient use of facility space as well as a faster information retrieval rate. Library management contacted our school for help in developing such system.

## **MOTIVATION and LIMITATIONS**

NULS for managing its multimedia resources, be it multimedia equipment or its related services, currently is using an outdated process and system. A request, with existing manual system can be submitted, processed and managed by a library staff. The entire approval process for a request is also handled manually on a paper. This whole process takes a lot of time to complete. In addition, there are few other problems with the existing manual system such as, misplaced requests, delays in responding and processing a request, manual filing and auditing, staff and space constraints and scheduling issues, to name a few. The higher influx of multimedia requests and a demand for quicker response has forced staff and management at NULS to look at a faster and more efficient way of managing multimedia requests as it produces faster turnaround times for scheduled projects as opposed to using its current a mundane, non-automated paper process to handle multimedia request.

In their continued effort to support their constituents our library was seeking a way to manage its multimedia equipment and related service requests in a more efficient and effective manner. The management of NULS then approached our school seeking our help to address these concerns and propose an automated solution to their existing manual process. A group of students was then assigned the task, as their capstone project, to conduct a study to investigate the possibility of automation of multimedia services for our university library. The reason for getting students involved in this project was to give them a real life experience of designing, developing and implementing a new system. This also gave them opportunity to apply all of the knowledge and skills that they gather during the program. This study explained various problems currently faced by library management and the staff and proposed automation of the entire process. The study suggested to seek an online portal to allow faculty members, students and staff to fill out multimedia requests over the web to reduce submission and processing time; this portal can also be used as a means to aid in the processing and management of these requests, this would eliminate the need for manual filing systems which will cause time, space, cost and other vital organizational resources. The same group of students was then asked to continue with the project to develop NULS Multi Media Request System (MMRS) to allow faculty members and other users; both onsite and remote, to electronically fill out a request form and submit it for processing. They were required to design, and implement a

prototype of MMRS so that NULS management and staff can totally comprehend the capabilities and functionalities of the system before going for a full implementation and integration of this system. This project also constrained the system design because of the restriction to use current hardware and software technologies available to library. The library currently maintains a high speed internet connection, web server, and the latest software needed to host MMRS application. The system also needed to be integrated with the existing library management system (LMS) to ensure that faculty members and other users can easily access it.

## **AUTOMATION**

Automation of library can easily be identified as the use of latest computer and other related technologies to perform traditional as well specific library activities. The process of library automation involves designing and creating a database for storage as well as for information retrieval. Library automation can be justified by stating that automation can; [2] increase the processing efficiency than a manual system, realize financial saving or continuing cost in certain cases where cost saving has been realized through automation, improve library services, make library administration and management efficient, avoid duplication of the work and facilitate resource sharing and increase technical processing efficiency over a manual system. It is therefore, expected that this approach overall will reduce the work of library management and staff.

It is a general understanding that automation of various library operation and services is essential in today's world. The automation is essential for efficient functioning of the library as well as saving time for its users. However, NULS has not at present implemented an automated system to handle some of its services such as, the multimedia requests and management, due to the lack of resources. They maintain a small information technology (IT) group; the current team does not have the man power to design, build, and implement the proposed system. To outsource this work out to an external service provider to work with the library development staff to meet its needs within the determined time is not feasible because of budget constraints. While the library system maintains a web site with multimedia product lists and descriptions, it does not currently allow for requests to be made online. In addition it also does not allow management, maintenance, processing and approval of such requests.

The new system will therefore provide a more efficient and effective way of handling multimedia requests, which will increase productivity and customer satisfaction. Hence we in this paper design develop and deploy an automated system, MMRS, to handle the flood of multimedia requests being received by library. However, it is also worth mentioning that every institution faces problems whenever new automated services are introduced and implemented. Automation therefore is done at various levels, with the main objective of improving user satisfaction and freeing the professional staff from the drudgery of routine jobs. Hence, it is necessary to ensure that the automated services are up to the satisfaction of the users and staff. For over 20 years Alexandria [5] has been automating school, public, college, church and special libraries. It is their belief that a

happy, strong, and loyal customer base is through listening, understanding, and adding capabilities to fit their needs.

## SYSTEM DESIGN

The NULS is therefore considering a move to develop and deploy an online portal to handle its multimedia equipment and service requests. This system would provide the library staff with an automated way of controlling and managing requests, eliminating a need to archive files in file systems (e.g. file cabinets, shelving) within the facility, resulting in a more efficient use of facility space as well as a faster information retrieval rate. This new system, MMRS, will allow users to submit request for multimedia related services and equipment through an online portal, eliminating the current manual process that requires the requestor to come in and fill out a hard copy form for routing/approval. It will also eliminate the need for physical file systems (e.g. file cabinets, shelving) to store requests within the facility as files will be stored in a database for rapid routing and retrieval.

In this project we analyzed various problems faced by management and staff using the current manual system. The group of students assigned the task of automation of an important functionality of our university library. They used all of the knowledge and skills that they acquired going through various courses in the program and their experience in completing this project. The figure #1 introduces each phase in the iterative model as well as what was accomplished for that phase. This is the model that was used for the development of the new system. This paper covers not only all the SDLC phases that students used to during the process of automation but also discusses various problems faced and the lessons that were learned.

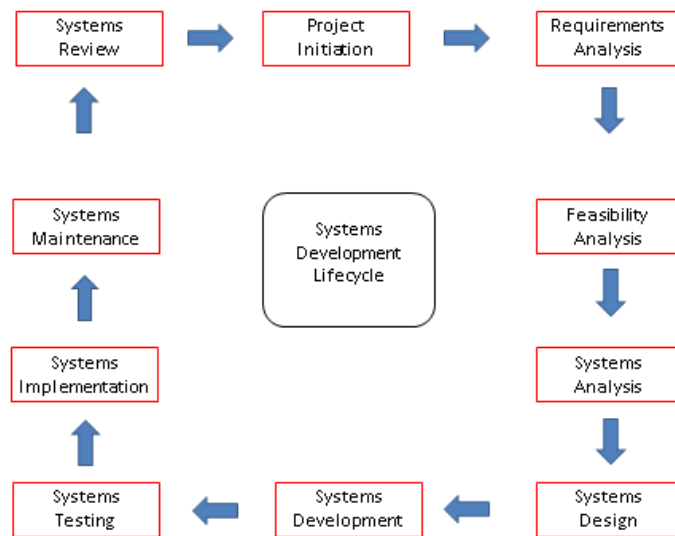


Figure 1: Systems Development Lifecycle (SDLC)

For designing a new system a detailed system requirement analysis was conducted as a first step. This stage dealt with how the requirements of the new system were carried out (how the logical model was implemented as a physical system). The stringent design criteria to follow was the one that came closest to the design brief, with the most cost effective use of current equipment and personnel. The design stage consisted of two phases: production of outline designs based on requirements specification with input from users and the detailed designs produced from the selected design. We developed number of design options and tested them against the requirements specification.

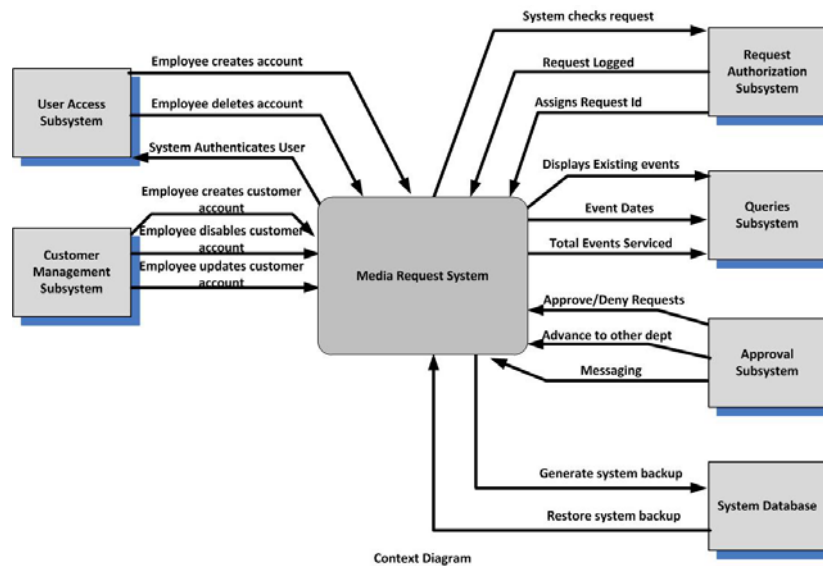


Figure 2: Context Diagram

The figure #2 shows a context diagram that provides a high level representation of all of the subsystems and their primary functions. This diagram further evolved to include details of any additional subsystems needed to meet the agreed upon requirements. The implementation of this type of software capability is required for the NULS to move toward offering an online portal. Since users demand a faster, more efficient way of submitting multimedia requests as it produces faster turnaround times for scheduled projects. While the library system maintains a web site with multimedia product lists and descriptions, it does not currently allow for requests to be made online. The new application had to be linked with the current NU web site to ensure that current users of NULS website can easily access it.

## PROTOTYPE

A prototype of NULS Multi Media Request System (MMRS) that has been developed is presented in the following paragraphs. This web based services has opened a set of new options for its users. It is designed to provide online reservation, rules for availability of the multimedia equipment and services and regulations of using multimedia equipment using the same portal. Users can also check the status of borrowed equipment. The system can also generate different kinds of reports like user's status, acquisition report,

multimedia equipment wise report etc. It also gives popup messages i.e whether the user has reached the limit of borrowing, when the multimedia equipment will be returned, etc. Once a users places request through the website then the NULS management and staff enjoys using this user friendly front end to approve or deny any of these requests, as well as manage all of the submitted requests. Following paragraphs present explanation of some of the important screens of the prototype.

Figure #3 shows the “New user registration” page with a list of field for the user information. All users of the NULS MMRS will be required to create an account to access the system; accounts will have different access levels which will limit users (other than system administrators) to a specific set of privileges; this will ensure that the integrity of the system is not compromised. As users input their profile information, the back-end database is checked for any duplicate entries. When a user is able to create his/her account, they can also later update their user profile, and disable their user account. This provides a user with some level of control over their account and profile.

The image shows a web form for user registration. It is organized into three main sections, each with a blue header bar. The first section, 'Login (all fields are required)', contains three text input fields for 'Username', 'Password', and 'Confirm Password', followed by a dropdown menu for 'Default Homepage' with 'My Dashboard' selected. The second section, 'Profile (all fields are required)', contains four text input fields for 'First Name', 'Last Name', and 'Email', and a dropdown menu for 'Timezone' with 'America/Los\_Angeles' selected. The third section, 'Additional Information (optional)', contains three text input fields for 'Phone', 'Organization', and 'Position'. At the bottom left of the form is a green 'Register' button with a checkmark icon.

Figure 3: New User Registration

Figure #4 shows the “User login page”. If user enters incorrect information a pop message will display the error. In case user forgets their userid/password “Forgot password” option can be used, that sends an email using the email address in the user profile as shown in figure #5. However, user can also use “Remember me” option to avoid any issues with future login sessions.

Figure #6 shows the “Notification page” that will send an email notifications to the user regarding the reservations made, existing reservations that are updated or deleted and if an existing reservation is approved or denied. However, user can select not to be notified for any or all of these situations.

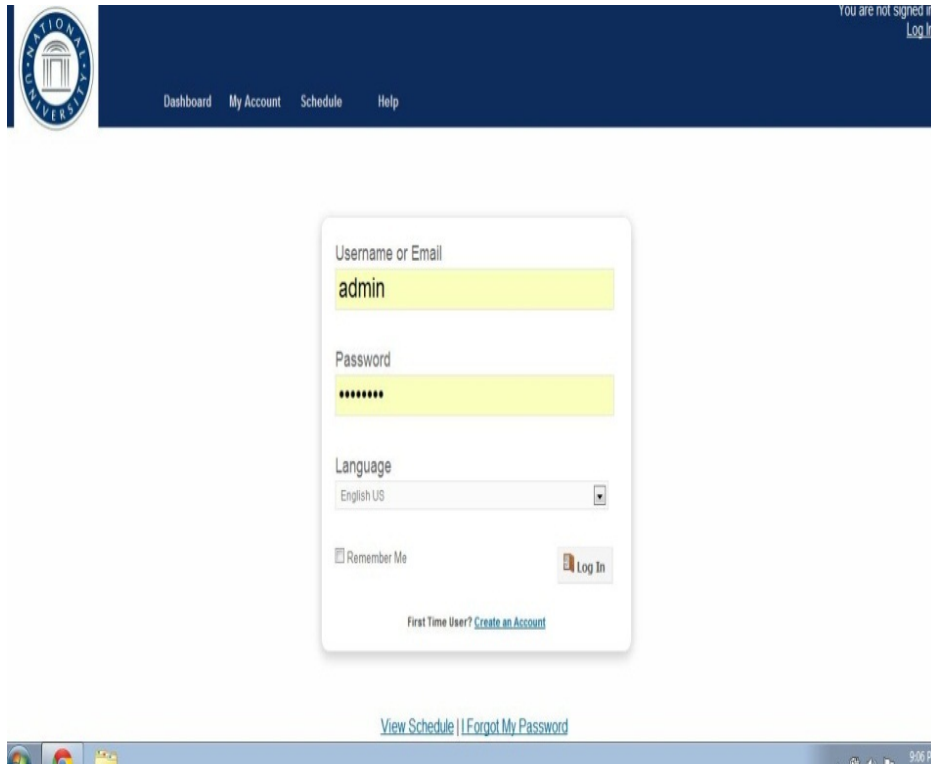


Figure 4: LogIN Page



Figure 5: Forgot Password Page

Figure #7 shows how a library user at the approval level can review users and their respective request information. Furthermore, they can approve or deny the request and forward them on to the next level for approval, in our case that would be the provost. The provost has the ability to forward the request to the communications department for additional information. The reviewer at the communication department can then approve



or deny request forwarded from the provost level user due to non availability of resources because of some unforeseen circumstances.

Notification Preferences

When I create a reservation or a reservation is created on my behalf  Send me an email  
 Do not notify me

When I update a reservation or a reservation is updated on my behalf  Send me an email  
 Do not notify me

When I delete a reservation or a reservation is deleted on my behalf  Send me an email  
 Do not notify me

When my pending reservation is approved  Send me an email  
 Do not notify me

Figure 6: Notification Page

Dashboard
My Account
Schedule
Application Management
Help

### Reservations

**Filter**

Between:  -  User:  Schedule:  Resource:  Status:  Reference Number:

[Export to CSV](#)

User	Resource	Begin	End	Created	Last Modified	Reference Number	Delete	Approve
Jessica Bruce	Interview (2 Camera)	05/17/2012 8:00 PM	05/17/2012 8:30 PM	05/16/2012 03:57:50	05/19/2012 00:52:05	4fc2b083a2f6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Jessica Bruce	Interview (2 Camera)	05/18/2012 6:00 PM	05/18/2012 6:30 PM	05/16/2012 03:58:24	05/16/2012 04:03:15	4fc2b0036d036	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Melissa Mitchell	Interview (2 Camera)	05/18/2012 9:30 PM	05/18/2012 10:30 PM	05/16/2012 03:59:52	05/19/2012 00:52:28	4fc2b0399e08a	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Melissa Mitchell	Interview(1 Camera)	05/19/2012 6:00 PM	05/19/2012 6:30 PM	05/16/2012 04:00:58	05/16/2012 04:03:20	4fc2b04aa843	<input checked="" type="checkbox"/>	<input type="checkbox"/>
User User	Interview (2 Camera)	05/19/2012 7:00 PM	05/19/2012 7:30 PM	05/19/2012 16:12:41	05/19/2012 18:54:06	4fc7b989e5c00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Melissa Mitchell	Speech/Seminar	05/19/2012 7:30 PM	05/19/2012 8:00 PM	05/16/2012 04:01:43	05/19/2012 00:56:55	4fc2b77679902	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Jessica Bruce	Speech/Seminar	05/19/2012 11:00 PM	05/20/2012 12:00 AM	05/16/2012 03:58:46	05/16/2012 04:03:17	4fc2b05584fd	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Melissa Mitchell	Interview (2 Camera)	05/20/2012 12:00 AM	05/20/2012 12:30 AM	05/16/2012 04:00:33		4fc2b03166a5c	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Jessica Bruce	Interview (2 Camera)	05/20/2012 12:30 AM	05/20/2012 1:00 AM	05/16/2012 03:59:13	05/16/2012 04:07:55	4fc2b0e114415	<input checked="" type="checkbox"/>	<input type="checkbox"/>
User User	Interview(1 Camera)	05/20/2012 1:00 AM	05/20/2012 1:30 AM	05/19/2012 18:12:17		4fc7b9851137ec	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User User	Speech/Seminar	05/20/2012 2:00 AM	05/20/2012 8:00 AM	05/19/2012 18:12:27		4fc7b85954e66	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Rows: 1 - 11 (11) View All  
Page 1

Figure 7: Approval Page

The users at any of the reviewer's level can also check the status of the existing requests that are pending. The users are responsible for submitting a request for multimedia equipment and/or service to higher levels for approval. A user could submit a request for themselves or another user who does not have access to this system. The request can be approved or denied based on the availability and capability.. When user wants to submit a

request a calendar, as shown in figure #8, pops up with all the dates that are available and are not blocked by either communication department or these are the dates when multimedia equipment and/or services will not be available due to weekends or holiday break. Figure #9 shows various options that are available to a user during a reservation session.

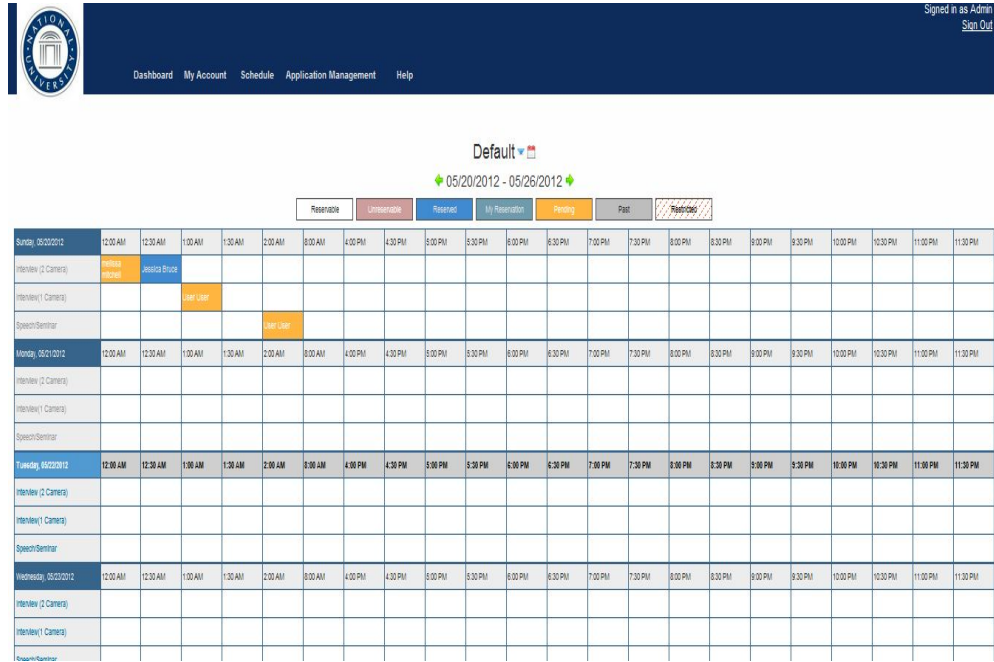


Figure 8: Calendar page

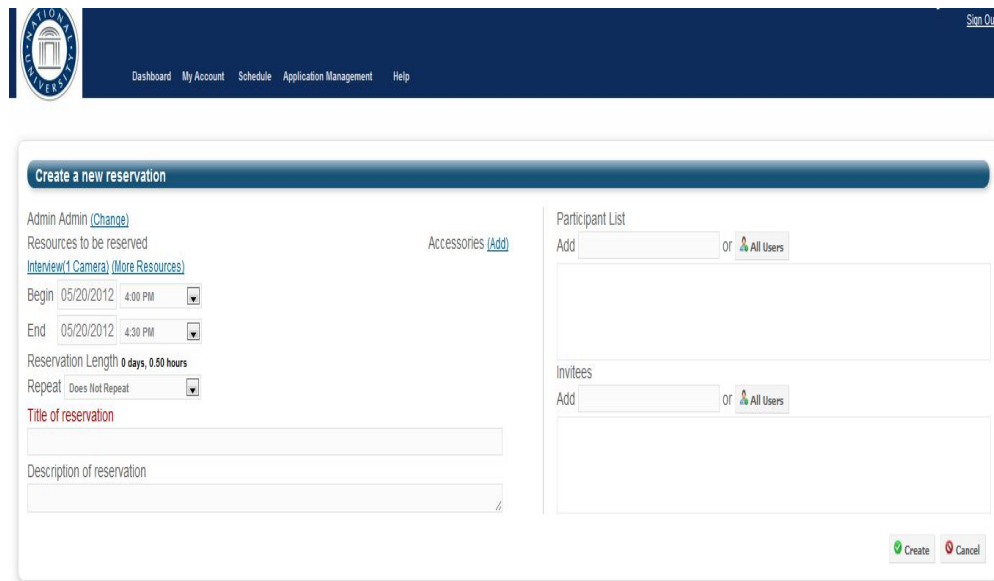


Figure 9: Reservation Page

## Media Request System

### Registration

Registration is required in order to use phpScheduleIt if you administrator has enabled it. After your account has been registered you will be able to log in and access any resources that you have permission to.

### Booking

Under the Schedule menu item you will find the Booking item. This will show you the available, reserved and blocked slots on the schedule and allow you to book resources that you have permission to.

### Express

On the Bookings page, find the resource, date and time you'd like to book. Clicking on the time slot will allow you change the details of the reservation. Clicking the Create button will check a reference number to use for reservation follow-up.

Any changes made to a reservation will not take effect until you save the reservation.

Only Application Administrators can create reservations in the past.

### Multiple Resources

You can book all resources that you have permission as part of a single reservation. To add more resources to your reservation, click the More Resources link, displayed next to the name resources by selecting them and clicking the Done button.

To remove additional resources from your reservation, click the More Resources link, deselect the resources you want to remove, and click the Done button.

Additional resources will be subject to the same rules as primary resources. For example, this means that if you attempt to create a 2 hour reservation with Resource 1, which has a maximum of 1 hour, your reservation will be denied.

You can view the configuration details of a resource by hovering over the resource name.

### Recurring Dates

A reservation can be configured to recur a number of different ways. For all repeat options the Until date is inclusive.

The repeat options allow for flexible recurrence possibilities. For example: Repeat Daily every 2 days will create a reservation every other day for your specified time. Repeat Weekly, ever those days every week at your specified time. If you were creating a reservation on 2011-01-15, repeating Monthly, every 3 months on the day of month would create a reservation every same example with the day of week selected would repeat every third month on the third Saturday of that month.


### Additional Participants

You can either Add Participants or Invite Others when booking a reservation. Adding someone will include them on the reservation and will not send an invitation. The added user will receive to Accept or Decline the invitation. Accepting an invitation adds the user to the participants list. Declining an invitation removes the user from the invitees list.

The total number of participants is limited by the resource's participant capacity.

Figure 10: Help Page

Figure #10 shows a help page for users of the system. It explains in detail different terms used within the MMRs system and also explains how to handle various situations that may be encountered during the system use.



[Dashboard](#)
[My Account](#)
[Schedule](#)
[Application Management](#)
[Help](#)
  
  

### Users

Find User:  [All Users](#)

Name	Username	Email	Phone	Organization	Position	Created	Last Login	Timezone	Language	Status	Permissions	Reservations	Password	Delete
User User	user	user@example.com		XYZ Org Inc.		2012-04-24 18:30:51 UTC	2008-09-16 01:59:00 UTC	America/Chicago	en_us	Active	Edit	Search	Reset	X
Admin Admin	admin	admin@example.com		ABC Org Inc.		2012-04-24 18:30:51 UTC	2010-03-26 12:44:00 UTC	Europe/Helsinki	en_us	Active	Edit	Search	Reset	X
Melissa Miltonel	melissa	mel@rail.com	2323232323	rrrrr inc	CEO	2012-05-01 04:40:53 UTC		America/Los_Angeles	en_us	Active	Edit	Search	Reset	X
John Smith	john_smith	john_smith@cu.edu	5551231234	Science Department	Lead Faculty	2012-05-05 19:32:15 UTC		America/Los_Angeles	en_us	Active	Edit	Search	Reset	X
Jane Smith	jane_smith	jane_smith@cu.edu				2012-05-05 19:33:40 UTC		America/Chicago	en_us	Active	Edit	Search	Reset	X
Will Holloway	will_holloway	will_holloway@cu.edu				2012-05-05 19:34:10 UTC		America/Chicago	en_us	Active	Edit	Search	Reset	X
Jessica Bruce	jessica	jessica@gmail.com				2012-05-16 00:50:26 UTC		America/Los_Angeles	en_us	Active	Edit	Search	Reset	X
April April	April	april@gmail.com				2012-05-16 01:08:19 UTC		America/Chicago	en_us	Active	Edit	Search	Reset	X
George Bush	George	george@gmail.com				2012-05-16 01:08:38 UTC		America/Chicago	en_us	Active	Edit	Search	Reset	X
Chris Hansen	Chris	chris@gmail.com				2012-05-16 01:08:57 UTC		America/Chicago	en_us	Inactive	Edit	Search	Reset	X

Rows: 1 - 10 (10) [View All](#)  
Page: 1

#### Add User

Username  Email  First Name  Last Name

Timezone  Password

Figure 11: User management page

Figures #11 and 12 are management pages under administration of users and resources that are available. An administrator can add a new user or modify an existing user. The allocation of resources is also managed through page as shown in figure #12.

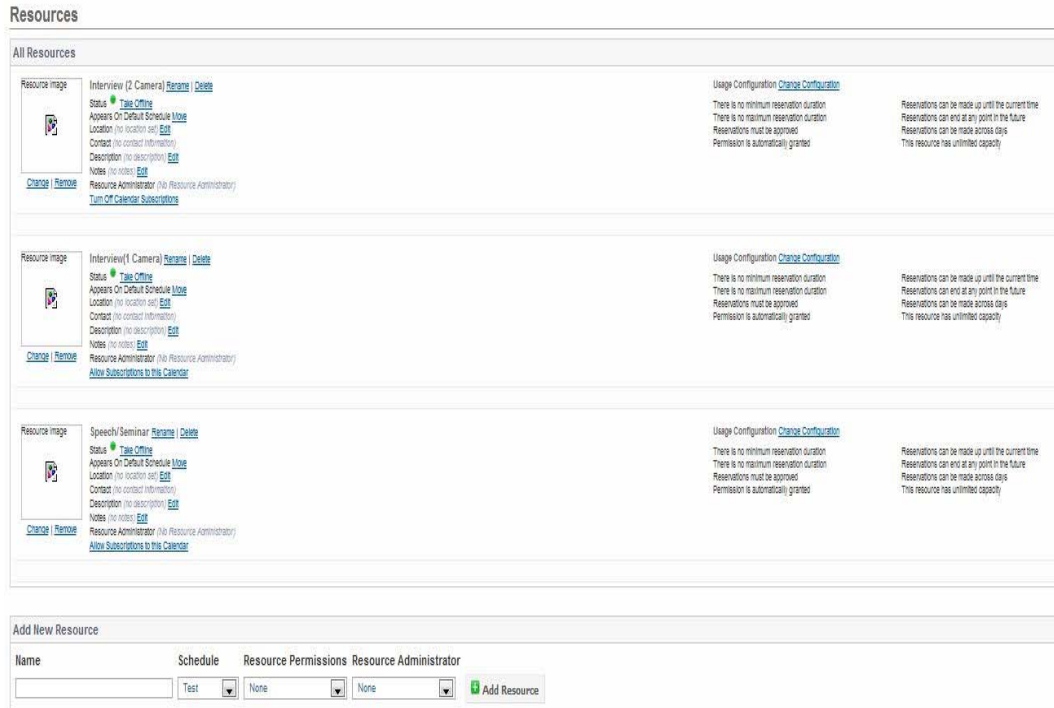


Figure 12: Resource page

## CONCLUSION AND FUTURE WORK

NULS currently has a manual paper process of handling multimedia requests for equipment and services. These requests are increasing substantially and therefore needed to be converted into a system that is available to both onsite and remote users. Financial constraints and shortage of IT personnel resulted in use of graduating student as a viable option. The management of the university library ensured that the library staff and students work in harmony, to ensure that the automation projects succeed. Automation of the multimedia request and services and management, presented in this paper, has increased the effectiveness of the multimedia services that are offered. The use of NULS web based Multimedia Request System (MMRS) for collection of service request through improved information retrieval would ultimately lead to increased user satisfaction. The NULS MMRS also provides library staff with a more effective/efficient way of controlling and maintaining multimedia requests; with this system, library staff will be able to eliminate the manual paper process for request submission which will reduce waste (e.g. paper and toner) all while reducing the cost and time to create and process them. The lessons learned from the NULS MMRS project are categorized as Risk management: Ensure that all team members have a detailed understanding of the project; have an effective use of email and phone communication when meeting time is limited.

Quality management: Get a clear understanding of the client's initial requirements and document them. This will avoid any conflicts with customer satisfaction and delivery. Communications management: Proceed with systems development even if client is unavailable to review and give feedback on progress; the initial requirements should be good enough to do so. This will eliminate major development delays. We have not yet completed a survey of users to establish this and to determine whether there are any software and hardware problems in implementing the automated system.

### Reference:

1. Jayaprakash, M. and Balasubramani, R. (2011). "Status of Automation in University Libraries of Tamilnadu: A Survey". *European Journal of Scientific Research*, 53(1), pp. 17-24.
2. Rajput, P. and Jain, S. (2006). "Status of automation in special library and information centers of Gwalior: A survey". *NCIMDL*, pp. 55-64.
3. <http://library.nu.edu/>
4. Begum, D. (2009). "East West University Library: A Model of Automated Information Services". In the proceedings of International Conference on Academic Libraries (ICAL-2009), Oct. 5-8, Delhi, India.
5. <http://www.goalexandria.com/>
6. Gbadamosi, O. (2011). "Assessing Library Automation and Virtual Library Development in Four Academic Libraries in Oyo", *US-China Education Review* 8(5), p711-717.
7. Yurtay, N., Bicil, Y. and Celebi, S. (2011). "Library Automation Design for Visually Impaired People", *Turkish Online Journal of Educational Technology - TOJET*, 10(4) p255-260.
8. Pace, A. (2009). "21st Century Library Systems", *Journal of Library Administration*. Aug/Sep2009, 49(6), pp. 641-650.
9. Back, G. and Bailey, A. (2010). "Web Services and Widgets for Library Information Systems", 29(2), 29 Issue 2, p76-86.