Centralizing Data Management in Print and Electronic Reserves

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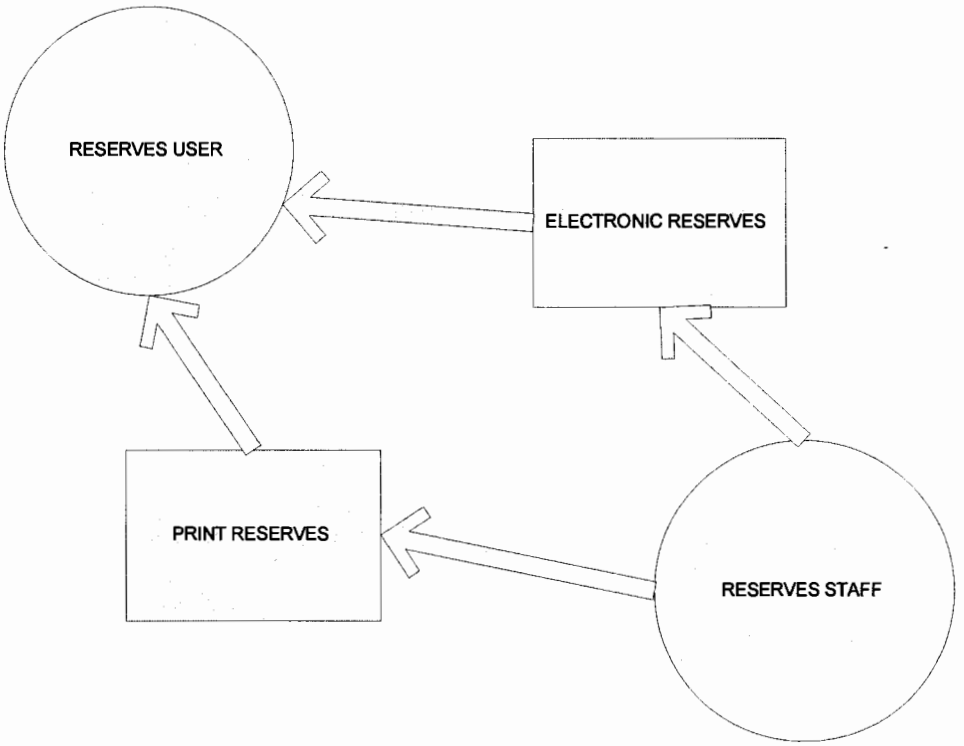
Executive Summary

The R.B. House Undergraduate Library currently uses two systems for maintaining course reserves. Traditional print reserves are assigned a call number and placed on hold in the reserves reading room. The call numbers for print reserves are maintained by DRA's Reserve Room software through a telnet application. Any student or faculty member can log in and follow prompts to access the call numbers for specific classes.

Electronic reserves, however, are handled by a separate system, Docutek's onCampus application. As with DRA, students and faculty can log in to the system, but instead of accessing a list of traditional call numbers, links to PDF versions of the actual documents or permanent links to the documents on the internet are made available. These two systems are also utilized by the libraries reserves staff for entering and storing information. Ultimately, both systems are accessible online via computer, just with distinct and separate software utilities.

Figure 1 – The reserves system simplified



In the original project specifications, the impression was that the DRA and Docutek systems needed merging to simplify processes for both end users and the reserves staff. Research by former reserves research assistant Charles Cobine determined

however, that students and instructors were only minimally affected by utilizing different systems[1]. Reserves staff, however, continue to express a desire for a more efficient process to perform their everyday tasks.

To be more specific, the system for processing reserves added new workflow requirements as new technologies were introduced. This methodology created layer upon layer of procedure, and ultimately resulted in a complex and nebulous system for adding any reserve to courses. Once this was understood, it was determined that a revision of the original problem definition would have to occur.

There are essentially five different systems used at any stage of the reserves process: a database containing a list of instructors; the DRA system; a log book; Docutek; and a shelflist database containing call numbers for the forthcoming semester. Two of the major players on the reserves processing team, Stephanie and Melissa, have to go to almost all these systems at nearly every stage of processing. Streamlining this multitude of procedures and unifying access to data resources were desires identified through the interviews and observations of the reserves staff.

In brief, the proposed solution involves the creation of a single resource authority database for course, instructor, and document data entry and retrieval for the reserves system. This feature alone will save a tremendous amount of time, eliminating the current system redundancy. The resource authority system will:

- Centralize information storage
- Distribute data to relevant external systems (DRA, Docutek)
- Provide universal data entry service
- Automate repetitive tasks
- Improve workflow
- Reduce data redundancy

We believe that streamlining the reserves process and centralizing data storage will improve the accuracy and efficiency of current processes and lay the groundwork for expansion and new features.

Current System

Currently, the UNC Libraries reserve system is made up of DRA, which handles metadata about print reserve materials and Docutek, which stores documents on electronic reserves and metadata for those documents. Stephanie Gilbert, the reserves supervisor, Melissa Salvanish, reserves processor, and a student employee manage information and documents in these autonomous data repositories with the help of several databases that contain additional information relevant to reserve materials. Figure 2 illustrates a simplified view of the interactions that take place between the agents and repositories in this process. For a more detailed view of the information flow that takes place in this process see the flow model in Appendix A.

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[1] Cobine, Charles J. Electronic Reserves Services at UNC-Chapel Hill: Faculty and Student Perceptions of Personal Control Access, and Service Quality. A Master's Paper for the M.S. in L.S degree. July, 2004. 92 pages.

An instructor with a new reserve request initiates the reserves activity by turning a request form in to the UL circulation desk. Circulation Desk Staff then passes the request on to Stephanie who confirms the accuracy and completeness of the request. Stephanie first assesses which kind of request has been submitted: a new request, a renewal, or a request to take materials off of reserve. The type of request determines how to proceed. While all request types require interaction with the same systems, the interactions are different depending on the request type.

To verify accuracy and completeness, Stephanie must refer to the Instructor Database for instructor and course information, and DRA to confirm title and author information for each item to be placed on reserve or renewed. If the item is intended for electronic reserve Stephanie must consult Docutek to see whether the item is already in that system and copyright eligibility must be determined[2]. Instructor, course, department, and item information must be entered into the Log Book database for every request and the shelf list database must be consulted to determine whether the materials are already on print reserve.

After Stephanie has determined a request is complete and accurate she passes it on to Melissa, who enters data into the appropriate places. Instructor and course information must be included in DRA's Reserve Room module for print reserves and Docutek for electronic reserves. Reserve Items must be entered into relevant systems (Docutek if electronic, DRA if print) and must also be added to the logbook. If an item is available on print reserves a call number must be retrieved from the Call Number Spreadsheet (a spreadsheet populated with numbers for each semester).

After all of this information is entered into all of the appropriate systems the student employee takes over. He or she scans documents to create PDFs, adds blank PDFs to Docutek as placeholders, and checks again to see if the document is already available in Docutek. If it is not available the student employee uploads the real PDFs to Docutek. The student employee must indicate completion of the process in the Logbook and Instructor DB.

The flow of information and sequence of actions in the current system are repetitive and overly complicated for the entity relationships that the system manages. We expect our recommendation to resolve these problems. For more details on how processing of reserve requests is currently accomplished refer to the flow and sequence models in Appendix A.

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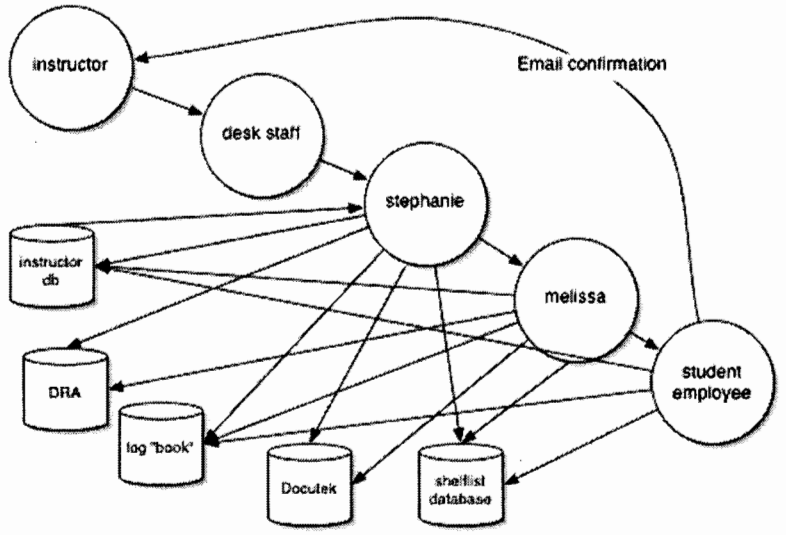
[2] Copyright eligibility is determined in the following fashion: if the material is part of a book, no more than 25% of the book may be available on the library's e-reserve system; if the item is an article from a journal no more than 3 articles from the same issue of a journal may be available on the e-reserve system. Currently these judgments are made manually for each material.

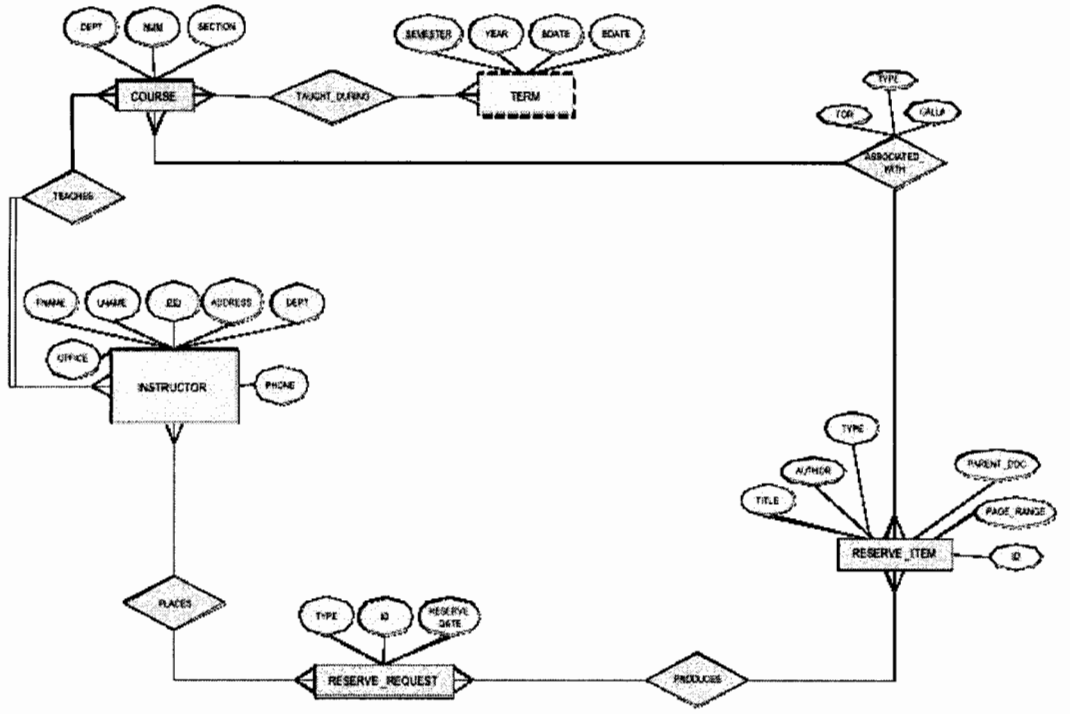
Figure 2 – Distilled Flow Model



Entities and Relationships

Despite the complicated sequence of tasks currently required to maintain the information for the reserves system, the information entities and the relationships between them are simple. An **Instructor** *teaches* a **Course** and *places* a **Reserve Request**. A **Course** is *taught during* a **Term** and has **Reserve Items,** *produced* by a **Reserve Request,** *associated with* it.

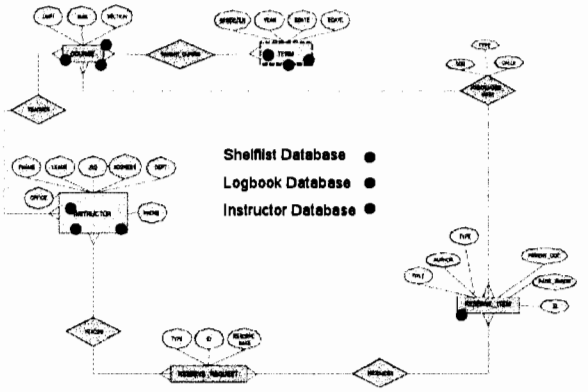
Figure 3



The Entity Relationship Diagram, Figure 3, paints a fairly elegant picture of data entities that make up the reserves system and their relationships to one another. It is important to note, however, that this elegance is not indicative of the current management of reserves information. The current execution of the relationships, as described above, is full of duplication of work and data entry. The extent of these inefficiencies can be seen in the description above and the sequence and flow models included in Appendix A.

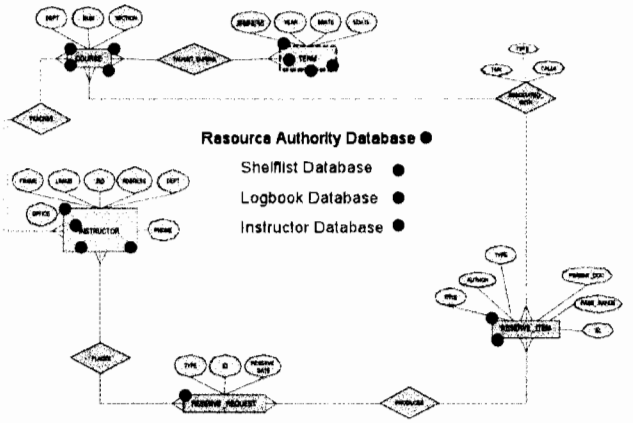
Instructor, course, and reserve item information is stored in the Instructor Database, the Shelflist Database, DRA, and Docutek's E-reserve system. Repetition of storage in this case means repetition of entry, and staff spend a great deal of time checking data against the systems. No one system is used as a primary source in the sense that no one system is the absolute authority.

Figure 4 – ER implementation with current system



By eliminating repetition of data storage we can eliminate the repetition of data entry and provide an authoritative resource for reserve materials. Doing so would simplify the implementation of the ER diagram making it look like figure 5.

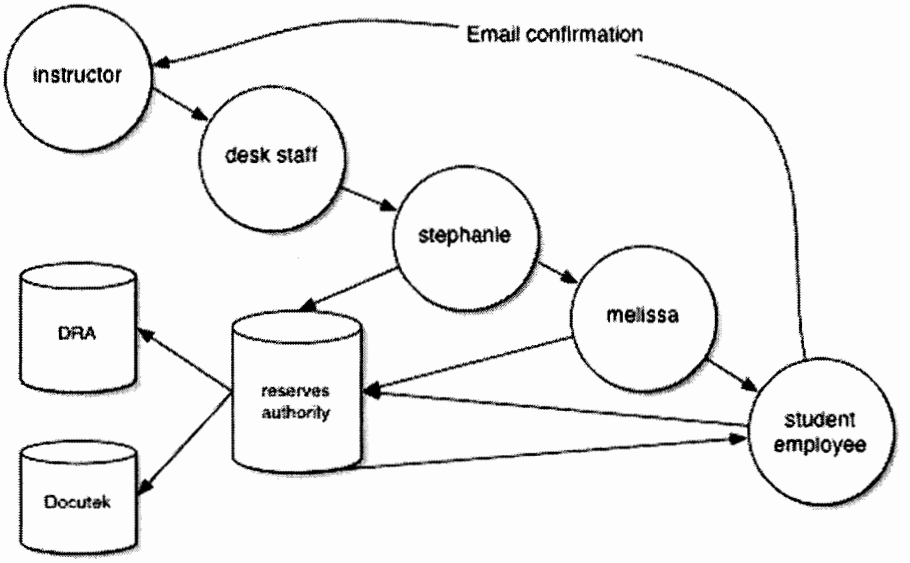
Figure 5 – ER implementation with RADB



The Revised System

By revising and centralizing a data repository we can reduce the number of steps required to process a reserve request and simultaneously improve accuracy and retrieval of appropriate information. A single system can better represent the entities and relationships at work in the reserves system and reduce the workload on staff who are currently managing data and checking data in many different systems.

Figure 6 – Distilled Flow model of revised system



Even using a single data repository, staff will have to carry out many of the tasks listed above, but will be able to do so in a much more streamlined fashion (see Figure 6). Custom interfaces will allow grouping of tasks and centralized interaction. Instead of interacting with several Access databases, DRA and Docutek, reserves staff will interact with the Reserves Authority Database. The RADB will store all of the information necessary for managing both print and electronic reserves and will communicate that data to Docutek directly by making HTTP requests and generating MARC records that can be easily imported into DRA. For more detailed information on the information flow of the new system refer to the Revised Flow Model in Appendix A.

Interfaces to the RADB can be built using any programming language to generate web forms or native client software. Given the libraries' current development practices we recommend using PHP to build web forms for interaction with the database. Forms should be organized by task sets so that reserves staff have everything they need to complete a task in front of them at once.

As well as streamlining and organizing tasks, interfaces to the RADB will provide automation of tasks where possible. For example, assessing copyright eligibility is currently a task performed manually for each item put on e-reserve. The rules for determining copyright eligibility are simple (less than or equal to 25% of a book or no more than 3 articles from a issue of a journal), and determining eligibility can be performed by simple math and database calls. Currently email confirmations are sent to each instructor for each reserve request; upon completion of a reserve request the system can easily auto confirm with an instructor. Other tasks that can be automated include uploading dummy PDFs to Docutek and automatically generating call numbers.

Timeline and Requirements for Implementation

The requirements for the implementation of our proposal are surprisingly minimal, because a large part of the necessary infrastructure is already in place for other

library systems. The Resource Authority Database can be added to an existing MySQL database server, and all of the new web interfaces can be hosted on existing web servers. We believe that this project could be completed over a summer semester, needing just one developer with HTML, PHP and MySQL experience (a fairly common set of competencies among library systems staff). In addition, a reserves librarian would need to be involved in the process, in order to learn the new system. From there, that staff member would be responsible for training the rest of the reserves staff and adjusting the work flow where necessary. The training and work flow adjustment may actually be the most difficult part of this process, and keeping the reserves librarian involved in the development process is crucial to ensuring a practical and usable system is created.

Possible Extensions

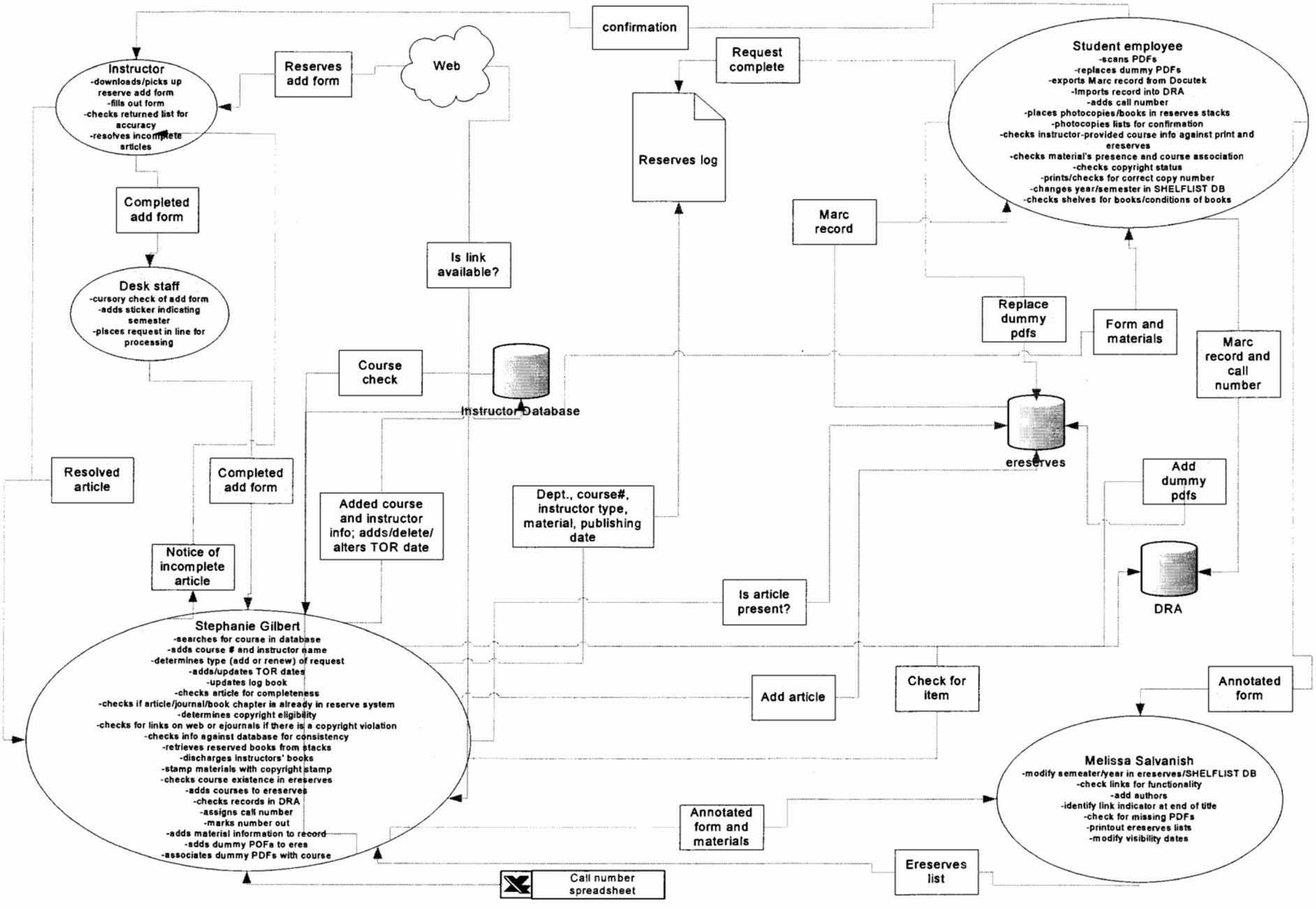
After this proposal has been implemented, the reserves system will be prepared for additional extensions. To begin with, further workflow adjustments would be quite easy to put in place. We feel that this may be useful in further streamlining the reserves process. The ideal time for this would be after this system has been in place for a few months, so that we could see how the actual work system has adjusted.

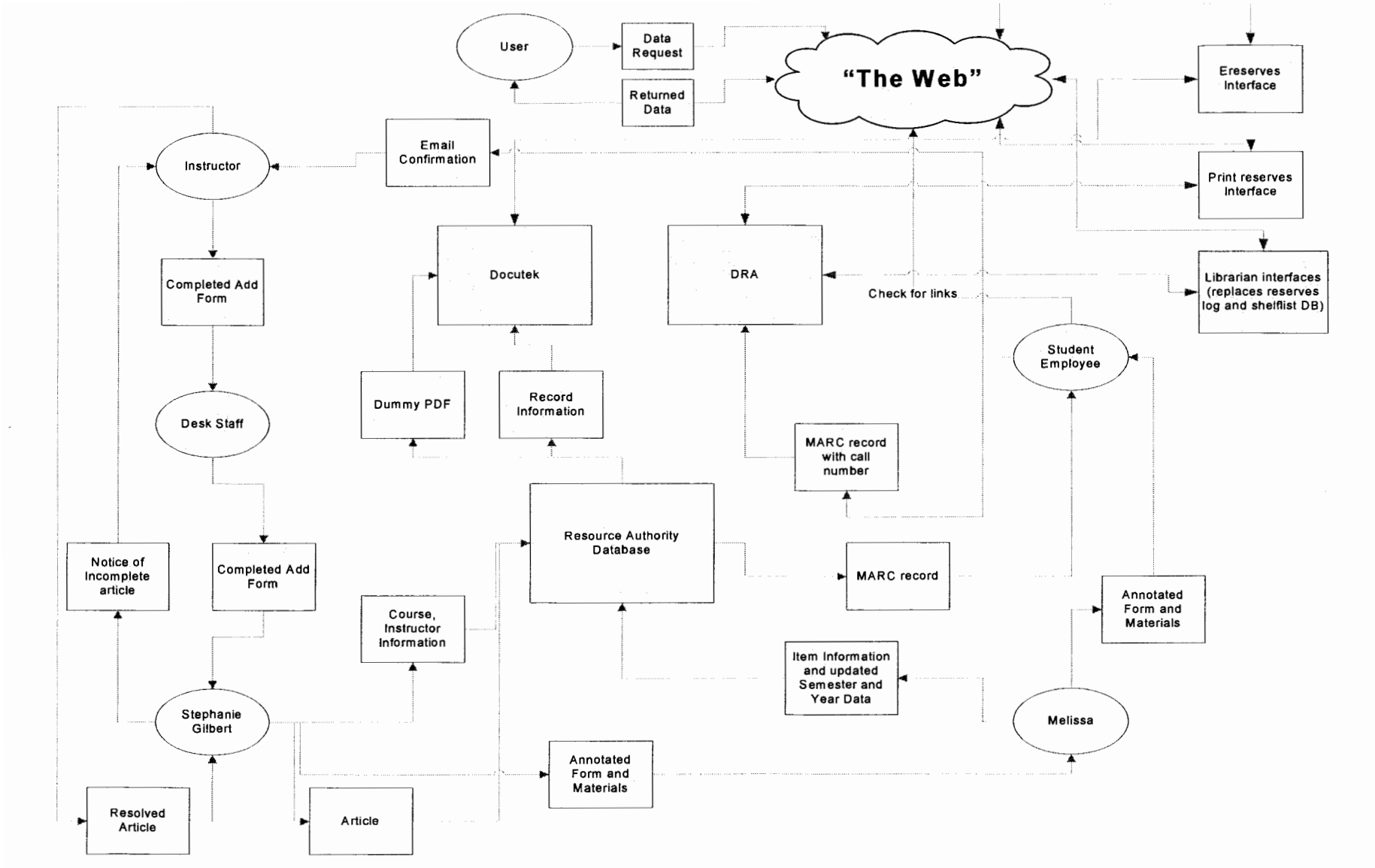
By centralizing the database, and storing it on a MySQL server, some automation of repetitive tasks would be fairly easy to implement. Additionally, automatically maintaining statistics related to the reserves process would have been virtually impossible with the previous system, but would be extremely easy after this proposal is implemented.

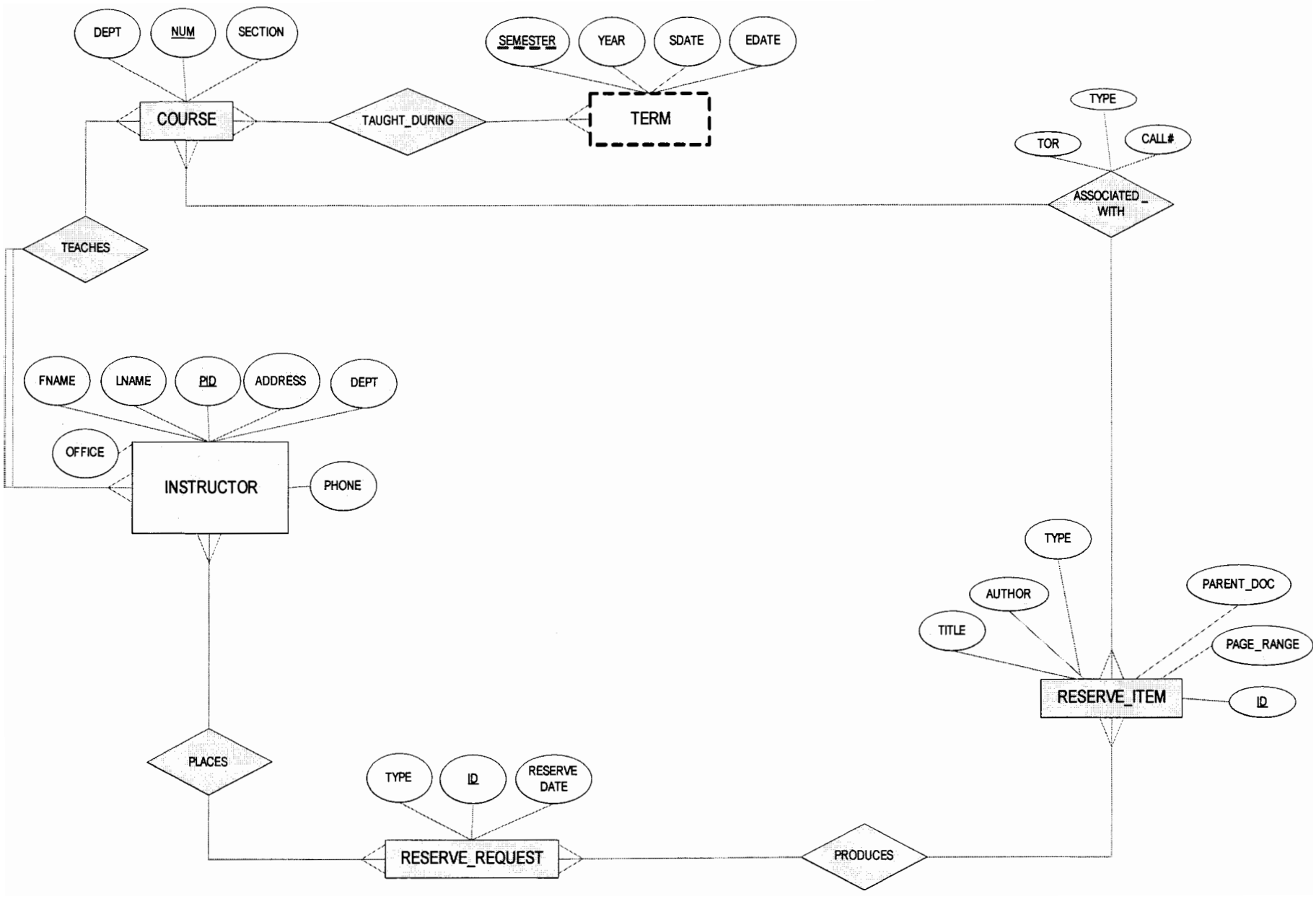
Finally, this new system lays the groundwork for actually unifying the reserves system, as we had originally planned. With a centralized database, it would be fairly simple for a unification suite to draw all of the needed reserves data from a single MySQL server. These kinds of tasks are performed routinely at the library, and this proposal would turn the unification task from a sticky wicket into a practically trivial task.

Appendix A. Additional Models

Flow Diagrams
ER Diagram
Sequence Models
Data Dictionary


confirmation
Instructor
-downloads/picks up reserve add form
-fills out form
-checks returned list for accuracy
-resolves incomplete articles
Reserves add form
Web
Request complete
Student employee
-scans PDFs
-replaces dummy PDFs
-exports Marc record from Docutek
-Imports record into DRA
-adds call number
-places photocopies/books in reserves stacks
-photocopies lists for confirmation
-checks instructor-provided course info against print and ereserves
-checks material's presence and course association
-checks copyright status
-prints/checks for correct copy number
-changes year/semester in SHELFLIST DB
-checks shelves for books/conditions of books
Reserves log
Completed add form
Marc record
Is link available?
Desk staff
-cursory check of add form
-adds sticker indicating semester
-places request in line for processing
Replace dummy pdfs
Form and materials
Marc record and call number
Course check
Instructor Database
ereserves
Resolved article
Completed add form
Added course and instructor info; adds/delete/ alters TOR date
Dept., course#, instructor type, material, publishing date
Add dummy pdfs
Notice of incomplete article
DRA
Is article present?
Stephanie Gilbert
-searches for course in database
-adds course # and instructor name
-determines type (add or renew) of request
-adds/updates TOR dates
-updates log book
-checks article for completeness
-checks if article/journal/book chapter is already in reserve system
-determines copyright eligibility
-checks for links on web or ejournals if there is a copyright violation
-checks info against database for consistency
-retrieves reserved books from stacks
-discharges instructors' books
-stamp materials with copyright stamp
-checks course existence in ereserves
-adds courses to ereserves
-checks records in DRA
-assigns call number
-marks number out
-adds material information to record
-adds dummy PDFs to eres
-associates dummy PDFs with course
Add article
Check for item
Annotated form
Melissa Salvanish
-modify semester/year in ereserves/SHELFLIST DB
-check links for functionality
-add authors
-identify link indicator at end of title
-check for missing PDFs
-printout ereserves lists
-modify visibility dates
Annotated form and materials
Ereserves list
Call number spreadsheet


User
Data Request
Returned Data
"The Web"
Ereserves Interface
Print reserves Interface
Librarian interfaces (replaces reserves log and shelflist DB)
Instructor
Email Confirmation
Completed Add Form
Docutek
DRA
Check for links
Student Employee
Dummy PDF
Record Information
Desk Staff
MARC record with call number
Resource Authority Database
Notice of Incomplete article
Completed Add Form
MARC record
Annotated Form and Materials
Course, Instructor Information
Item Information and updated Semester and Year Data
Stephanie Gilbert
Melissa
Annotated Form and Materials
Resolved Article
Article


DEPT
NUM
SECTION
COURSE
TAUGHT_DURING
SEMESTER
YEAR
SDATE
EDATE
TERM
TYPE
TOR
CALL#
ASSOCIATED_WITH
TEACHES
FNAME
LNAME
PID
ADDRESS
DEPT
OFFICE
INSTRUCTOR
PHONE
TYPE
AUTHOR
PARENT_DOC
TITLE
PAGE_RANGE
RESERVE_ITEM
ID
PLACES
TYPE
ID
RESERVE DATE
RESERVE_REQUEST
PRODUCES

Processing Reserve Request

Instructor wants materials put on reserve for his class

Trigger: Instructor has course reserves to put on reserve

Downloads/picks up add form/renewal Form

Inst. Fills out form

Returns Form and materials inf relevant to UL Circ. Desk in person or via email (in the case of email the inst. Must bring in mat.)

Desk staff receives form. Performs cursory check of form.

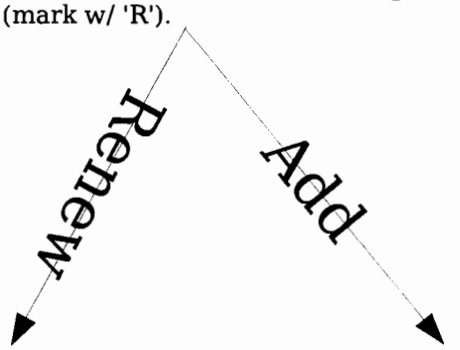
Desk staff places form on Stephanie's desk; adds sticker indicating semester and place in line for processing

Stephanie checks course in Instructor Database; searches by instructor to find course.

If course not found in Inst DB add course number and instructor info to Inst. DB. If course in Inst DB but inactive (Taken off reserve) add TOR date to notes field, delete TOR date in TOR field, and alter last update field.

Staff wants to know what function must be performed with the request.

Determine type of request and annotate form accordingly: Add new materials to an existing course (mark w/ 'A'); Add materials to a new course (mark w/ 'N'); Renew materials for an existing course (mark w/ 'R').



Add Material

Add new materials to E-reserves and Print

Enter Department, course number, instructor type, material, publishing date into LOGBOOK.

If photocopy, check article for completeness. If not complete email instructor to resolve.

Check e-reserves to see whether article/journal/book chapter is already present.

Determine Copyright eligibility: < 25% of a book is available on e-reserves or <3 articles from the same issue of a journal is available on e-reserves

If copyright violation for article check for link on web or in e-journals

Check information on form against info in DB (which one? DRA? Docutek? Some other?)

If material is a book in library collection retrieve from stacks or discharge if brought by instructor.

Enter materials in print and e-reserves systems

Give annotated form and materials to Melissa for processing

Stamp original list materials with copyright stamp

Check e-reserves course page to make sure course exists in e-reserves

If no course add course to e-reserves

Check for materials in E-reserves and records of materials in DRA.

Add material cont.

If not in DRA get call number from CALL NUMBER SPREADSHEET and mark number out as used. Add material information to record.

If not in E-reserves add dummy PDFs to e-res and associate with new info (includes title, copyright, author).

Associate with course and set visibility dates.

Pass form and materials to student employee. If materials not in E-reserves scan to PDF and replace dummy PDFs.

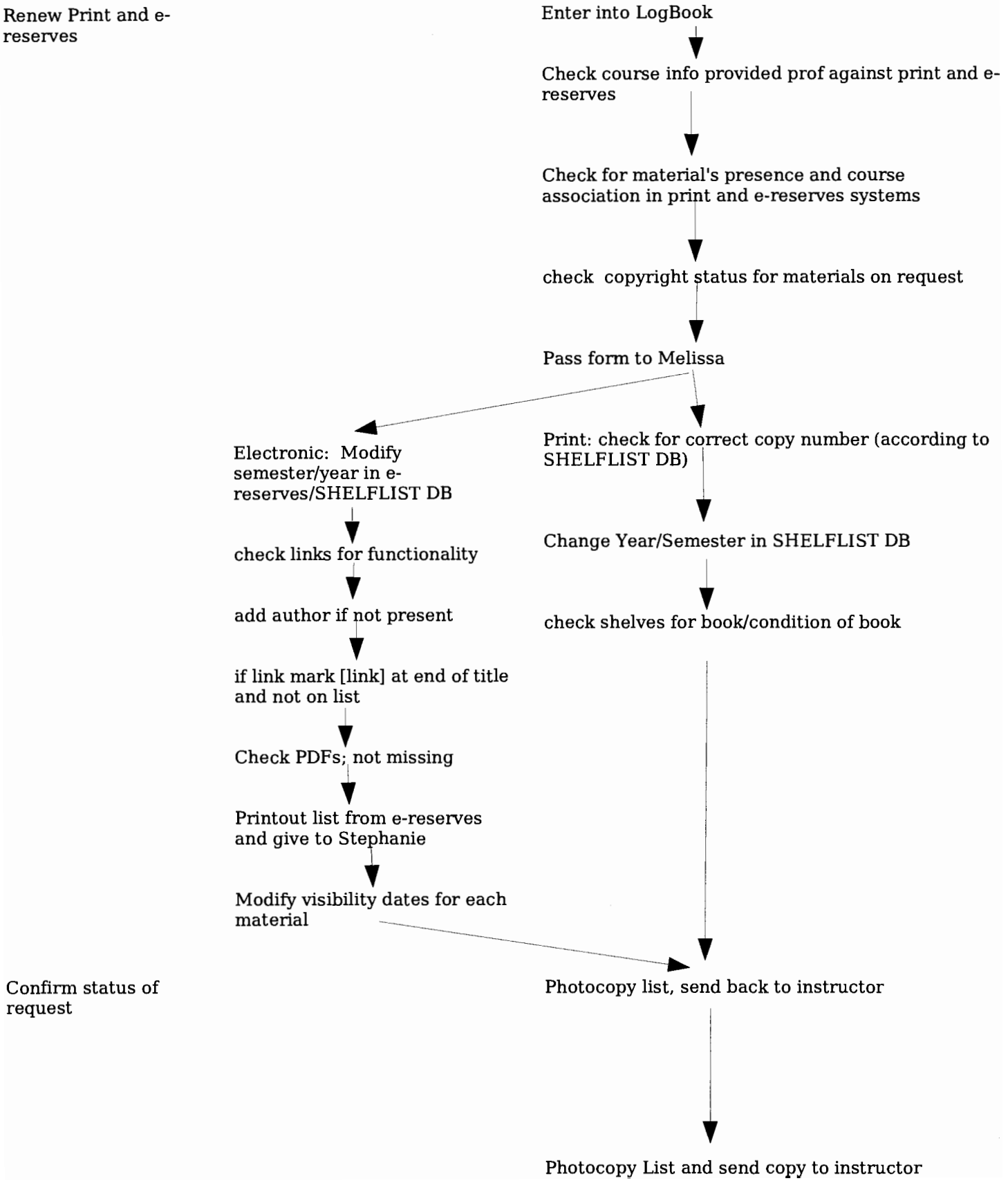
Export Marc record from Docutek. Import into DRA. Add call number.

Place Photocopies/Books in reserves stacks

Photocopy List and send copy to instructor as confirmation.

Mark request complete in log book

Renew Reserve Materials



Data Dictionary

INSTRUCTOR Entity

Attributes:

Name: FNAME
Description: Instructor's First Name
Type: String

Name: LNAME
Description: Instructor's Last Name
Type: String

Name: PID
Description: Instructor's ID number
Type: Integer

Name: PHONE
Description: Instructor's Phone Number
Type: Integer
Constraint: Must be exactly 10 digits

Name: OFFICE
Description:
Type:

Name: ADDRESS
Description:
Type:

Name: DEPT
Description: Instructor's department at the university
Type: String
Constraint: Must be on list of recognized departments

COURSE Entity

Attributes:

Name: DEPT
Description: Department the course is listed under
Type: String
Constraint: Must be on list of recognized departments

Name: NUM
Description: Course Number
Type: Integer

Name: SECTION
Description: Designates different sections of the same course number
Type: Integer

TERM Entity

Attributes:

Name: SEMESTER
Description: The name of a type of Semester
Type: String
Constraint: Must be one of 'Fall', 'Spring' or 'Summer'.

Name: YEAR
Description: A numeric year.
Type: Integer
Constraint: must be exactly four digits.

Name: SDATE
Description: The date of the start of a semester
Type: Integer
Constraint: must be exactly 8 digits, in the form DDMMYYYY

Name: EDATE
Description: The date of the end of a semester
Type: Integer
Constraint: must be exactly 8 digits, in the form DDMMYYYY

RESERVE_ITEM Entity

Attributes:

Name: TITLE
Description: Title of the item
Type: String

Name: AUTHOR
Description: Author of the item
Type: String

Name: TYPE
Description: What kind of item is it (Book, Periodical, DVD, etc).
Type: String
Constraint: Must be a limited list of item types predetermined by a librarian.

Name: PARENT_DOC
Description: Title of item is the reserve item pulled from
Type: String

Name: PAGE_RANGE
Description: Range of pages of reserve item
Type: String
Constraint: formatted as PPP-PPP

Name: ID
Description: arbitrary ID for record
Type: Integer

RESERVE_REQUEST Entity

Attributes:

Name: TYPE
Description: Type of request
Type: String
Constraint: Must be one of list of types of requests ('add', 'renew', 'delete', etc.)

Name: ID
Description: arbitrary ID for record
Type: Integer

Relationships:

Name: TEACHES
Description: Relates INSTRUCTOR and COURSE

Name: TAUGHT_DURING
Description: Relates COURSE and TERM

Name: ASSOCIATED_WITH
Description: Relates COURSE and RESERVE_ITEM
    Attribute: Name: TOR
    Description: Date Taken Off Reserve

Type: Integer
Constraint: Exactly 8 digits, format DDMMYYYY

Name: PRODUCES
Description: Relates RESERVE_ITEM and RESERVE_REQUEST

Name: PLACES
Description: Relates INSTRUCTOR and RESERVE_REQUEST

Appendix B. Reflections

The central idea that we have all learned from this project is the usefulness of taking a disciplined approach to looking at work and information systems. This project is an excellent example of what seemed like an intuitive problem: the separation of the print and electronic reserves. Unfortunately, what you see is not necessarily what you get. If we had proceeded on that assumption alone, we would not have addressed the more crucial problems in the system: internal data consistency and redundancy. Instead, we did interviews, constructed models and analyzed the results as a group. This process led us to the more pressing issue, and a prerequisite to joining the reserves listings with long-term stability.

Furthermore, our analysis was an iterative process, which proved to be valuable. As we interviewed staff, drew up models and analyzed the systems, we were constantly re-evaluating our analyses. This allowed our problem definition and proposal to evolve as more information became available, keeping them relevant over weeks of information gathering and analysis.

For all of us, this was by far the most thorough experience we've had in working with models. We found models to be extremely useful in visualizing a problem, and especially helpful in gaining new perspectives on the root causes of the problem. The versatility of models should not be overestimated, though. We found that models often have a very limited domain in which they are maximally informative, and that converting raw information to a given model always results in some (typically significant) information loss. In other words, it's important not only to know a variety of modeling systems, but also to be able to select the most appropriate one for a particular information-seeking task. We all feel more qualified to make these decisions after finishing this project.

Finally, we learned the value of teamwork. While we have all learned this lesson before, we felt that this group was particularly effective, and we spent some time discussing the reasons for this. We feel that three significant factors played into this: good team member roles, good meetings and effective task division. We each were able to take on roles in the team that complemented our personalities, and TJ was also willing to take on more of a managerial role. This minimized conflicts and improved performance, in our view, because everyone was clear what their part in the project was. We made good use of meetings by only scheduling them when the work required group interaction, and by keeping the meetings relatively short and on-topic. That we were able to beat back the usual meeting-bloat seen in group projects helped us maintain a positive attitude about the project.