

From the Programmer's Point of View: Imagining Creative Solutions to Serve our Patrons

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Programmer's Point of View

A problem is the first phase of development

Given enough time/resources/support any
(computer) problem can be solved

What this talk is not

- Not a call for librarians to stop being librarians
- Not a call for everyone to become a programmer
- Not a statement about the future of libraries

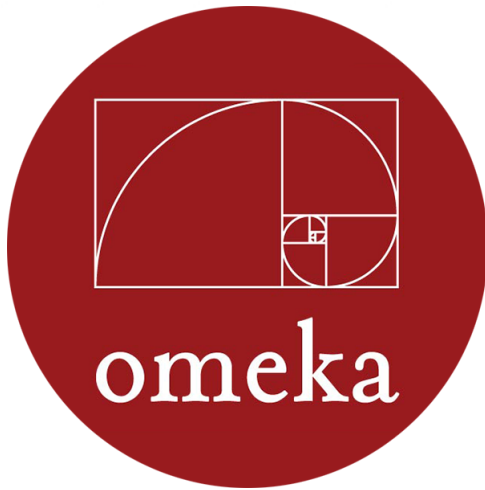
What this talk is meant to be

- A call for librarian empowerment
- A call for all types of librarians to take an active role in the design and implementation of software services

Standing on the Shoulders of Giants



ArchivesSpace



blacklight

Standing on the Shoulders of Giants

code{4}lib

MEASURE
the
FUTURE

DocNow

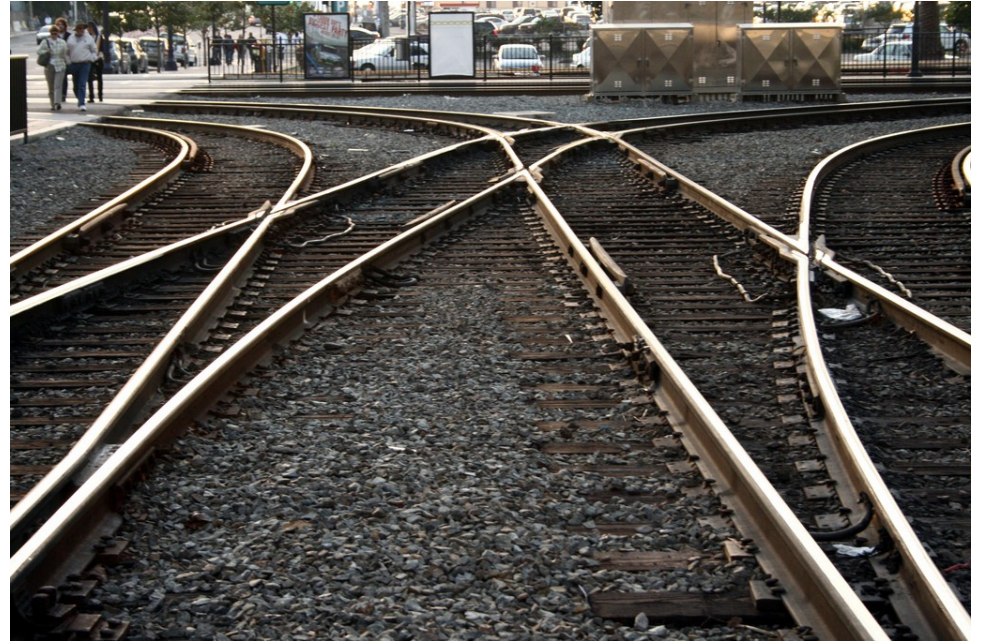
- The inspiring work of systems librarians and library developers from all types of libraries

Custom Software Solutions

- We begin with:
 - Small applications
 - “glue” between larger systems
- In the future:
 - Contributions to larger open source projects
 - Collaborative projects

Different Paths

- People who program
- People who need to tell the programmer what to do



What's the goal?

- Give the user what they want, how they want it
- User experience trends are set by commercial entities
 - Expectation for library services to have similar user experience as non-library applications

What's the goal?

- Satisfy the user's information need in as few steps (clicks) as possible
 - Generally with some software somewhere in this process

ACRL top trends

- Research data services (RDS)
- Data policies and data management plans
- Digital scholarship
- Open Educational Resources (OER) ^[1]

Ongoing Shift

- **ARL Statistical Trends**

- Reference Transactions (**-77%**) 1991-2015
- Initial Circulation(**-58%**) [2]
- Graduate Students (**+149%**) 1986-2015
- Total Students (**+54%**) Faculty (**+40%**)
- Interlibrary Lending (**+82%**) Interlibrary Borrowing (**+237%**) [3]

Ongoing Shift

- **ARL Statistical Trends**

- Ongoing Resource Expenditures (**+521%**) 1991-2015
- Expenditures for Bibl. Utilities, Networks, etc. (**+411%**)

vs

- TOTAL Expenditures (**+197%**)
- One-Time Resource Expenditures (**+79%**) [4]

How are we doing it today?

- Online catalogs
- Discovery Layers
- Online research guides
- Mobile Apps
- Repositories, Digital Collections
- Custom library applications / websites

Traditional Options

- Off-the-shelf commercial products
- Ask institutional department
(IT, Communications/Marketing)
- Large-scale open source projects

Downsides

- No perfect solution for *our* problem
- Time
- Cost
- Reliance on others

No perfect solution for *our* problem

- Existing, off-the-shelf software not library oriented
- The specific need may be:
 - Too small
 - Too specialized
 - Too undefined

Time

- Procurement process
- Long build times
- Not responsive to users' needs within common time frames
 - Semester
 - Academic Year

Cost

- Commercial solutions have recurring costs
(maintenance contracts)
- Hourly rates for new development or features
- Funding for software is often in competition against acquiring resources / ongoing subscriptions

Reliance on Others

- Others' concept of what our users need
- Maintenance
- New features
- Responsiveness

Moving Forward

If core library services are to be delivered exclusively through web applications

And our role is to get people the resources they need

Then we should have a very large role in the design of those applications

Solution

DIY – ~~Do it Yourself~~ – Do it Ourselves

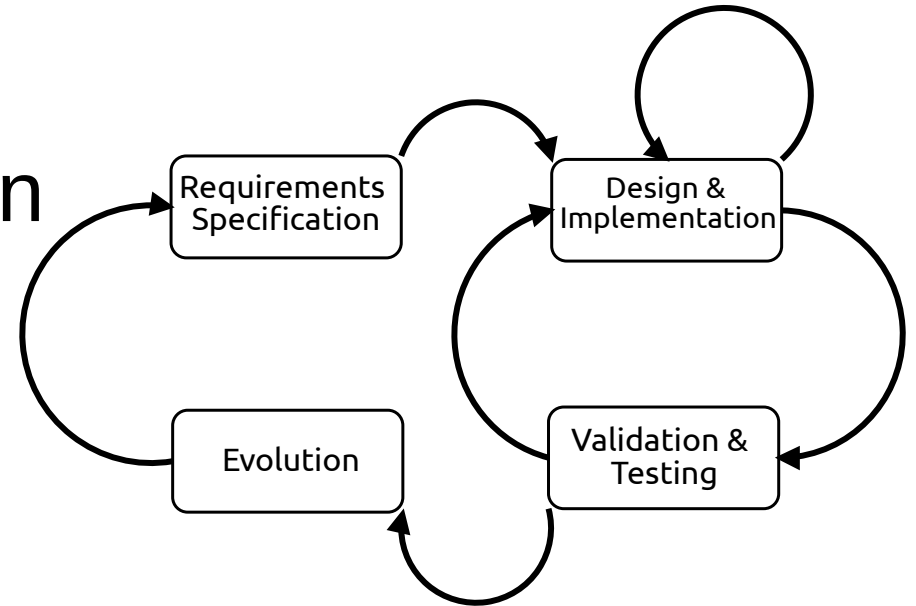
- We know our users' needs best
- We know what would make things better
- We can do this ourselves

What do we need to Do it Ourselves?

- Knowledge:
 - Software Development Process
 - System Architecture
- Skills:
 - Programming

Software Development Process

- Specification
- Design & Implementation
- Validation & Testing
- Evolution [5]



Case study – Reserves Kiosk

- What we have:

- Listing of reserve items kept in a spreadsheet, printed and placed in a binder on the circulation desk.

What we want:

- Touchscreen kiosk
- Off-campus availability
- Easy/fast to maintain and update

Software Development Process

- **Specification**

- Define the problem
- What features are required to solve the problem?
- Use cases / User stories

Case study – Reserves Kiosk

- **Specification**

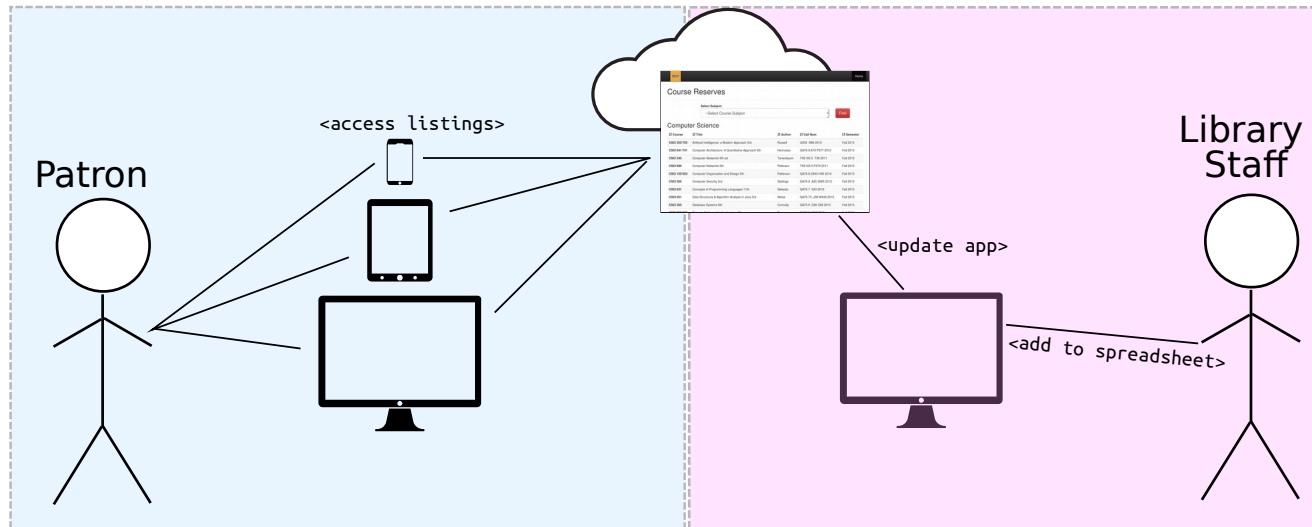
- Define the problem
 - We need a listing of reserve collections
 - It needs to be easy to use, modern, and not introduce a major new service
- What features are required to solve the problem?
 - Online availability
 - Provide a kiosk-like interface
 - Simple (cheap) to deploy
 - Short development time, low resources

Case study – Reserves Kiosk

- **Specification**

- Use cases / User stories

- As a student, I need to know if the textbook for my class is on reserve
 - As library staff, I need to be able to quickly update our list of holdings



Software Development Process

- **Design & Implementation**
 - Identify architecture and application components
 - Evaluate software languages, existing code libraries
 - Target deployment platforms
 - Consider existing data and systems

Software Development Process

Architecture of an Application

- Presentation Layer (User Interface)
- Application/Business Logic Layer
- Data Layer (Database, Information store)
- Platform

Case study – Reserves Kiosk

Architecture of an Application

- **Presentation Layer**
(User Interface)
 - Web-based, standards compliant
 - Touch, app-like
- **Application/Business Logic Layer**
 - Interface with Google Apps
 - Fast, simple
- **Data Layer**
(Information store)
 - Relational Database
 - Easy to host
- **Platform**
 - Low upkeep, low cost

Case study – Reserves Kiosk

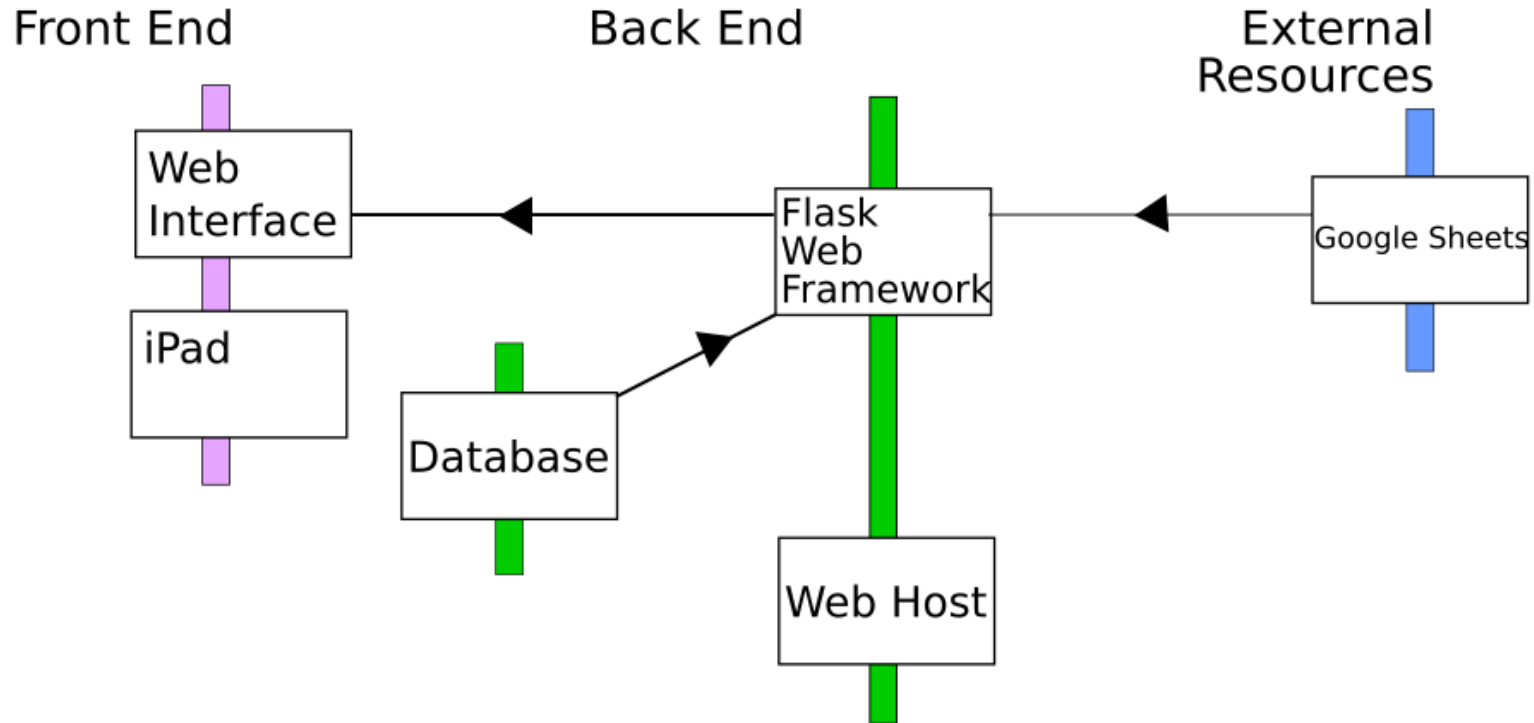
- **Design & Implementation**

- Evaluation of software languages, existing code libraries
 - Open source, leverage existing solutions, code
 - Bootstrap (HTML, CSS, Javascript)
 - Python Flask (Web framework)
 - Postgres Database
- Target deployment platforms
 - Low cost shared web hosting
 - iPad
- Consider existing data and systems
 - Leverage current reserve lists
 - Utilize Google Apps (secure, staff already using it)

Web Front End Interface	Bootstrap, HTML, CSS, Javascript
Web App Framework	Flask
Data Processing and Storage	Python, Postgres, Google Sheets
Web Server	Apache Web Server mod_wsgi
Server, Operating System	Third party web host, Linux

Case study – Reserves Kiosk

- Information Flow



Software Design

- **Validation and Testing**

- Simulation Testing
- Component Testing
- User tests

- **Evolution**

- Ongoing maintenance
- Changing Requirements
- New features
- Change Tolerance

Case study – Reserves Kiosk

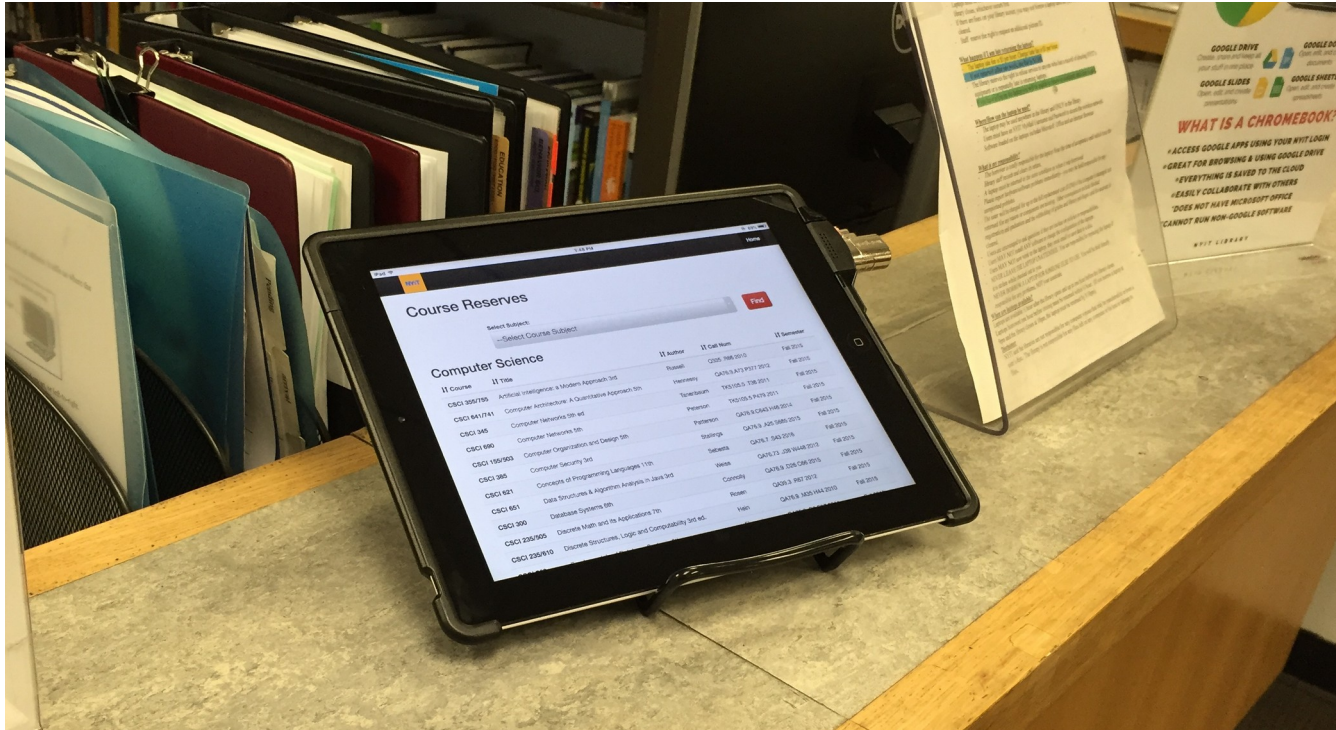
- **Validation and Testing**

- Simulation Testing
 - Sample data
- Component Testing
- User tests
 - Informal discussion with users
 - Participant observation

- **Evolution**

- Ongoing maintenance
 - Updates
 - Evolving platforms
- New Features
 - Additional locations
 - New types of resources

Case study – Reserves Kiosk



Getting Started with Programming

- **Work with Web standards**

- HTML
- CSS

HTML



CSS



Getting Started with Programming

- **Pick a Language, Any Language**

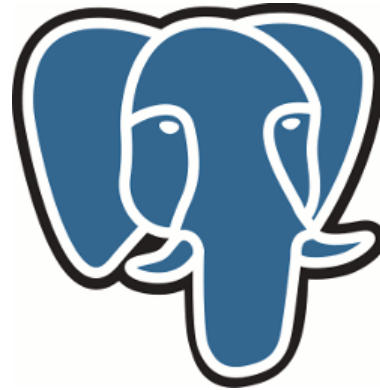
- Python
- Javascript
- Ruby



Getting Started with Programming

- **You will Eventually need a Database**

- Postgres
- MySQL



PostgreSQL
the world's most advanced open source database

Getting Started with Programming

- **Learn a common platform for deployment**

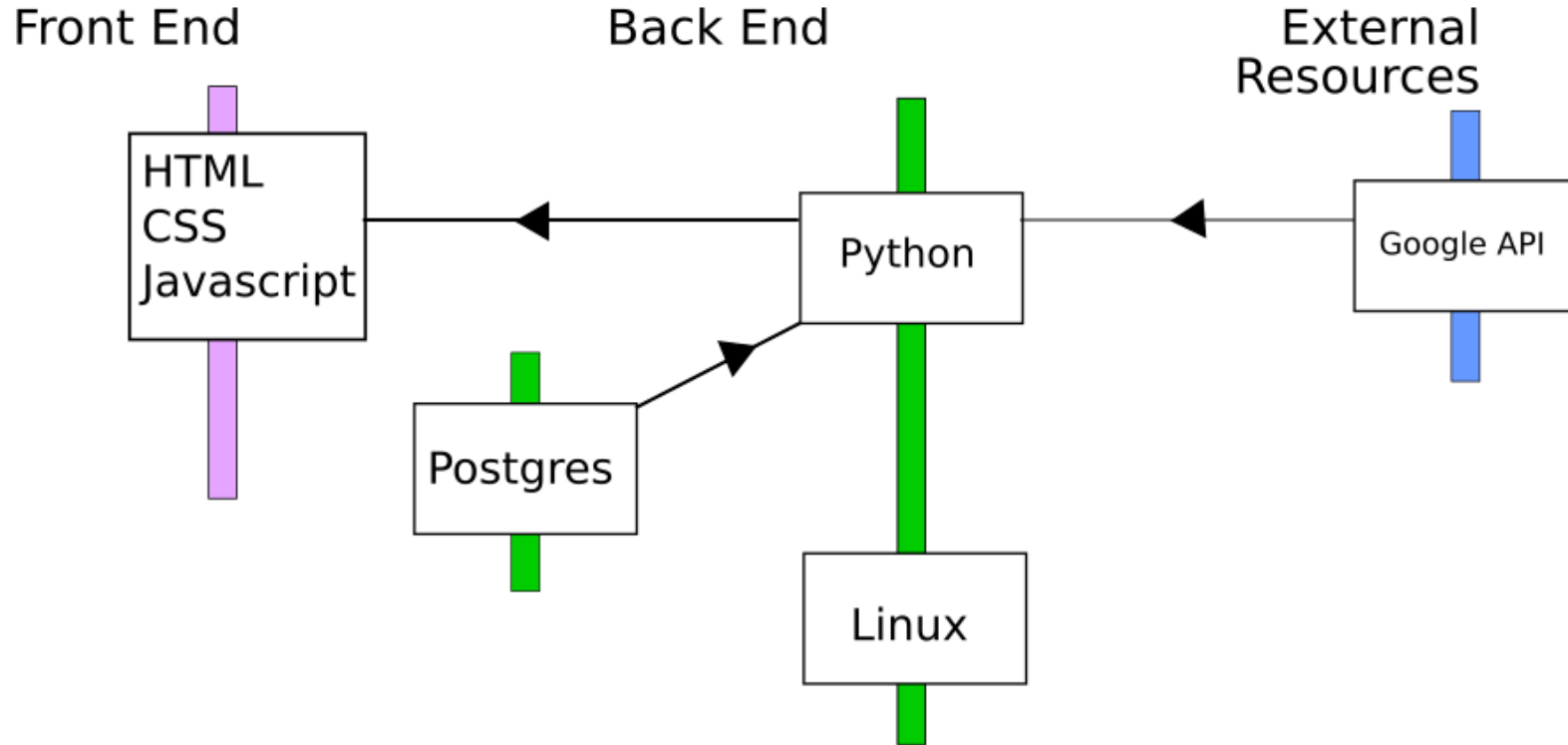
- Unix / Linux
- Cloud / Web



redhat®



Getting Started with Programming



Another Project

- **3D Printer Tweetbot**

- **Goal:** Provide interactive real time updates on status of 3D Prints
- **Design:** Twitter as the public front end / user interface
Python to interact with Twitter API
Raspberry Pi as platform
- User tweets a trigger word to the bot account, gets reply with real time photo of 3D printer bed



Thanks!

References

- [1] ACRL Research Planning and Review Committee. 2016 top trends in academic libraries: A review of the trends and issues affecting academic libraries in higher education Coll. res. libr. news June 2016 77:274-281 “<http://crln.acrl.org/content/77/6/274.full>”
- [2] Service Trends in ARL Libraries, 1991-2015 Source: ARL Statistics 2014-15 Association of Research Libraries, Washington, D.C <http://www.arl.org/storage/documents/service-trends.pdf>
- [3] Supply and Demand in ARL Libraries, 1986-2015 Source: ARL Statistics 2014-15, Association of Research Libraries, Washington, D.C. <http://www.arl.org/storage/documents/supply-demand.pdf>
- [4] Service Trends in ARL Libraries, 1991-2015 Source: ARL Statistics 2014-15 Association of Research Libraries, Washington, D.C <http://www.arl.org/storage/documents/expenditure-trends.pdf>
- [5] Sommerville, I. (2010). Software engineering (9th ed.). Boston: Addison-Wesley Educational Publishers.

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