



# EVOLUTION OF A DIGITAL, PAPERLESS, BIOSAFETY MANAGEMENT PROGRAM



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## INTRODUCTION



The establishment of a concise informational system for use in laboratory settings has become essential in all aspects of the research laboratory.

Issues of compliance, medical clearances, emergency contacts, equipment service and inventory records, SOP and protocol approval dates, lab audits, lab surveys and essential lab training are all necessary to be retrieved at any time for a research laboratory to function at the pace necessary in the modern lab

- The overall development process of a unique lab management tool, termed *LabManager*, is a copyrighted software based program that institutes all aspects of sound lab management in one useful tool developed by the Penn State Hershey Research Quality Assurance Team and the College of Medicine Research IT group.

By digitizing the forms commonly used by BioSafety in the field (Annual Laboratory Survey Summary Reports, photographs, commonly referenced policies, etc) onto a centralized server location with convenient mobile access should lead to shorter turn-around times of Summary Reports and overall timeliness of data entry. The use and access of a mobile tablet system for querying information in the field is also an essential feature of this plan.

## OBJECTIVES

The goal was to provide an effective lab management tool to be used across campus at all levels. The LabManager system was populated with information on:

- Basic science laboratory locations (room#, building, campus)
- Basic laboratory equipment and associated manuals & maintenance records
- Annual Laboratory Surveys and Audits
- Laboratory placard and emergency contact information
- Laboratory approved protocols and proper laboratory SOP's
- Training records and research clearances of lab personnel & PI
- Direct links to all research compliance software platforms (IRB, IACUC, etc)
- Direct links to service records of our Asset Manager

Capabilities beyond data storage:

- Mass emergency notifications by location
- Automatic scheduling of administrative duties (audits, surveys, follow-ups)
- Automatic Summary Report generation (for receipt of audits, surveys, follow-ups)
- Building maintenance/outages notification to specifically impacted areas
- Internal "Craig's List" style listing of scientific equipment for sale/use
- Secure access to individual lab's reporting hierarchy with customizable access controls for PI's, Lab Managers, Staff, Students, Visiting Scholars, and Administration.

Future applications:

- Intra-Campus connectivity for LabManager, enabling remote management/data acquisition of multiple campuses in the Pennsylvania State University family.
- Mobile/Tablet interface (IOS/Android compatible)
- Integration into work order request system for initiation of repairs through the LabManager platform.

## RESULTS

The LabManager system has proven to be a useful tool in our University setting to keep all essential lab, BioSafety and compliance information in one location.

The system has increased the accuracy of training records as well as verifying proper lab use with identified committee approvals. It has also increased the efficiency of searching for specific agents and equipment across campus, as well as increased knowledge of specific laboratory research profiles. We feel that this ease of access has facilitated an enhanced collaborative atmosphere with our ongoing research enterprise.

We have successfully rolled out the management capability to over 300 individual labs, 160 PI's, and several independent academic research buildings. The ability to query and produce instantaneous results on agent use and location has proven beneficial on several occasions when regulatory agencies have requested specific information.

LabManager has also afforded the Research Quality Assurance team the ability to monitor incident rates and information. This data has shown to reduce the overall institutional risk by providing a means to more efficiently track and investigate these incidents.

With new capabilities being released on a monthly basis and the plans for cross-campus use across Penn State University, continual user feedback, continual user feedback and UX improvements will need to be investigated and addressed to ensure smooth and efficient use of the platform.

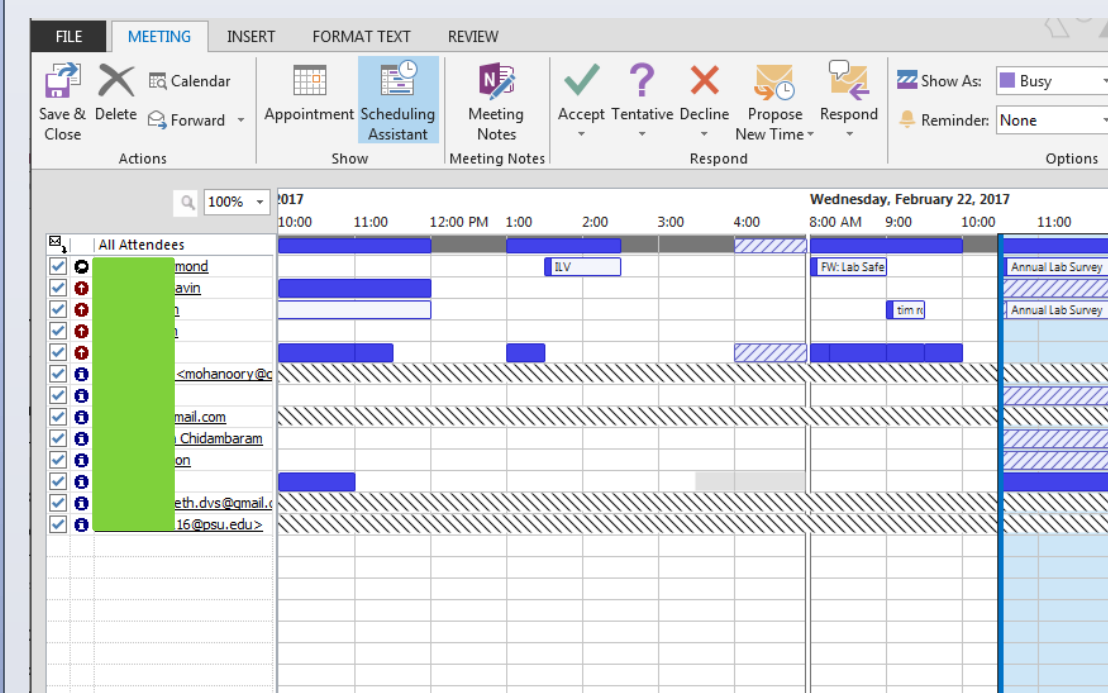


Fig.1 – Automatic generation of Outlook Calendar Events are sent to the PI, Lab Staff, and the BioSafety Officers conducting the Survey. An informational message with attached supporting documents is also sent at the same time as scheduling (Fig.2).

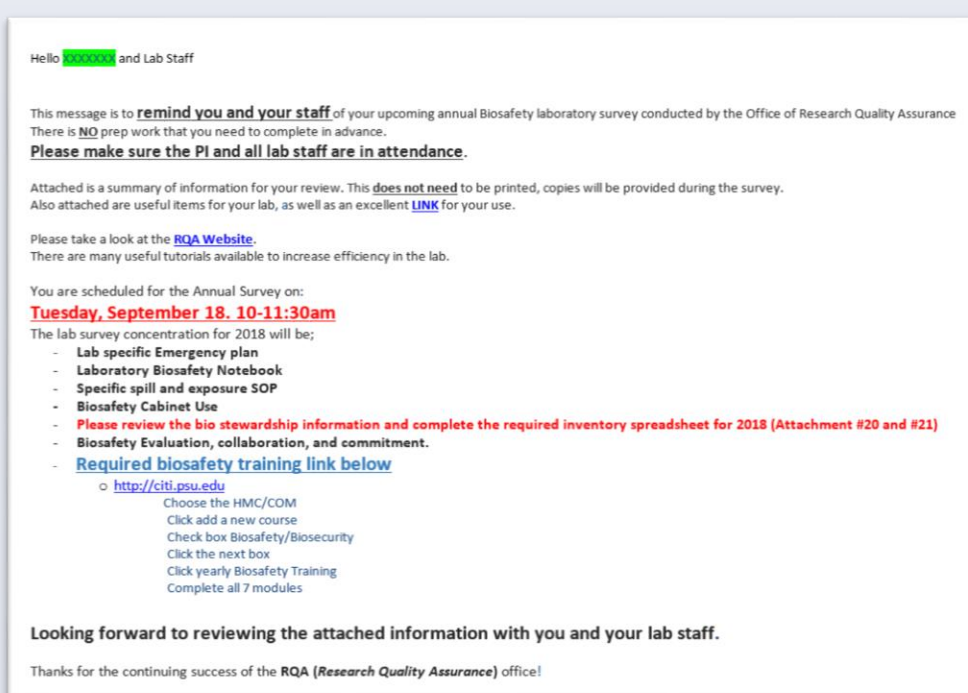


Fig.2 – Automatic generation of Outlook message and sending of initial survey documents prior to visit. Generated email goes to PI and all lab staff that are listed on the IBC Approval as well as BioSafety.

## METHODS & TECHNICAL INFORMATION

LabManager has several key technological features which enable it to be smoothly running and interactive service available on a range of platforms:

- Angular framework:**
  - The LabManager program utilizes the latest web technology to present a single page web application that makes lab management easy to access.
  - Angular makes use of *Material Design* for a modern look and feel that is expected of mobile ready applications.
- JavaScript Object Notation (JSON):**
  - To keep things fast JSON is used to limit most internet usage and requests to the Application Programming Interface (API).

```

import { Component } from '@angular/core';
@Component({
  template: `
<h1 [style.font]="font" >{{title}}</h1>
<div [person.address.]]></div>
<span (c.latitude) longitude
  )>
export class street
  
```

Fig.3 – Angular framework and tooling example (1)

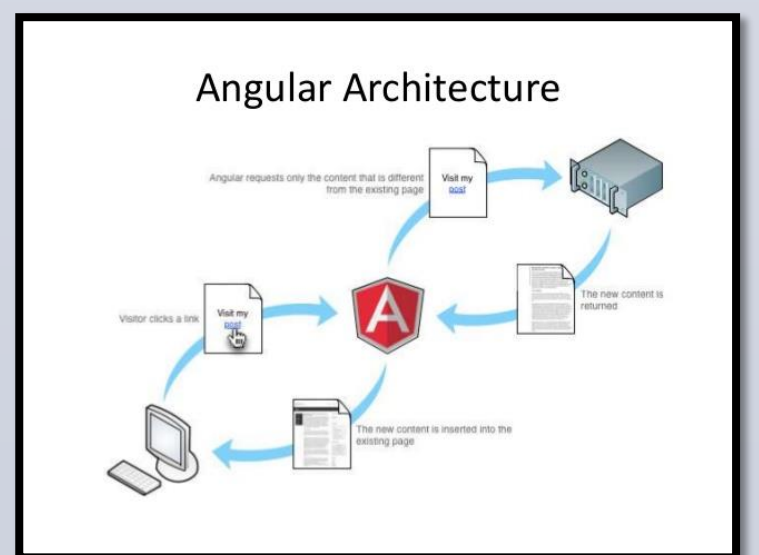


Fig.4 – Angular Architecture Flow Diagram (1)

## USER INTERFACE

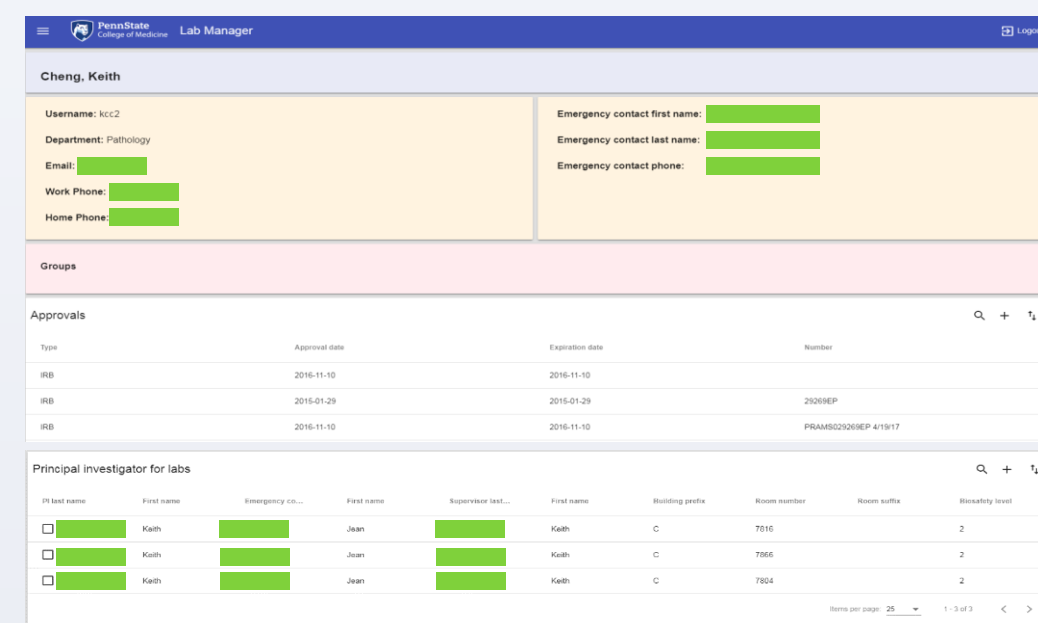


Fig.5 – View of a PI's LabManager profile. As the PI of a lab, all information is viewable and updated live as the files are edited. The PI is also able to assign members to their labs with clearances based on position.

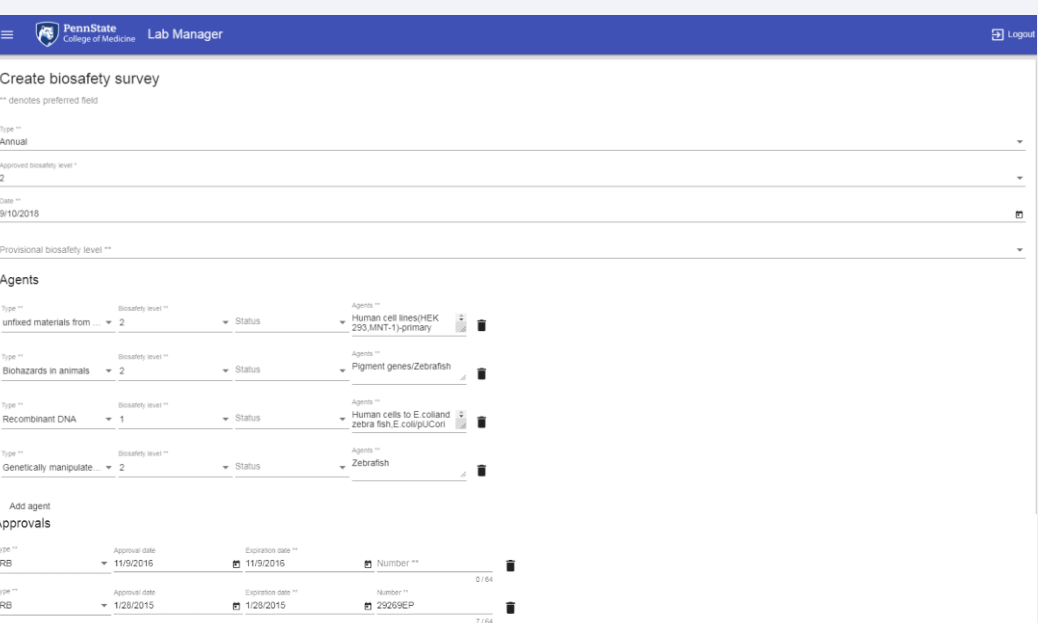


Fig.6 – Example of a BioSafety Survey Form from a BioSafety Officer's view. Survey is saved in real-time and a Summary Report is automatically sent to the PI and Staff after completion of the visit.

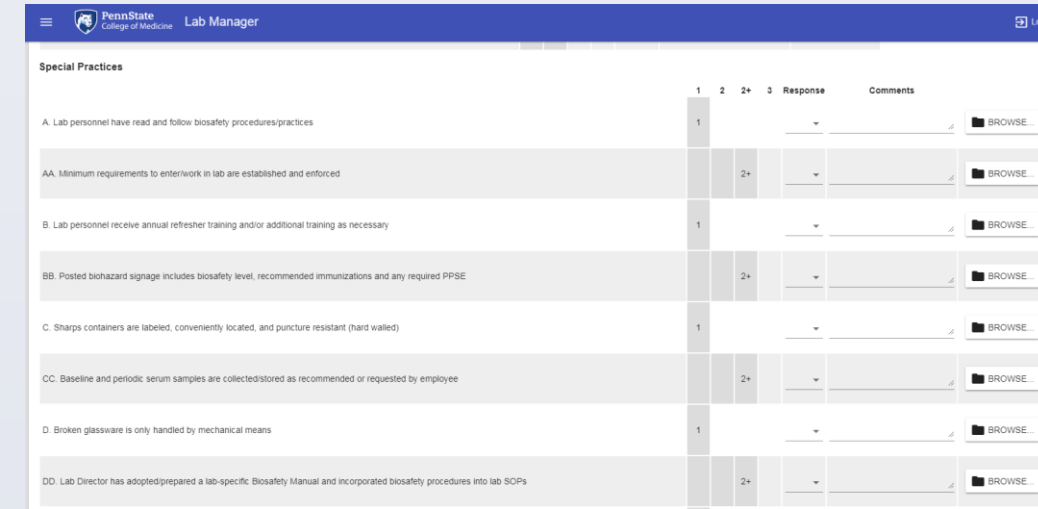


Fig.7 – Survey questions to be filled out by a BioSafety Officer during a BioSafety Survey. Note that photographs can be attached as supporting documentation, as well as logging private notes for admin. If an issue is noted, it will be automatically added to the Survey Summary Report.

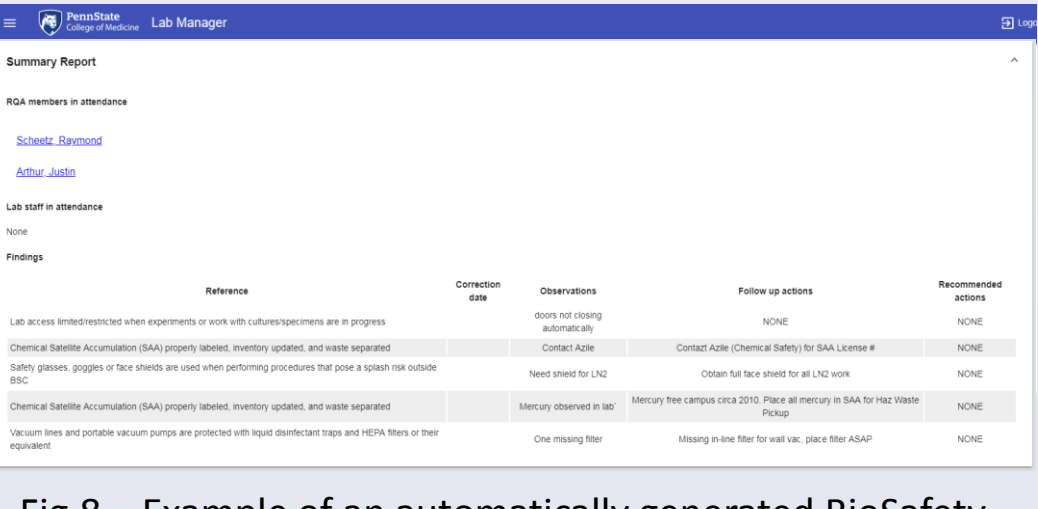


Fig.8 – Example of an automatically generated BioSafety Survey Summary Report. The interactive document is sent to the PI/Staff after the Survey is completed & approved by a BioSafety Officer. This form also updates in real-time as corrective actions are completed and informs the PI and lab staff of such.

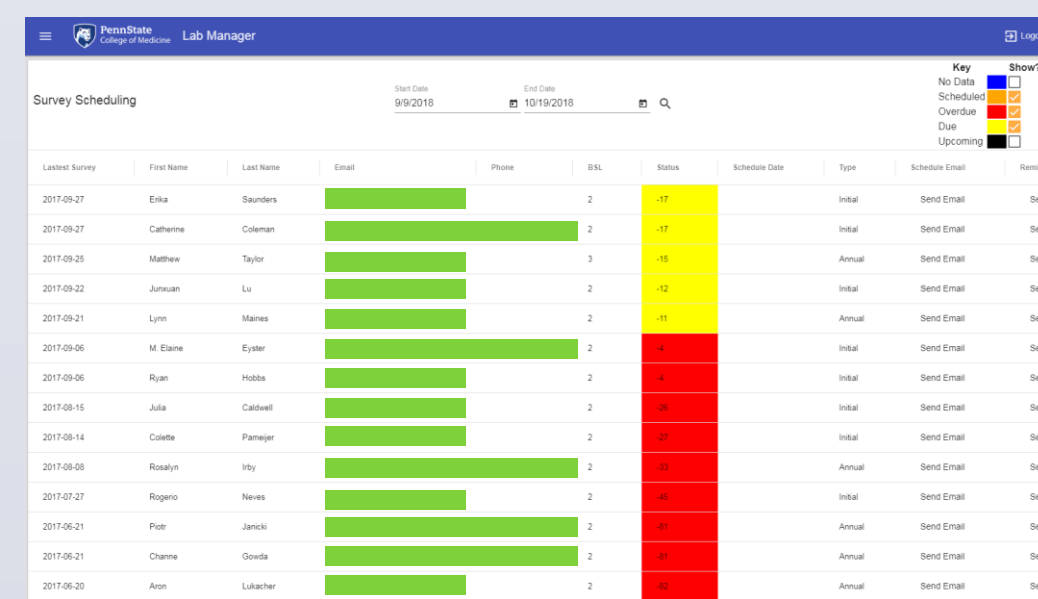


Fig.9 – Administrative view of the Survey Scheduling Assistant. This system correlates the IBC Approval expiration dates with the next needed date of Survey, producing a searchable list and automatic Outlook Calendar Event.

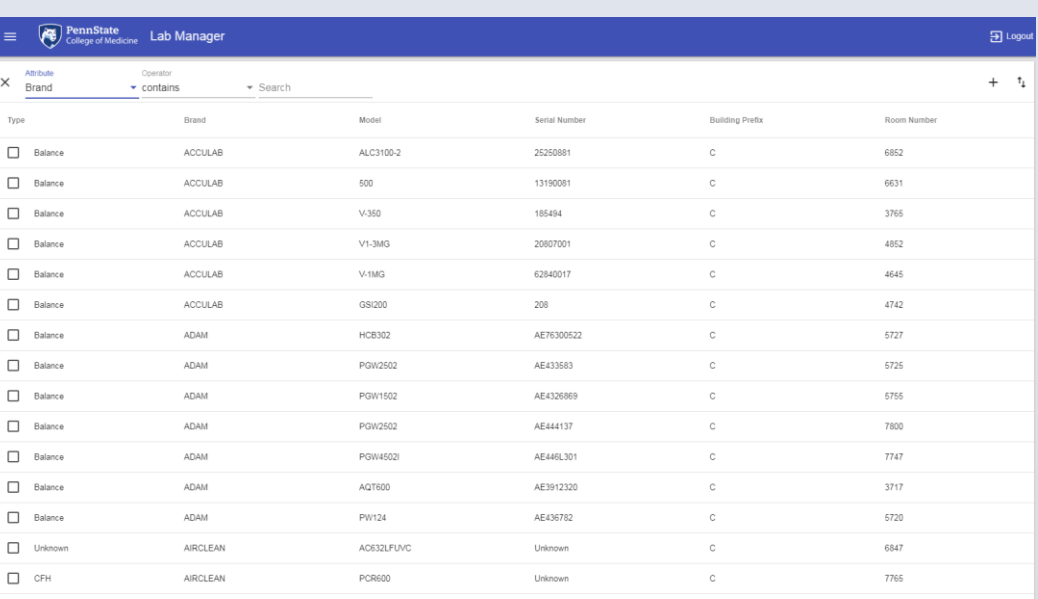


Fig.10 – User view of searchable laboratory equipment. (If a lab lists equipment for use or sale) This also includes service records, manuals, and vendor contact information.

## ACKNOWLEDGEMENTS

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## REFERENCES

1: Image Source: <https://pt.slideshare.net/camilolopes/angular-js-25429872/4>