Project Title: UC Safety Integrated Suite

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Project Team Members
The UC Safety Suite project success has been dependent on the support of the researchers, the Environmental Health & Safety (EH&S) and IT Services communities across all UC campuses. As part of the UC Risk & Safety Solutions development process, numerous staff and faculty provided guidance, feedback, expertise and insight.

The team members listed below made up the product development teams

- Colin Aiken, Developer
- Rachel Aurand, Developer
- Joseph Bair, Quality Assurance Analyst
- Jay Ballinger, UC Systems and Integration Architect
- Steve Barton, Developer
- Michael R. Benning, Project Coordinator
- Charles Bookman, Lead System Administrator
- Joan Burg, Project Manager
- Christine Carcamo, Business Analyst/Quality Assurance Analyst
- Donna Carrasco, UC ERM Service Desk Manager
- Andie Cheung, Developer
- Diana Cox, Product Portfolio Manager
- Yashesh Damani, Developer
- Jessica Eisner, Test Engineer
- Bijan Fouladi, Developer
eCompliance
- Carolyn Germino, Developer
- Rajbir Grewal, Developer
- Pradeep Haldiya, Developer
- Moira Heilmann, Project Coordinator
- Tim Holmes, Developer
- Cameron Jamison, Developer
- Lisa Johnston, Quality Assurance and Design Manager UCD
- Mira Kaloper, Developer
- Cat Keeley, Project Manager
- Jennifer Knight, Agile Test Engineer
- Eric Kvigne, Product Owner
- Dave Mannion, Developer
- Ryan Mosely, Scrum Master
- Serguei Mysko, Developer
- Will Oleksy, Interim Program Manager UCD
- Suresh Pawar, Developer
- Eric Pereira, Quality Assurance Analyst
- Dung Phung, Developer
- Taniya Prabhakar, Student Intern
- Christine Romero, Project Coordinator
- Anthony Schrick, Product Owner
- Sowmya Sekar, Developer UCSD
- Yashpal Singh, Developer
- Walter Sysko, Developer
- Stefan Tomic, Developer
- Bow Vang, Designer
- Nicole Vang, Business Analyst
- Nishant Vincent, Contractor
- Andria Way, Scrum Master UCD
- John Yeh, Student Intern
- Alex Zanganeh-Azam, Designer
Project Description
The UC Safety Suite is comprised of the following applications: Biosafety Information Online (BIO), Chemical Inventory System (CIS), Employer’s First Report (EFR), Field Safety/Travel Operations Planner (FSTOP), Hazard Assessment & Chemical Exposure Monitoring (HACEM), Laboratory Hazard Assessment Tool (LHAT), Occupational Health Surveillance System (OHSS), Risk Assessment Determinations in Chemical Academic Labs (RADiCAL), Safety Inspection Tool (SIT), UC Safety Profile and Waste Accumulation Storage Tracking electronically (WASTe). The suite provides researchers with a comprehensive way to manage workplace risks, meet institutional, state and federal requirements and easily manage data associated with their teaching and research laboratories.

How It Works
Researchers needed a way to manage safety and associated risk in the lab, while allowing for dynamic regulatory changes in order to have safety-compliant laboratory and teaching spaces. The integrated packages serve as a comprehensive tool allowing researchers and their staff to focus their time on research and allowing the suite to manage the administrative elements of their work in a fraction of the time that work used to require.

Research staff need a robust and elegant way to track activities occurring in the lab. As Principal Investigator, the first point of contact is LHAT, where a comprehensive hazard assessment is created for the lab, appropriate Personal Protective Equipment (PPE) is identified and training for the PPE is provided. Since its release in late 2013, LHAT has been used by more than 34,000 researchers at nine campuses. SIT provides Environmental Health and Safety (EH&S) staff with an online and mobile friendly way to assess the safety of the researcher’s lab and track the resolution of issues found during inspections. Since its release at the end of 2013, approximately 1,300 inspections have been completed at four campuses. Injuries occurring in the lab or other work environments are tracked in EFR, which provides administrators with a way to track claims and verify corrective actions. EFR serves as a proactive tool that provides decision makers with data they need to consider policy changes that can prevent future injuries and keep workers safer. EFR is currently in use at UC Davis and has already helped to manage over 600 incident reports.

![Figure 1. LHAT lab management page](image-url)
Chemical inventory tracking and management is a critical component of the work done by researchers. They are required to provide a chemical inventory on an annual basis. CIS stores this inventory data, and provides EH&S staff, lab staff and emergency personnel with an up-to-date account of each lab’s chemical repository. Currently 3,000 users on seven campuses are managing a combined 630,000 chemicals in CIS. RADiCAL determines a control-banded Standard Operating Procedure (SOP) for the work done in the lab, providing researchers with needed information to conduct their work safely. HACEM, in use at nine campuses, allows EH&S staff the ability to track data related to the monitoring of research personnel for chemical exposures. WASTe facilitates the regulatory compliant labeling, tracking, collecting and shipping of hazardous wastes created by research and teaching facilities. Currently six campuses have implemented WASTe, which accommodates over 13,000 users and currently has 55,000 tags in the system.

![Figure 2. WASTe – View of tags in laboratory](image)

Biological agents used in research are subject to specific management guidelines and must be thoroughly documented and reviewed by a governing board at each campus. BIO manages the Biological Use Authorization (BUA) process for recombinant DNA activities for both research and teaching. In use at four campuses, BIO has over 7,100 users. OHSS allows for the creation of a risk assessment and medical evaluation for researchers with exposure to animal biohazards and other workplace exposures. An average of 100 assessments are completed each month across four campuses in OHSS.

FSTOP helps users create a travel plan to help identify risks associated with work done in remote locations and abroad by researchers and course instructors.

UC Safety Profile is the core repository of people, location and training data for researchers, their staff and EH&S professionals. Profile currently has over 85,000 users from all 10 campuses, the medical centers and Agriculture and Natural Resources (ANR). Profile contains property data provided by each campus’ Facilities Management team. The people and location data simplifies the user experience and makes it easy to set up an online lab group in just minutes. That information is entered once and is then available to other suite products. Training data imported from the Learning Management System (LMS) is also displayed for each lab member.
Figure 3. Profile – Laboratory view

Efficiencies
Prior to the release of the UC Safety Suite, many of these processes were managed on paper or in legacy online systems that were not inter-related. What used to be a fragmented, labor intensive administrative experience is now a clean and concise management of lab data that is easily accessible at the touch of a hand.

Now researchers and EH&S staff have access to robust data regarding critical aspects of their work for the University of California. The quality of the data housed in each of the suite products is now greater as it is less prone to user error and inconsistencies. System data can now be accessed easily in each of the applications.

All applications are only accessible through Single Sign-On authentication to provide greater security of sensitive data. This also replaces the practice of keeping “lab passwords” shared by all facility staff for multiple applications.

The suite alleviates the problem of redundant data by providing the ability to enter core lab information a single time and have it available in multiple suite products. This represents a significant administrative time saver.

Partnerships
Creating a project of this size could not have been done without the close collaboration of many researchers and their staff at all campuses. Some, like Craig Merlic at UCLA, served as subject matter experts (SME) who helped drive the development process toward the needs of those in the trenches. Dr. Roger Belcourt at UCD served as advisor and SME for OHSS, ensuring that the product satisfied the needs of Occupational Health staff at multiple campuses. Support also came from many individual researchers and their staff at UC Santa Cruz, UC Merced, UC Davis and others, who provided in-person work sessions with members of various product development teams to ensure that the suite products were developed to provide high value and meet the business needs of end-users. These partnerships continue to thrive, ensuring that the suite evolves with changing regulations and institutional needs.

“The talented staff at UC Davis have developed robust, user-friendly software tools intended to allow researchers to significantly increase both their safety and regulatory compliance. The Laboratory Hazard Assessment Tool provides Research Faculty and staff the ability to identify the hazards with which they work and efficiently communicate these hazards to everyone in the lab. From this information, the appropriate Personal Protective Equipment (PPE), lab coats,
aprons and safety eyewear is identified. Using LHAT, the researchers are trained on the use of their PPE along with when, and to whom, the lab coats and safety glasses are issued."

-Russ Vernon Ph.D., Director, Environmental Health & Safety UC Riverside

"(LHAT) provides an elegant solution to the challenge of developing personal protective equipment hazard assessments for every laboratory on campus. The clear and visually-appealing user interface allows virtually all faculty, staff, and students to use the system with no prior training or assistance. The standard LHAT assessment process and questions are easily understood, and the system also allows for custom entries. Because LHAT is web-based, the system administrators can access assessment data for any lab group from any location, assisting with real-time regulatory compliance."

-Lisa Wisser, Laboratory Safety Program Manager, UC Santa Cruz

“Chemical exposure monitoring is a large part of my daily work. This provides an easy to use platform to meet my needs. With the development of the HACEM database the chemical exposure monitoring records at UC have come from the paper and file cabinets stage and moved into the realm of an electronic record management system in which data is easy to enter and easy to retrieve.”

-Carol Lawson, M.S., CIH, UC Davis Office of Environmental, Health and Safety office

Technology Used
The UC Safety Suite was developed using Agile methodology, which is based upon short iterations of work with ongoing user feedback. This process ensures that the most important aspects of a product are prioritized and developed in order, eliminating waste. Each of the pieces of the Suite are in continual development and continue to benefit from end users’ suggestions for enhancements and improvements. The technology utilized includes, but is not limited to the following:

Front End Technologies
- JavaScript
- AngularJS for dynamic web application design
- Bootstrap for compatibility with mobile devices

Server Side Technologies
- Java
- Spring MVC
- Spring Batch
- Kuali Rice
- SOAP Web Services (JAX-WS)
- Apache Tomcat
- Linux application servers
- Mule ESB for proxy services
- Drools rule engine

Databases
- Microsoft SQL Server
- MySQL

Development Tools
- SoapUI for raw web service testing
- Java integrated development environments (IDE)
- JUnit for unit and integration testing
- Protractor and Karma for JavaScript testing
- JIRA for Agile board management
- JIRA for issue/task management
- Confluence for team collaboration and documentation
- Bitbucket for source control

Maintenance Tools
- Pingdom and Icinga for availability monitoring
- Elasticsearch, Logstash, Kibana for logging and analysis

Relevant URLs
Most of the products can be accessed in the UC Safety Demo Site at https://ehs.ucop.edu/auth-demo/