

Case Study:

Implementing RFID for Census and Tracking in Academic Research Animal Facilities

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In 2010, Stanford University's Veterinary Service Center (VSC) implemented an RFID (radio frequency identification) system for animal census and tracking. This was done after conducting an internal evaluation of animal facility operations, particularly with regard to procurement, census, and billing. One important requirement of the new system was the need for a rapid, automated method of conducting census. This article reviews the product selection process, implementation strategy, and challenges faced implementing RFID in Stanford's animal facilities.

Product Selection Process

In 2008, the VSC conducted an evaluation of its animal facility systems and procedures. This resulted in the determination that a new system was needed to manage operations, including a rapid, non-paper-based census system. A request for proposal (RFP) was developed that detailed specific functional, technical and timeline requirements. Several committees were established: 1) an Executive Committee to provide project oversight and feedback on critical issues; 2) a Tactical Team consisting of the subject matter experts from the VSC and; 3) a Technical Team consisting of university IT experts. All vendors that responded to the RFP were invited to present their overall project plan and demonstrate their product's functionality to committee members. The vendors were evaluated by team members and the top three were invited to present to the Technical Team and respond to more detailed questions about the technical requirements. Final evaluation by VSC senior management resulted in two vendors being selected, Key Solutions, Inc. for the laboratory animal management system (LAMS; aka eAnimalOrdering) and Allentown, Inc. for census using RFID (Wi-Com Sensus). After the vendor selection was completed, the Tactical Team focused on refining the functional requirements for incorporation into the system.

Initial Implementation

The implementation was done in a phased manner. First, a test RFID system was installed to train staff and establish the electronic interface connections required to move data between the LAMS system and the RFID system, including cage data (e.g. principle investigator, protocol number, barcode, species, room number, billing code, responsible person) and census data (e.g. check-in date, scan date, location, check-out date). After the initial testing, the integrated LAMS and RFID system was implemented in October 2010 to coincide with the opening of a new barrier animal facility. The first animals moved into the new barrier were transferred from an existing housing location necessitating the migration of the current cage information from the legacy system into the new system (see below for more detail about migration strategies). Cage cards were linked to cage card holders containing RFID tags as the animals were housed in the barrier facility. The initial population was several hundred cages and allowed us to begin to use the system in a controlled manner to identify any technical, network, and user issues. As new animals were received at the facility, VSC staff entered the data into the LAMS to create new barcodes then linked the bar-coded cage cards to RFID holders. Data on the new cages was sent from the LAMS to the RFID system via an automated electronic interface. Census scanning of RFID tags was done using handheld devices (Photo 1). Newly set-up cages were linked to RFID card holders using mobile carts with a laptop and RFID/barcode reader attached. In general, these carts did not enter housing rooms.

As the census within the facility increased, it allowed us to further refine our processes for managing the RFID linkages and address system issues particularly with regard to the increasing size of the database, network traffic, and equipment troubleshooting. We were also able to train a small number of investigators on system use and the new requirements for working with the RFID holders. Users were given

access to a check-out station (Photo 2) to de-link their barcode and RFID holder, which stopped their per diem billing. During this time we worked with the vendor to refine our scanning techniques to ensure an accurate census was being taken and to reduce the likelihood of bleed-through of RFID signals between rooms. We found our RFID census in this facility was 99-100% accurate.

Phase II Implementation

The RFID system operated in the barrier facility for approximately eight months before moving to the two other main vivariums on campus. The LAMS system would be accessible by investigators to request animal purchases, transfers, etc. as a part of the phase II implementation.

A different data migration strategy was used for the second phase, which did not rely exclusively on the data from the legacy system (see below for more detail). Migration of data and linking of all cages in the two other main vivariums was completed by June 2011, when the entire system went live. Additional RFID staff was hired to assist investigators with proper RFID use, checking out RFID holders, scanning rooms, and linking new cages. One of the significant challenges in the larger vivariums was the higher volume of users and cage turnover as compared to the barrier facility. This required additional efforts to train investigators on proper RFID use, particularly in understanding that each barcode is uniquely identified with one RFID holder and the importance of checking out RFID holders.



Photo 1: Census scanning by RFID

Final Implementation

Other species were migrated into the system beginning in July 2011. For some species, data was uploaded from the legacy system to preserve their initial barcodes. In most cases, however, new barcodes were created. Facilities outside the three main vivariums were brought into the new system during final implementation. This included several off-campus facilities. It was determined that RFID stickers would be attached to the cage cards rather than using the RFID holders for the off-campus facilities. This was done because of the logistics of moving RFID holders to/from campus, the limited cleaning facilities for the RFID holders at the off-campus facilities, and the smaller census. Photo 3 shows a cage card holder with the embedded RFID tag (top) and a cage card with an RFID sticker (bottom). To date, approximately 2,000 of the nearly 40,000 cages in the system under RFID are using stickers as opposed to RFID holders.

Data Migration Strategies

Our initial data migration strategy was to download data from the legacy system and create spreadsheets that were uploaded into the LAMS system. The data was then sent via an automated electronic interface to the RFID system. This allowed the use of current barcodes, however, the legacy data was not always up-to-date and accurate with regard to cage information or billing account numbers. A different strategy was adopted during the second phase of the implementation. In each housing room, existing barcodes were scanned and data was collected on the current number of

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Photo 2: Check-out station for de-linking RFID tags and barcodes

cages in each room by protocol, investigator, responsible person, and billing account. This information was used to create new barcodes in the new LAMS system. The RFID team members then linked these new barcoded cage cards to RFID holders, attached them to the old cards, and put them on each cage. The new cards were numbered differently than the legacy system and provided a direct identifier that the barcodes were available in the new system. Also, colored cards were used to provide further visual identification of the newly migrated, linked cages. While the second method required more preparation time, the data was up-to-date and more complete when compared to migrating the legacy data. The RFID teams were able to migrate and link about 30,000 cages in approximately one month.



Photo 3: RFID cage card holder and RFID sticker on a cage card

Challenges

Switching from a paper-based census to an RFID-based census has presented a number of challenges. While the RFID system is faster and more accurate than paper, it requires a higher level of support and training. The most significant challenges are:

- Dedicated staff for RFID is required and they must be trained to use the equipment and troubleshoot as needed.
- Getting new cages (weans and splits) into the system is more time-consuming than simply counting the cages on paper. The cages must be linked and activated to start per diem billing. However, our initial assessment indicates that the new method results in a more accurate count of care days for new cages.
- Users must be trained that each barcode is uniquely identified to an RFID holder. Users sometime switch barcoded cage cards and holders or put multiple barcoded cards on each cage. When faced with situations where investigators have switched holders and barcodes, a manual barcode scan is done and compared to the RFID census scan. Cages must sometimes be re-labeled with new barcodes to correct improper labeling. This is particularly an issue where investigators do a lot of breeding and set-up a large number of new cages. As investigators have become more familiar with the system we see less switching of barcodes and RFID holders.

- Checking out RFID holders is new. Some investigators do not promptly turn in their holders, which results in an inaccurate calculation of care days. Reminders to check-out RFID holders are posted throughout the facility including locations where dirty cages are dropped-off. We do not have investigators check out their own cages in our main vivariums because of the volume of check-outs (nearly 1,000 cages/day) which could cause a line of people waiting to use the stations. Bins are provided for the holders and RFID staff check them out.

- Different cage types are used in our facilities, which mean we need RFID holders with different cage clips. This makes managing the cleaning and sorting of the holders more complicated. Plus, when a cage moves from one facility to another, a change in RFID holder (and barcode) may be required.

- This system relies on two separate systems, two separate databases and multiple pieces of equipment for scanning, check-in and check-out. Managing these requires both technical and application expertise and any down-time of equipment has repercussions for all aspects of the operation.

Conclusion

Implementation of the RFID census system has benefited Stanford's animal care operations by providing us with more accurate and timely census data. It has also allowed us to more closely track the movement of cages and quickly determine whether specific cages are in the correct location. While new staff has been hired to maintain/operate the RFID system, other staff has been relieved of taking laborious manual census and counting paper documents allowing them to focus on other duties. The monthly census and billing no longer requires nearly 100 hours of staff time to process and enter data. Additionally, the system delivers census data on a daily basis, which assists investigators and staff in the management of cages.

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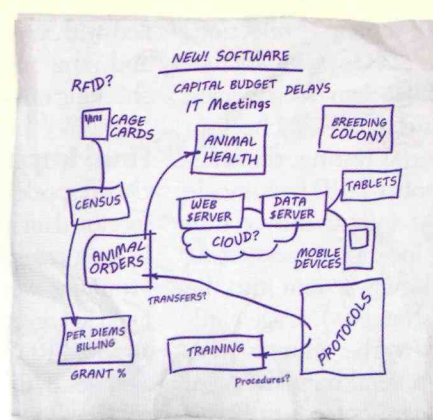
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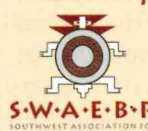


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