



Recommendations for the Installation of RFID Systems

Based on findings from the
National Applied Research
Project on RFID Systems.
2009-2011

The author acknowledges Agriculture and Agri-Food Canada - Growing Forward Program - for funding support for this research.

The assistance, cooperation and support of the Steering Committee and personnel at the test site Livestock Auction Markets and Buying Stations are greatly appreciated.

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OBSERVATIONS AND RECOMMENDATIONS for INSTALLATION OF RFID SYSTEMS

This report is an excerpt from Phase Two of the Applied Research Study on RFID systems at auction markets and buying stations. It discusses key observations and recommendations as observed by the Project Manager (PM) over the three phases of the project that took place between 2009 and 2001.

Timing

The hardware in Phase One was installed in August of 2009 and did not interrupt process flow as it was down time for the auction markets. The integrated systems were installed during the fall run, from September to October of 2010. This created extensive challenges as the site personnel are exceptionally busy and therefore training and changes to business process was difficult and stressful. In interviews with the test sites, all agreed that changes to business process required by new software or hardware in a location that changes process flow, must take place in the off season.

Recommendation

- Installations should take place in May/June or December to mid-January.
- This will enable site personnel to have the time to fully train and get used to the process prior to busy season.
- If additional labour is necessary, there will be time to recruit and train new people.
- If there are technical issues with any of the hardware or software, the impact is not as great as during fall run and the sites have the time to investigate the cause.

RFID Systems

Hardware

In all cases, the hardware was installed prior to the software being ready for deployment. The hardware vendors were all very professional and installed the systems on time without requiring extensive follow-up. Each took ownership of the installation and ensured site requirements were managed in the most efficient manner (such as dedicated electrical lines and the construction of alleys). The hardware installation is the easy part of the RFID system integration. All the test sites noted that this was the most efficient part of the installation, with generally no problems or concerns. Only one system was delayed as a result of shipping from overseas. In order obtain the best results alley construction must follow hardware vendor specifications. In one case the market constructed their own dual alley which did not meet the specifications and the read rate was affected.

Recommendation

- Site assessments are critical. Determine in advance if the hardware vendor is charging for the site assessment and what is included.
- Determine if there are service technicians in the province where the system is being installed. Travel is expensive if the technicians are required on site to correct read accuracy problems or fix the systems.
- The hardware vendor should participate in the construction of the scanning alley to ensure it is built to the proper specifications.

- The vendor should establish a baseline read range on all panels at installation and test the system for read accuracy.
- On-site read range testing on scanning days is critical to ongoing performance of the readers. If the read range drops, the vendor must be contacted to evaluate the cause and possibly visit the site to rectify the problem.
- It is important that all costs are clearly stated in the original quote, including freight and travel.
- Extended service contracts are recommended to ensure ongoing maintenance of the systems.
- Each site must get a clear explanation of the warranty and service agreements. Define if vendor travel is included in the service agreements. The responsibilities of the site must be clearly identified so as to not void the warranty.
- Clarity is required of vendor obligations and performance clauses in contracts; this leads to lower costs for repairs and changes.
- The four-panel Destron system worked just as effectively as the eight-panel system, with less cost and less space required for installation.

Software

In Phase One, recording tag numbers was done by a third party using custom designed test software. That process stood outside the business process and operating software was not affected. In Phase Two, the objectives were to integrate the hardware and the software into the business process. Two sites rejected the offer of new operating software because the change that would be required in business process, the learning curve was too steep, and each facility had customized their software to align with their business process. A change to all new software was too much of a change in operating procedure. Phase Two-B studied basic functionality software that by-passed enterprise systems and stood alone on independent data entry devices.

Three things have been noted repeatedly throughout this research:

1. No two facilities are the same; each has a unique process flow and design. In many cases the existing software was custom designed for the user, this turn meant that any new software needed to be custom designed to integrate with the unique existing software.
2. Site assessments are critical to ensure that RFID hardware is installed in an area that fits with process flow. It was recognized in Phase Two that facilities have customized their business software to fit with their unique process flow. Just as there is no “one size fits all” hardware design, there is no such thing as a standard software module for any of the operating processes. Four of the 10 sites required additional customization of the modules that were purchased for their sites which, in most cases, doubled the cost of the software module. One site required a complete new business process system to accommodate Phase Two.
3. The higher the level of software customization, the higher the cost of RFID tags collection and reporting modules and training requirements. Software that stands outside the business process is more cost effective and reduces the demand on labor.

In Phase Two, with integrated software, the site personnel took responsibility for entering the data that correlated with the consigner or sales lot, and the challenges faced by the test sites were numerous, including:

1. Expertise on the software (previous version before the integration of the new modules) is essential to assist with ensuring that alignment with the other business functions. The test sites estimated the level of technical competency required to operate the software was an average of 3.5/5.
2. Recruiting personnel to work at auction markets is a challenge. Adding the requirement of personnel who are competent and comfortable with computers, accurate in keyboard skills to enter data, and accepting of new processes add to the recruiting challenge. Some markets have hired additional people to enter the data because the existing personnel did not have these capabilities.

3. Facilities with data entry at receiving had greater problems than those with the system at the sale ring. This was due to the yard staff generally being less comfortable computers. Taking on the responsibility of computer data entry was outside of their area of competency and added stress to the day.
4. Retaining personnel at these facilities is also a challenge. Once an individual is trained on the systems, retention is even more important as that is now a skilled position.
5. The test sites noted that the data entry by site personnel in auction markets, whether at the sale ring or at receiving, was an added stress in an already busy position. Inexperienced personal at either of these locations can slow down the speed of commerce by creating a bottle neck.

In Phase Two, most of the test sites complained about the lack of training provided as the software was deployed electronically and there was no in-person training. One facility specifically requested on-site training at a cost of \$1,200 per day plus travel. Although it wasn't an onerous task to learn the new tag capture software, time spent on technical support was extensive in some facilities due to numerous technical and process issues. In the words of one test site operator, "we have the software company tech support line on speed dial."

There was extensive data cleansing required in Phase Two and numerous data errors recorded in the CLTS. This was a result of the movement files not having any software rules to scan out the recording of duplicate tag numbers or numbers with invalid CCIA formats. The issue with numerous data errors is that the read accuracy became skewed, and the administrator required additional time to review the errors in the CLTS.

In Phase Two-B with data collection over a 24 hour period rather than by individual group/lot, greatly reduced the labor requirements. Software that was not integrated with management systems has a high ease of use, low labor requirement and high functionality. This software is pre-packaged and does not require customization, integration on network servers or management systems. If this software crashes, the business software is not affected.

Recommendation

- Integrated systems require integrated process. Yard personnel must work with software and this is generally not their level of expertise or competency. For a successful scanning and reporting program, it is strongly recommended that site have personal dedicated to the management and administration of this task.
- If facilities choose to have software that links into their business software, a site assessment by the software vendor is critical. This will ensure the software is designed to maximize efficiency within the specific business process and will also save expensive software modifications at a later date.
- Sites must determine if there is any value to them employing software that integrates with their business systems. If they do not perceive a benefit, choose basic functionality software that is not linked with enterprise systems.
- Internet access from the data entry device is important to enable the transfer of movement files to the CLTS.
- Install the software on a data entry device that can be operated by a competent individual in an environment that doesn't restrict process flow (receiving booth, office computers).
- When purchasing the software to document and report the tag numbers ensure that training is included and offered on the day the scanners are being used.
- Ensure there is training on the submission of the movement file to the CLTS.
- Purchase a technical support agreement with the software vendor to ensure that technical issues, bugs and processes are provided free of charge.
- The software for submission of tag numbers to the CLTS should scan out redundant tag numbers and formats that are not aligned with the approved CCIA tag number protocol.

Data Entry Devices

In order to record the tag numbers on software for movement reporting, a data entry device must be used. In Phase Two, there were several systems employed; some performed better than others.

The Panasonic Tough Notebook, at a cost of \$5,900, is advertised to withstand harsh environments. It did not perform well in a prolonged cold environment of -32C. It did start working again after it had been taken indoors to warm up.

The DT500 by Viewtrak Technologies was deployed at two sites, at a cost of \$7,900. The drawback to the DT500 is that software has to be customized to run on its operating system. A change to software is expensive and the device cannot be used to run any other software as the operating platform is unique to Viewtrak Technologies. It did perform well in cold and harsh environments but the cost/benefit was not favorable.

Thin client computers (that link with the network servers) and monitors, at a cost of \$700, were used at receiving. It was found that these \$700 devices performed just as well as the \$7,900 DT500 and the \$5,900 Panasonic laptop. The key factor to their use is that they must be housed in a protected environment such as a heated receiving booth.

Recommendation

- Choose the right data entry device for the location and protect it from the elements as much as possible.
- If basic functionality software is chosen, it can be installed on an office computer and therefore no additional data entry devices are required.
- The data entry device housing the software should be connected to the internet for ease of transmission of the movement files to the CLTS, and to facilitate online software training and technical support.

Integration of hardware and software

Phase Two and Two-B identified challenges of linking software and hardware given the different parameters in each facility, the different nuances of the enterprise software and RFID hardware, and the challenge of tying everything together. The time required to manage the installations in Phase Two was more than double that of the installations in Phase One.

The budget challenges in Phase Two were a result of linking the hardware with the data entry devices. Neither the hardware or software vendors took ownership of this piece of the integration. As such, when the quotes were obtained for the hardware and software there was no mention of the cost to link the hardware with the data entry devices. This required extensive CAT5 cabling, installed by qualified electricians, with the ends specifically configured to align with the data specification of the hardware and software. There was also a requirement for electronic hardware to link the cables and convert the signal; in most cases a digiboard was used. The challenge was presented when the hardware was already installed, the software was ready to be deployed, but there was no cable or network box to link the two together. The hardware and labour for this piece of the integration cost almost \$2,000 per site.

Another challenge with integrated systems is determining whether the cause of failure is the hardware or software. When the software stopped recording the tag numbers, the first call was generally to the software vendor. In some cases, the Project Manager requested the hardware and software vendors both visit a site to determine the cause of low reads, since the failure point was not evident with simple testing.

Recommendation

- In most installations, a dedicated project manager will benefit the installation of the system as there are many pieces that must come together in a coordinated and functional manner to be successful. These installations are technical and sites are best served by a dedicated resource to ensure the coordinated efforts of all parties. The project manager can be the hardware vendor or an outside party.
- The decision on both the hardware and software vendors must be made in advance of any installation.
- The hardware has to link into some kind of software to document the tag numbers and create a movement file. The software should be installed first and tested prior to the installation of the hardware.
- The hardware vendors should be made aware of the choice of software, the location, and the type of data entry device. Linking the hardware and software with cables, network boxes and adapters should be done by the hardware vendor, in consultation with the software vendor, and that cost should be included in the installation quote.
- The hardware/software combination should be tested before the hardware vendor leaves the installation.

RFID systems operation

In Phase One there was a dedicated project employee at each site. They were accountable for; recording data, evaluating read accuracy and working with hardware vendors to maximize read accuracy, daily testing of the systems read ranges to evaluate hardware reliability, and generally attempting to attain the highest read accuracy possible without physical interference of the scanning process. Phase One was a proof of concept; as such, it was important to understand the variables of the hardware in the environment in which it was placed.

In Phase Two, the site personnel assumed accountability for monitoring and maintaining the systems. The problem with this approach is that the site personnel are already fully engaged with responsibilities of their own. The receiving staff during peak times and the ring clerks during the sale, have to deal with high levels of activity and processes to complete their tasks without impeding the speed of commerce. Adding extra responsibilities in an environment where the staff is already exceptionally busy, adds stress and reduces commitment to working with the system. A ring clerk was asked if read range testing was done prior to each sale, her response was “it only takes about five to 10 minutes to do the testing and record the information, but how many extra five to 10 minutes do I have for all of these little jobs that need to be done on sale day?” Buy in and support of the program by owners, management and staff is critical to the success of any reading and reporting program. The integration of the RFID system into the business process will have more impact on some business processes than others, but all will experience some degree of change.

In Phase Two, two markets experienced dramatic reduction in read accuracy after installation. It was only because the Project Manager was monitoring the read accuracy report that this problem was identified. Hardware vendors were called to the site, made adjustments and read accuracy increased by almost 20% as a result of the modifications to the RFID hardware. Had the reports not been monitored, the system would have continued with low read accuracy, reducing the information available for traceability. In Phase Two-B, one facility had significant read accuracy issues, but due to a lack of time and understanding the problem was never resolved and tag collection and reporting was impaired. The importance of having a person responsible for the maintenance, monitoring and reporting on the RFID system is cannot be understated. A dedicated person is critical to successful operation of an RFID system.

Recommendation

- In order for RFID systems to be effective in support of traceability at auction market and buying stations there must be a commitment from the site to ensure the systems are working at optimum efficiency.
- One or two people, per site, must be accountable for working with the RFID system to ensure optimum performance of the readers and the software. This would include a commitment to:

- Be fully trained on the use of the readers and the software
- Conduct daily read range testing on scanning days
- Ensure the RFID hardware is functioning to the highest level and that the readers and alleys are well maintained
- Report inaccurate reads to vendors and trouble shooting
- Evaluate reports on read accuracy to determine trends
- Monitor the hardware to improve read accuracy; may require tuning, software updates, rebooting the systems
- Evaluate the RFID system integration with business process to determine if there are more effective methods to integrate the system, reducing the impact on business
- Evaluate the use of the RFID system to determine if there are any benefits available to the facility in the use of the tag collection data
- Advise the software vendor on more efficient data collection methodology

RFID systems and traceability

A limited window on industry compliance for the installation of RFID systems will create a bottleneck. It will be difficult to equip the entire industry in one year. RFID system installation requires extensive coordination, assessment and lead time on installations. A short-term ramp up for compliance could increase the price of hardware and software due to supply and demand. The systems, both hardware and software, are not technically capable of achieving 100% accuracy. During the research project, results established the technology used was capable of reading at approximately 90%.

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