



# final report

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# Developing innovative supply chain data capture and transfer platform for MLA's eNVD POC Trial

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### Abstract

Meat & Livestock Australia (MLA) engaged rural mobile applications developer MandraIT to develop an innovative supply chain solution to be used in MLA's electronic National Vendor Declaration (eNVD) Proof-of-Concept (POC) Trial.

Extensive consultations with industry stakeholders including processors, producers, saleyards and transporters enabled the developer to tailor the mobile eNVD solution to specific industry needs.

Giving careful consideration to the outcomes of industry consultations the mobile eNVD application for the MLA POC field trials was designed and built as a robust, secure and user-friendly solution.

The project is also helping to build a strong community of supporters of a national eNVD system willing to share their experiences with other industry stakeholders.

### **Executive Summary**

The project was designed to develop an easy-to-use mobile electronic National Vendor Declaration (eNVD) application (using Apple's iOS platform) that will make it simple for supply chain participants to exchange data electronically during Meat & Livestock Australia's (MLA) eNVD Proof-of-Concept (POC) Trial project in 2014.

The project required the development of a user-friendly interface to the MLA pilot database that would successfully capture, transfer and receive electronic data during the field trials.

An important part of the project was an extensive engagement process with key industry stakeholders including producers, processors, saleyards and feedlots. Industry feedback was collected at various stages of technical development and provided to the application developer to tailor the eNVD application as closely to industry needs as possible.

An integral part of the project was to select a group of trial participants committed to having their staff trained in using the eNVD during the field trials and to provide feedback on the process and outcomes to inform the overall MLA eNVD POC Trial outcomes.

As a result of in-depth training and education provided throughout the project period participants expressed confidence in being able to successfully record their supply chain transactions using the new eNVD mobile application.

During industry consultations the majority of stakeholders acknowledged the definite need for an electronic system. Feedback from industry emphasised that an eNVD solution needed to be user friendly and tailored to specific industry needs.

Accordingly the mobile eNVD application to be used in the MLA POC Trial was built as a robust, secure, user-friendly and industry needs focussed solution.

Key experiences and learnings related to the technical development and to the stakeholder engagement process were documented and communicated throughout the project period. The main learnings, issues and suggestions resulting from the project have been summarised in the final project report to facilitate sharing with industry.

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### Background

The project facilitated the development of an innovative mobile electronic National Vendor Declaration (eNVD) solution (using Apple's iOS platform) to be used during Meat and Livestock Australia's (MLA) eNVD Proof-of-Concept (POC) Trial 2014. The application was designed to facilitate the following supply chain transactions:

- producer to producer
- producer to sale yard and/or feedlot
- producer to abattoir and involving transporters.

As part of the project the mobile application developer engaged in extensive consultations with relevant industry stakeholders including processors, producers, saleyards and transporters.

The mobile eNVD application built during the project period incorporates functionality that guides and supports the user through filling out the NVD in its new digital format. Training and presentation materials were developed and users received training and education in using the application to ensure successful participation in MLA's field trials.

The eNVD application was designed to be as intuitive as possible while taking into account how it will be used in the field. Ongoing training, guidance and support will be provided to participants of the MLA eNVD field trials using the new mobile eNVD application to ensure smooth running and successful outcomes.

# **Project Objectives**

In summary the project aimed to achieve the following outcomes:

- 1. Build an easy-to-use mobile eNVD application (using Apple's iOS platform) that will make it simple for supply chain participants to exchange data electronically and replace paper based NVD systems
- Develop an innovative user-friendly interface to the MLA trial database that will successfully capture, transfer and receive electronic data during MLA's eNVD POC Trial
- 3. Create and engage with a community of industry users including producers, processors, saleyards/feedlots and demonstrate the benefits of an easy-to-use eNVD solution
- 4. Provide training and education to users, and develop training materials to support and guide participants in using the mobile eNVD application to record their supply chain transactions
- 5. Document the key learnings of the project to be shared by other industry stakeholders to inform future projects.

# Methodology

In order to achieve the five project objectives the steps detailed below were undertaken.

### Objective 1: Build easy-to-use mobile eNVD application

Throughout the process of building the new eNVD mobile application there was an underlying directive to always come back to the following three key principles:

- 1. default to the most likely action
- 2. show how it is done the first time
- 3. reduce the number of actions required until impossible to reduce any further

The steps followed in building the application are user-centric, so the following explanation of the overall approach taken also details the focus on usability.

- provided technical development team with detailed briefing on industry specific requirements and need for user-friendly and intuitive features to gain user commitment
- followed proven design methodology to arrive at a solution specification that encompassed the business requirements of the target audiences and key stakeholders from a use and value perspective
- worked backwards from the interface and process flow mapping to the data structures and applicable supporting technologies
- produced a detailed storyboard based on the design in order to validate (dry run) the interface and the supporting technologies and data structures
- rapid-built a test interface demonstrating the flows and proving the individual technologies to gain feedback from industry representatives and test set of indicative users
- revised flow and data structures based on learnings
- completed pilot build to timelines as agreed
- provided trial participants with test version of application at various stages of development
- collected user feedback via phone calls, emails and personal meetings
- incorporated user feedback into application design
- provided participants with re-designed versions of the application to confirm user expectations regarding ease-of-use and functionality of the eNVD application were met

### Objective 2: Develop innovative user-friendly interface to MLA trial database

- designed the interface to be as intuitive as possible since industry user adoption and buy-in was the number one success metric in this project
- identified the key data areas required to supply the structured data needed for MLA tracking requirements as per the MLA database and API supplied for the pilot
- applied mapping to ensure the actual data collected via the user interface and the assumptions made in the process modelling, supported the required data points to supply to MLA. Ensured this was applied in a way that both supported the real daily user processes and operating environment, and the needs of the legislative and operational requirements of the eNVD POC Trial.

Further validation, monitoring and continuous improvement activities are scheduled to be undertaken during the actual field trials as follows:

- validation during pilot to ensure requirements of both end user and MLA (data source and sink) are fully met
- utilisation of pilot findings to revise mobile eNVD solution prior to publication and release to the industry
- repeated cycles of validation and modification from learnings on an ongoing basis

### **Objective 3: Create and engage with community of industry users**

- established criteria required for selecting field trial participants including location, size, anticipated supply chain transaction, willingness to provide feedback and undertake training
- developed a list of potential trial participants meeting set criteria for the trials
- contacted potential participants by phone, followed up by email and held personal meetings as necessary
- promoted participation in MLA field trials and demonstrated the benefits of an easy-to-use national eNVD system to industry stakeholders at rural events and meetings
- shortlisted a group of producers, processors and transporters meeting the criteria for the field tests and willing to participate and provide feedback
- held meetings with shortlisted participants to confirm requirements for the trials and gain commitment for training and education
- confirmed willingness of field trial participants to embrace new technology and moving to a new digital system

### **Objective 4: Provide education and training and develop training materials**

- once a test version was available training and education was provided to users in operating the eNVD module built for the trials
- training materials including manuals and presentations were developed and provided to participants
- practical training sessions including onsite visits to participating producers and processors were provided to ensure best possible preparation and guidance for field trials
- field trial participants were equipped with the knowledge, information and support materials necessary to successfully record their supply chain transactions with the new mobile eNVD application
- demonstrations of the eNVD mobile application built for the trials were provided to audiences at selected industry events

### **Objective 5: Document key learnings of the project to be shared with industry**

- feedback from industry stakeholders was collected over the phone and during personal meetings
- throughout the project period key learnings related to both the technical development work and stakeholder engagement outcomes were documented.

### Results

Results achieved during the project period relating to each of the project objectives are summarised below.

### Objective 1: Build easy-to-use mobile eNVD application

Through formally collected and informal anecdotal feedback from selected test groups during development there was positive feedback on the overall design and flow.

The overall design objective to minimise the number of screens and number of interactions was successfully met. The overall design uses three main screens and one form navigation screen. This covers all functions to navigate, search, create, import, edit, view and share and makes the mobile eNVD application easy to use and imminently suitable for the MLA field trials. Further refinements will be possible once there is feedback from participants during the field trial phase.

A major advantage of moving from paper to mobile is increased process speed so users save time meeting their eNVD requirements in the new digital way. During industry consultations it was observed that the speed of filling a form digitally could potentially play a major factor in convincing industry users to make the switch from paper to digital. Taking this into consideration, the eNVD application developed for the MLA eNVD field trials was built with speed in mind. As an example, the application gives industry users the option to autocomplete any text in a field that has been entered there previously making the process fast and easy.

Industry users testing the eNVD application during the project period confirmed that implementing autocomplete functionality into the eNVD mobile application achieved desired speed and accuracy targets. The functionality reduced the number of times an eNVD user was required to enter the full field details and therefore reduced the chances of typographical errors. When the application was tested by various industry users it was demonstrated that this functionality alone had the potential to double the speed of filling out a form.

Industry users' feedback during the testing phase confirmed that the built-in functionalities of pop-up windows, pop-up alerts and auto-fill achieved their goals to guide and support the user through filling out the paperwork in its new digital format.

Examples of the design of the mobile eNVD application that show some of the user support and guidance features are contained in Appendix 1.

### Objective 2: Develop innovative user-friendly interface to MLA trial database

During final testing it was proven that the new application developed for the eNVD POC Trial was able to provide the required structured information to MLA in order to meet industry traceability requirements and ensure accurate records.

The project team was able to overcome some initial significant hurdles during the development phase. The developer of the mobile eNVD application aimed to design the fundamental structure of the interface and application flows to be flexible to enable easy use in day-to-day operations and reduce user "frustration". Initially, this appeared to be at odds with the MLA pilot API's simplistic flow and data model that

pulled only a bare minimum of the actual data collected during the consignment process. By over-simplifying the flow and being rigid in the process, the MLA pilot API in its initial design structure caused a number of roadblocks in designing the eNVD application.

Initially this proved to be a significant hurdle that was overcome by the project team taking innovative approaches to mapping the data from the real processes through a simple interface to reduce the API requirements for the pilot.

Despite the tight restrictions on workflow and minimal data points required by the MLA database and API, it has been proven technically possible to meet the data requirements in their current form.

The demonstrator/pilot application and underlying server have proven the selected approach and the mappings to the API.

### Objective 3: Create and engage with community of industry users

Extensive consultations with industry stakeholders including processors, producers, saleyards and transporters were held throughout the project period. As a result the project gained the support of major industry players who agreed to participate in the eNVD field trials.

Continuous feedback from stakeholders flowed into the design process of the mobile eNVD application at various stages of development and enabled the project team to tailor the application to industry needs. Guided by constant and extensive industry feedback the functionality of the new eNVD application was continuously tested and reviewed by key industry users.

Throughout the project period it was successfully demonstrated how the new eNVD technology could be used to the benefit of all players in the supply chain.

### **Objective 4: Provide education and training and develop training materials**

The project equipped eNVD trial participants with the knowledge, information and support materials needed to successfully record their supply chain transactions with the mobile eNVD application built for the pilot.

Industry participants expressed appreciation for thorough training and education provided throughout the project period. It was confirmed that the training and presentation materials developed as part of the project were fulfilling their purpose in guiding industry users through filling out the NVD in its new digital format.

As a result industry users involved throughout the project period confirmed that they felt well-equipped, trained and guided and expressed confidence in their ability to successfully participate in the MLA eNVD pilot project.

### Objective 5: Document key learnings of the project to be shared with industry

Key learnings from the project were communicated to MLA and other relevant stakeholders throughout the project period, with the main discussion points and suggestions summarised in the following section of this final report.

### Discussion

This section explores the learnings gained throughout the project period both with regard to outcomes from stakeholder engagement and the technical development work. Issues that were identified and suggestions for future work are contained under the relevant headings.

### Stakeholder Engagement

As part of the project, feedback was collected during stakeholder discussions and is summarised below.

### Producer Feedback

Feedback was collected from industry stakeholders continuously throughout the project through personal meetings and phone discussions. Participating producers were asked for feedback, comments and suggestions before, during and after the release of the final eNVD mobile application.

Comments provided by producers throughout the project are summarised below to emphasise some of the major issues they saw with the release and implementation of the new eNVD process.

- eNVD needs to be available whether in range or out of range and poor connectivity needs to be taken into consideration
- A stand-alone NVD is not sufficient with producers noting that the new process needs to be able to change and accompany all requirements to meet their markets rather than just narrowly focus on the eNVD
- desire access to consignees to gain approval for NVDs as soon as possible
- no interest in re-doing documents that are nearly identical from start to finish in a mobile device for example where some loads might have multiple NVD's to same location

### Transporters Feedback

Meetings were conducted with a range of small to large transporters to discuss how the new eNVD system would affect their operations and how it could assist their businesses. Main comments collected from transporters are summarised below.

- Transporters need to have the ability to add details and edit regarding any changes occurring in transit for example changes in drivers, spelling of cattle or if animals die or are left behind
- some transporters expressed concerns that the document contained a lot of irrelevant information to them, and only wanted to carry the one document where possible
- all in all transporters were keen to be part of the eNVD POC Trial

### **Livestock Agents**

Meetings were held with a number of agents to discuss any issues they saw regarding the eNVD project. Key issues raised by agents are summarised below.

- if cattle were sold from a sale yard how would the declaration be still valid on exit for the animals
- how would an agent store accompanying documents associated with the electronic documents

#### Processors

Throughout the project, processors were engaged through numerous personal meetings with different levels of management within relevant companies. Follow up phone discussions were held to ensure the application built for the eNVD trials met specific industry requirements.

Processors expressed support and enthusiasm for the eNVD project and were pleased to share key comments, suggestions and issues which are summarised below.

- expressed a need to see documents before they are submitted to ensure cattle in transit can be accepted at destination
- identified a need to be able to update the documents should the consumer and/or industry require it
- concern was expressed by some processors regarding the strength of the data being produced and MLA having direct access to it

### **Technical Considerations**

During investigation of the mechanisms to be utilised for "mobilising" the eNVD, various new technologies and novel approaches were implemented and tested by the project team to confirm functionality and suitability.

The main focus was given to the following issues:

- Data management
  - Data volume at rest
  - Speed in transfers
  - Self contained sharing (packing data into self-contained files that allowed full transfer)

### Connectivity

- Working off network
- Working with low bandwidth
- Intermittent connectivity

### Submission Security

- Authentication
- User Experience
  - Adoption

- Comfort
- Virality (The tendency of an image, video, or piece of information to be circulated rapidly and widely from one Internet user to another)

Several of the considerations overlapped, such as the desire to handle packaging and integrity of data, all overlapped with the data volumes required to transfer the content rapidly, whilst still meeting requirements for usability and experience.

#### Data management

In data management, the basic principles of development for mobile devices were especially important. A balance between offline cached data and online-only data needed to be achieved.

For example, uploading revised forms should not require re-submission of the unchanged answers for content that already exists on the server, and similarly for downloading new revisions.

Project focus was also placed on efficient transfer of documents. Industry users consulted emphasised they do not want to wait a long time for file transfers and may not have the luxury to do so in their day-to-day work day.

The project therefore utilised smart approaches to packing and compressing data in a lossless fashion. The aim was to be frugal in data transfer, such as pre-empting transfers with a negotiation phase to identify the minimal data required to transmit, and to ensure processes (as much as possible) were kept to smaller atomic functions to avoid large retry events in the case of interruption or failure.

#### Connectivity

Many of the data considerations led into the connectivity considerations as mentioned above, however the requirement for working off-network was paramount and not trivial to overcome.

The most complex requirement was working as much as possible between physical (legacy forms) and electronic (mobile) domains. This was one area that needs more investigation to arrive at a strong solution and outcomes of the field trials will help to inform and refine connectivity considerations.

There are ways to enable electronic forms to be shared with the ability to go to physical form and later loaded by another person via QR-Style barcodes, however this does not solve the ingestion of content physically added to the form before converting back to electronic.

#### Security

The primary considerations around Authenticity (confirming the identity of the user of the application is genuine) match up with standard practices for authentication in document exchange.

Use of these mechanisms to authenticate users and content were explored throughout the project period and proved to be equally applicable to the mobile eNVD application.

#### User Experience

User experience was of paramount importance since the target demographic was a demanding audience with specific needs and desires.

The primary concerns were to ensure a very simple interface with only a couple of screens as well as the minimisation of "clutter".

A hybrid table-view/wizard style interface was prototyped and tested, and was readily accepted by early test groups.

The choice of scrolling or using the "previous" and "next" buttons was discovered to be quite often flipped between by test users.

The use of "history" will be tested more thoroughly during the actual eNVD POC Trial phase.

### Suggestions

The project identified further improvements and additions that may be integrated into the MLA pilot database and API to support the requirements of the eNVD POC Trial more fully such as:

- The Form definition xml needs to be extended to include semantics about the particular fields and their relationships to each other. Otherwise any business logic surrounding the questions and their relationships (address lines/state/PIC/name/etc.) can only be hardcoded into the user interface and will break when the next form version is published.
- 2. The Form definition xml needs also to include computational information for the forms in an embedded formula script. Otherwise any business logic surrounding the questions and their relationships (total is made up of the sum of each number of head) can only be hardcoded into the user interface and will break when the next form version is published.
- 3. The Form definition xml also needs to encapsulate the semantic of the questions. This allows for more intelligence in the client end to integrate into existing and new systems. Without this semantic tagging, the client software needs to maintain its own semantic mapping, which will of course break with the publications of a new version of a form.

Essentially, the business logic for each form needs to be encapsulated in the form definition xml to correctly implement the ability to revise forms through publishing a form revision alone. Without this capability, the software company will always need to be contracted to update the application before any new form is published.

As part of the project process a number of areas were identified in which the API was either deficient or architected in a sub-optimal way for use in a mobile solution such as the points identified below.

- the submission of forms, (each form revision), was architected to expect a complete form submission (all fields) on each submission, rather than accepting only a "delta" approach. This inherently requires far more data transfer and therefore a longer transfer time, with an associated increased risk of interruption or failure. This approach is quite common in web interfaces where the form submission encapsulates the entire form content on each submission.
- The flagging of submissions as "consignor", "transporter" and "consignee" submitted statuses following a linear and restrictive prescribed flow is somewhat restrictive and requires a certain amount of business logic in the client end rather than being encapsulated in the form description. Project outcomes suggested that more thought may be put into the form definition language and protocol and the submission process to allow a more side-effect style submission capability, or to relax the linear approach to form progression. An underlying assumption of the approach tested on the mobile end was to try and model "real life" as closely as possible. This means that anyone can technically fill in various sections and people make business decisions on these technically noncompliant forms. So the business record should be retained as it led to the decisions that were made, not rejected as

the tool then becomes useless to the end user. If there are certain conditions that need to be met to be compliant then these infractions should instead be logged and reported for later follow-up.

 The current form description language needs to be enhanced to encapsulate relationships and formulas. The current description language does not allow description-based encoding of the total of a number of fields to be entered into a "total" column and does not provide hints on relationships such as the coupling of street address, suburb and state with the destination PIC to allow fast selection.

This last note on the descriptive language for form definitions appears to be an essential point rather than a "nice to have". The project identified that the current approach may not be maintainable without most likely requiring work from programmers when a form definition is versioned.

Without the business logic encapsulated in the form definition, the programmer is forced to hard-code the sum formulas and overlay the "implicit" logic. So when the form is updated and the fields are in a different order, or the IDs change, then the form logic will break. This will require coding work to fix and would appear to defeat the essential requirement to have the form definitions configurable.

The issues identified are not insurmountable, and with some careful thought a rather simplistic descriptive scripting language could be formulated to allow the programmer to interpret the forms and not hard-code the business logic.

## Conclusion

A main focus and guiding principle in the development of a mobile eNVD POC Trial application was user friendliness. The aim was to overcome any potential reluctance by industry stakeholders to embrace new technology. The eNVD application for the MLA eNVD POC Trial was therefore designed to make life easier for industry users with the ultimate goal to help industry stakeholders increase their productivity and profitability.

As a result producers, processors, transporters and other industry stakeholders consulted during the project period acknowledged that the solution built for the trial was easy to use and intuitive. Companies selected for participation confirmed their willingness to share their learnings from the eNVD POC field trials and provide feedback on the eNVD process.

The mobile eNVD application for the MLA eNVD POC field trials was developed with the industry user and their specific needs firmly in mind paving the way towards a fully digital eNVD system across Australia.

The project identified several suggestions for improvements to the MLA pilot database and API to assist in facilitating successful outcomes of the impending eNVD POC Trial.

The project team will continue liaison with MLA's eNVD POC Trial project team to follow up suggestions and continue discussions. Feedback from industry users during the actual field trial phase will play a key role in informing the overall MLA eNVD POC Trial project outcomes and recommendations.

# Appendix 1



### eNVD Ease-of-Use Features – Design Examples

(i) [O] **K**Back **New Form Recently U** Import from barcode mla Scan the barcode from an Cat NVD form to import it mla **Generic Cattle MLA Forms** Sheep and Lambs [↓] mla **Γ**↓] Goats mla **Bobby Calves** F↓] mla

> In the eNVD POC Trial application the user interface is designed to be as intuitive as possible. Pop-up help messages are available to guide the user through the application and whenever the information button is pressed.