Final report

Data stocktake, analysis and implementation roadmap

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Executive summary

Background

Realising the opportunity to create new value from data is a high priority for the livestock export industry. The ambition of the *Data stocktake, analysis and implementation roadmap* project (the project) is to drive a wide range of benefits in performance, transparency, and efficiency through mechanisms such as benchmarking, supply chain data sharing, reporting of performance to the community, and the use of data to justify evidence-based reforms to regulation. Livestock export industry data and insights are also recognised as key enablers to achieving the LEP RD&E Program's key focus areas related to animal health and welfare, supply chain efficiency and market access.

Objectives

The objectives of the project were to undertake a stocktake of the current data landscape within the livestock export supply chain (from the farm of birth/origin to in-market facilities), conduct a deep analysis of the data and develop an industry roadmap to standardise the collection of data throughout the supply chain. The project also considered data initiatives currently underway to identify gaps and opportunities and how they might integrate into the roadmap. Although this was a complex project, the objective was achieved and uncovered new insights to help guide the livestock export industry toward digital transformation.

Methodology

A service design methodology was adopted to achieve the project objective. The focus was on understanding the lived experiences industry stakeholders have of data collection processes along the livestock export supply chain. Semi-structured interviews (12), stakeholder workshops (3) and industry and compliance documents were used to inform the data stocktake. Thematic analysis of stakeholder interviews and documentation was undertaken. Insights from all project data were used to develop the project deliverables.

Results/key findings

Over 400 data points were identified along the livestock export supply chain. Eighty-one data pain points were identified and categorised into six core themes. Most data points were perceived by exporters to be compliance data without any productivity benefit to collection. Following stakeholder analysis, four personas were identified to describe how different stakeholders understand and act on industry data. The completed data stocktake identified six key insights:

- Most data points along the supply chain are perceived as pure compliance data without any greater productivity benefit
- High complexity in data requirements has resulted in duplication of bespoke systems, processes, and forms by different exporters
- Accuracy and efficiency of data points are impacted by different collection methods (e.g., paper-based)
- Lack of data value in current data collection methods and the level of accuracy of the scoring system in some areas of the supply chain (e.g., ships and facilities in market) may inadvertently

impact animal health and welfare by drawing on the assessment of averages

- Exporters collaborate in market to address regulatory challenges, share in-market non-commercial knowledge, and share tasks around data collection
- Supply chain stakeholders would benefit from current information across the whole supply chain to make informed business and animal welfare decisions.

Benefits to industry

A comprehensive data stocktake across the livestock export industry has helped to identify opportunities to drive a wide range of benefits including performance and transparency advancements, as well as increased supply chain efficiency and animal welfare. These significant benefits can be realised if the industry acts on the three recommendations described below. The data roadmap within this report conceptualises the pathway to realise the benefits. It can also be used as an evaluation tool for other data and digital projects to determine how they fit within the data roadmap.

Future research and recommendations

Recommendations from this project have the potential to transform the sector through digital solutions as an enabler for process efficiency improvements through the supply chain. Most urgently, digital solutions can help reduce the current burden of compliance and reduce the high number of pain points and bottlenecks, for exporters and veterinarians. Digital solutions can also be the key enabler to better connect stakeholders (producers, exporters, veterinarians, LiveCorp, MLA and the government) and create mutual benefits by addressing common problems. There are also opportunities to progressively value-add to the sector with digital technologies and innovations that can create practical value. The three recommendations below describe how the industry can unlock the potential benefits.

1. Develop industry data capability for the livestock export industry:

    a. Establish an industry data taskforce or working group to drive the implementation of the industry data roadmap

    b. Validate industry-wide digital maturity levels and key capability gaps to inform a digital skills and capability development program for the industry

    c. Develop a collaborative data strategy with the livestock export industry and with the regulator to maximise adoption through enablement of regulatory and productivity benefits that will support long term industry growth. The foundation for a data strategy must reflect the key insights from the data stocktake.

2. Develop a livestock export industry platform solution to improve collection and sharing of data across the supply chain. Explore linkage opportunities with other livestock industry data projects. Use insights from this data stocktake and undertake a progressive experimentation process that thoroughly engages industry stakeholders and regulators.

    a. Experiment 1 – Design and test new data collection methods, including automation, IoT sensors and data standardisation

    b. Experiment 2 – Create new value from data through analytics and improved user experience solutions

c. Experiment 3 – design and build a reporting application for dual productivity and regulatory benefits

3. Design and develop sensor-enabled capture of the animal welfare indicators outlined in the SAWS report and ensure they can be applied in practical contexts in the livestock export context (e.g., on ships, quarantine, feedlots).

   a. Establish a higher degree research program and collaboration between DAWE, a university (veterinary science) and the LEP RD&E Program to develop an evidence base for animal welfare indicators and KPIs

   b. Conduct an R&D project to develop and validate sensor-enabled objective animal welfare measurement KPIs with livestock export veterinarians, exporters, and producers

   c. Build evidence-based animal welfare indicators and KPIs into a shared dashboard tool to increase consistency and value for all stakeholders, noting that this requires data collected over a period of time.

   d. Conduct an R&D project to explore the potential use of data to redefine commercial arrangements and incentives based on evidenced livestock quality and welfare condition scores throughout the voyage, leading to better quality stock delivery to end customers. Identify options and consider barriers and implications to nodes in the value chain from objective data-enabled contract arrangements.

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1. Background

Recognising the value of both producers and exporters to the livestock export supply chain, LiveCorp and Meat & Livestock Australia (MLA) run a joint program known as the Livestock Export Program (LEP).

- The collection, aggregation, analysis, sharing and use of data and data derived insights is recognised as a **core enabler** for the livestock export industry and the LEP RD&E Program to achieve the **goals and priorities** related to animal health and welfare, supply chain efficiency and market access.

- It is a **high priority** for the livestock export industry (producers and exporters) to make **better use of data** and information to drive a wide range of benefits in performance, transparency, efficiency, and improvements through mechanisms such as benchmarking, supply chain data sharing, reporting of performance to the community, and the use of data to justify evidence-based reforms of regulation.

To build its capability around data collection, aggregation, analysis, sharing and use of data, the LEP requires a comprehensive understanding of the current data landscape for stakeholders within the livestock export supply chain. The LEP recognises that:

- Previous mapping of the use of data by exporters (undertaken in several earlier IT projects) has shown there is a wide variation between the types of data, how it is collected, the tools used to collect it and what is done with it. A wide reaching stocktake was required to get an **accurate picture** of the current data landscape.
    - Identification of any significant **current data gaps** that are of a high perceived value to stakeholders.
    - Identification of **concerns and roadblocks** of supply chain members regarding the sharing of data with other stakeholders or components in the supply chain.
    - Determining the **issues or potential roadblocks** that need to be overcome to enable data to produce individual business, supply chain and industry benefits is necessary.

2. Objectives

Through this project the LEP sought to undertake a data stocktake, analysis of data and its uses, and produce an implementation roadmap for data initiatives to address the above needs. The main project objectives were as follows:

- Undertake a stocktake of the current data landscape for stakeholders within the livestock export supply chain (from farm of birth/origin to in-market facilities).
- Use Service Design methodology to undertake 'user interviews' to determine what data or information members of the supply chain and potential data users need, want or value – particularly in relation to the goals of advancing animal welfare improvement, supply chain efficiency, market access and business profitability.
- Conduct analysis to:
  - Create a plan identifying what data should be collected and for what purposes
  - Determine what data the RD&E program should focus on as priorities for standardisation
  - Determine the issues or potential roadblocks that need to be overcome
  - Develop a data roadmap for the industry.

3. Methodology

A service design process was adopted as the project methodology to uncover key value for the LEP and the livestock export industry in Australia. The methodology is divided into four steps – discover, define, develop, deliver - and focuses on stakeholder experiences and the perceived quality of data collection processes along the livestock export supply chain. This includes points of intersection/connection (nodes). The project method, phases and key project activities are visualised in Figure 1.

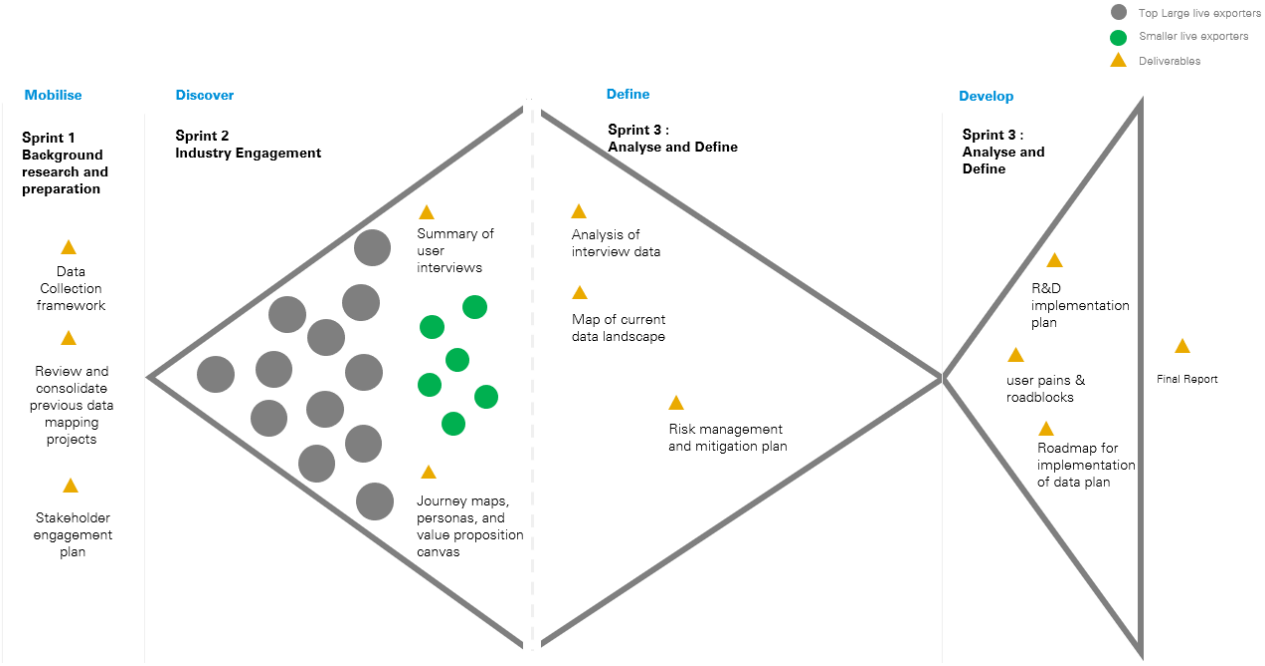


Figure 1 - Double diamond framework

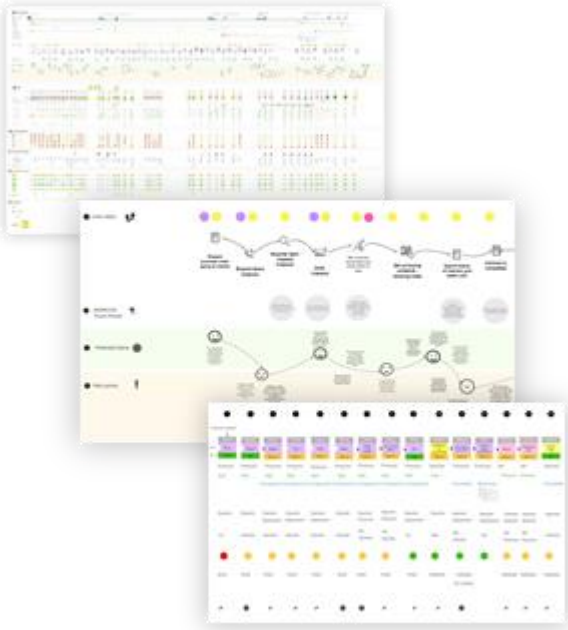
3.1. Discover – industry engagement

The objective of the Discover phase was to engage with participants of the supply chain to understand data collection from their perspective. Using a data collection framework, the project team conducted 16 stakeholder interviews which included exporters, veterinarians, industry committees and government regulators to discover data processes, pains, and gains.

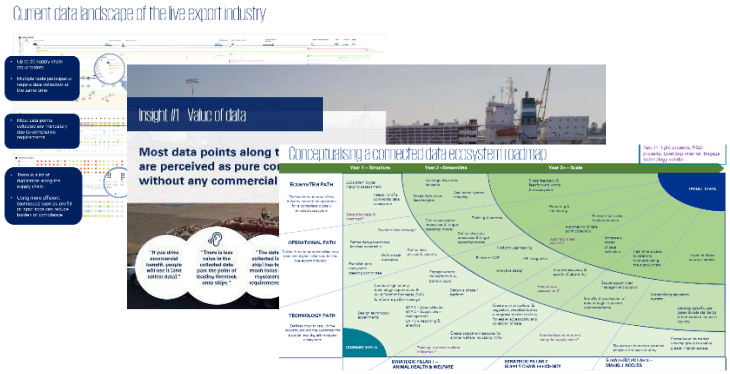
Data collection forms were also obtained to support findings and gain a holistic view of livestock export data collection processes. An initial mapping of the gathered information including processes, pains and gains provided a comprehensive understanding of the livestock export supply chain and its participants during the discovery phase. These key activities informed outputs including a summary of user interviews, journey maps as well as personas and highlights what users want, need and value along the supply chain.

3.2. Define – analysis and synthesis of data

Building on the industry engagement in the Discover phase, an iterative process of analysis and synthesis was undertaken. Data collected from supply chain participants was analysed to identify where there was value in data that might inform value propositions and strategic opportunities to transform the industry. A map of the current data landscape was produced, and each layer of the map analysed to identify trends across the industry nodes and data types. For example, stakeholder pains and gains were consolidated into themes and the value of data points to each persona defined. This was achieved using the MoSCoW prioritisation method of Must, Should, Could or Would have. The value of data points was weighted against the LEP RD&E Program's focus areas of animal welfare, supply chain efficiencies and market access to identify gaps and opportunities.



3.3. Develop and deliver – insights and value propositions



Building on the previous phases, the Develop and Deliver phases involved the identification of key insights, value propositions and a roadmap for implementation through to 2025 and beyond. Key insights were based on the pain point themes, as well as the value of data to personas. A total of nine key value propositions were developed and aligned to the LEP RD&E Program's focus areas (animal health and welfare, supply chain efficiencies and market access) to inform future initiatives and R&D projects. The roadmap was developed to assist the LEP with the implementation of a connected data ecosystem for the livestock export industry including a risk management plan to overcome industry roadblocks.

The service design process identified 400+ data points and 81 pains along the livestock export supply chain and six pain point themes (Figure 2). Qualitative data from the various stakeholder engagements were synthesised into four representative personas to show the different needs, experiences, behaviours, and goals associated with data.

4. Stakeholder engagement

Using the service design discover process, 16 stakeholders from across the livestock export industry were interviewed to gather perspectives on how data is being collected across the supply chain. A data collection framework was used to collect and sort the information, process steps, forms, and artefacts from each interview. This identified over 400 data points, 81 pain points and four persona groups (Conservative Chris, Progressive Paula, Challenging Catherine, and Regulative Rick).

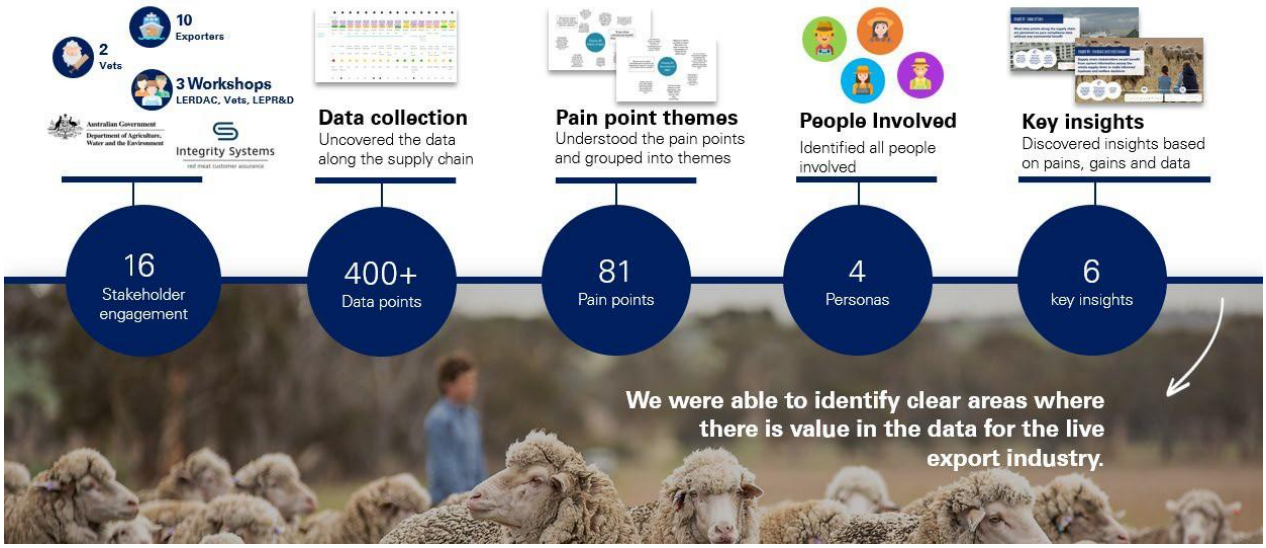


Figure 2 – Summary of service design process

4.1. Data sources

4.1.1. Interviews

Semi-structed interviews were conducted with 16 stakeholders including exporters, veterinarians, service providers, and industry bodies (see table below) to understand the current state of data in the livestock export supply chain. Standardised interview questions asked during consultations to collect information on the relevant steps, pains, gains, roadblocks, and data points to capture different perspectives and experiences are defined in Appendix A. Consultations were held virtually using Microsoft Teams to enable broad participation during COVID-19 health restrictions, and information was gathered in an interactive 'Mural board' where stakeholders were able to review and validate the information collected. The table below lists the stakeholders interviewed over a period of three months.

The LEP RD&E Program and the project team would like to acknowledge and thank all the stakeholders who gave up their time to participate in engagement and interviews.

Table 1 – List of stakeholder consultation

ORGANISATION	ROLE	DISCUSSION POINTS	DATE
Halleen Australasian Livestock Traders	Exporter	Discussion with stakeholders to understand the process of the livestock export industry and the data being collected, as well as pressure points experienced along the supply chain	24/02/22
South East Asian Livestock Services (SEALS)	Exporter		22/02/22
Frontier International Agri	Exporter		14/02/22
Southern Australian International Livestock Services (SAILS)	Exporter		07/02/22
Austock Rural	Exporter		08/02/22
Rural Export and Trading Western Australia (RETWA)	Exporter		28/02/22
Individual	Veterinarian		22/02/22
Individual	Veterinarian		23/02/22
Integrity Systems Company (ISC)	Service provider		15/03/22
Unique Excellence	R&D project lead - 'Improving regulatory efficiency and consistency through standardised export declarations'	Discussion to understand synergies between projects and draw from shared learnings	10/03/22
Australian Accredited Veterinarian (AAV) RD&E Forum	10 x AAVs	Presentation and discussion at industry AAV workshop	23/11/21
Livestock Export R&D Advisory Committee (LERDAC)	Strategic advisory body for the LEP RD&E Program	Presentation and discussion at industry workshop	29/11/21
LEP RD&E Program research webinar	Approximately 30 x exporters	Part of a workshop presentation on current industry R&D projects	18/01/22

4.1.2. Forms and artefacts

As part of the industry engagement, forms and artefacts were collected from stakeholders to further inform the discovery phase to provide a holistic understanding of data along the supply chain and the data maturity of the industry. For example, forms included a series of Excel spreadsheets such as LIVEXCollect used to collect regulatory information on ships.

4.2. Process steps along the supply chain

A user journey map, shown in Figure 3, was developed as part of the overall data stocktake to summarise the steps that stakeholders take along the supply chain and their pains and gains associated with each step and data point collected along the supply chain.

Figure 3 - Overview of initial user journey

4.3. What the project team heard from stakeholders

The images below highlight comments from stakeholders collected during stakeholder consultations. The comments were aligned to nodes along the supply chain and against the LEP RD&E Program's three focus areas of animal welfare, supply chain efficiencies and market access.

4.3.1. Animal welfare

Animal welfare is a key focus for the industry and underpins its operability through various animal welfare standards such as ASEL 3.2. Utilising meaningful data can lead the way in the advancement of animal health and welfare within the Australian standards and industry codes, while providing added commercial benefit.

Sourcing criteria	Transporting livestock to quarantine facility	Quarantine facility	Transporting livestock to destination	Discharge	In-market
"We are doing anything to help with the health of animals on ships [i.e., vaccination]" **"We developed our own best practice manual for air freight"** **"We started our own project late last year to analyse correlated data i.e. weight more related to troughs getting cleaned etc."**	**"6 point plan is great, the verification of photos and videos of animals is great and the only way to ensure that everything is done correctly"**	"No communications from feedlot on vaccinations" "We have our own health certificates which we send to the department to sign off – its easier ad has less room for mistakes" **"Feedback and feed-forward – I want to know what is going on between the feedlot in Australia and loading"**	"Feed quality scale has 3 options. A slight amount of fines, hard pellets, high grain content, different for different decks" **"Can't monitor welfare of 3,500 head of cattle based on an average"** "Our cattle lose weight on board. It's a very fine art to have weight gain [on sea journey]. Difficult to retain the level of people due to COVID that can do that". "Can't see what animals I treated 3 days ago".	"There is no manageable data. More and more data is being recorded with no real difference. It just takes time away from tending to animals".	**"If cattle leave the supply chain, they will be exposed to bad animal health and welfare".** **"What are the things you're actually trying to answer?"**

Figure 4 - Comments from stakeholders relating to animal welfare

4.3.2. Supply chain inefficiencies

Current data collection methods along the livestock export supply chain are characterised by duplication, limited data sharing, bespoke systems, and inaccuracy, as highlighted in Figure 5. To reduce inefficiencies and create meaningful data, processes along the supply chain need to be overhauled collaboratively with industry, regulators, and other stakeholders.

"There is a lot of duplication on this side of the ocean"

"NOI – so difficult to lodge"

"**TRACE used to be just a communication point, now it is an approval point as well. However, the regulator is mostly not contactable if a problem occurs"**

"Limited amount of people that know how to do an eNVD so they're all paper"

"Common to have mistakes [on paper forms], so we need to chase them up to get them fixed"

"NLIS is one the most ineffective and clunky systems but one of the most relied on systems in the country"

"Centralised data is a hard sell. We want to manage our own data"

"Spreadsheets are the best way to do it but they are very messy"

"We have a lot of ideas around dashboards and apps"

"We need to get standardisation of documents – one set of documents nationally, no matter if importer or exporter"

"We have our own health certificates which we send to the department for sign off – its easier and has less room for errors"

"More data is required. Taking longer and longer which takes away time from tending to animals"

"If a digital solution does the job to 60%, people will rather use their traditional methods of collecting data"

"We want to go further with data – for instance, to adjust costing models for timing of year, based on timing trends"

"We need more manageable and meaningful data"

"ESCAS needs a standardised template for the Department"

"LIVEXCollect forms are better than what we had before – god send in some ways to be able to work of a standardised point across industry, but still figuring out what to do with data".

"File storage – exporters responsibility. Department says just keep it on file"

"The department is very slow in assessing information which makes it difficult for us if data is requested from a while ago".

Figure 5 - Comments from stakeholders relating to supply chain efficiencies

4.3.3. Market access/in-market

Market access is the third focus area of the LEP RD&E Program. Besides animal welfare data collection, protocol requirements are another major data contributor to the industry. In-market data is also important. However, complex data requirements, limited standardisation, and data access in importing countries are causing issues for exporters to provide regulators with sufficient and meaningful in-market data on animal welfare.

"COVID made it even more difficult to personal relationships with importers"

"Everything we collect [data] is for compliance with protocols of importing country"

"We've got issues with customs when importers are not listed on export certification list"

"We need to implement a traceability system and communicate it gently with importers"

"High-frequency tags would make a huge difference, especially in high-risk markets. Data collection on RFID is a pain point for us"

"There are no standardised requirement documents across markets"

"Certain diseases [on farm, quarantine] can hold complete trade"

"There are a lot of blackspots with verification. Some don't even have to provide trucking documents. We want data verification in all markets to hold stakeholders more accountable".

"ESCAS data helps manage the risk in-market"

"Importers dislike ESCAS. All of a sudden there is another policy on breeder cattle. What is reasonable, let's work together".

Figure 6 - Comments from stakeholders relating to market access/in-market data

4.4. User personas

Four fictional personas – Conservative Chris, Progressive Paula, Challenging Catherine, and Regulative Rick – were identified from the stakeholder engagement process based on interviewee motivations, behaviours, values, and needs. The displayed personas can help understand different participants along the supply chain and identify their potential supply chain issues and needs, highlight digital capabilities, and could further inform actions to reduce risks, as well as increase capabilities.

4.4.1. Persona 1 – Conservative Chris

Meet Conservative Chris

No technology wiz	Worried about non-compliance
Wants tools that are easy to use	Frustrated with the current situation
Cautious of sharing data	Limited interest in data

What are my motivations?

- I'm motivated to sell high quality and healthy animals but I want to do so on my own account with minimal data requirements.
- Data overly complicates trades. I want to adopt a simplified way of exporting animals that takes the guess work out of sourcing livestock to improve my business.

What are my behaviours?

- I only share data that is required by the department. I don't want to complicate it further by collecting and sharing more data than necessary.
- I like to keep it simple - I buy cattle from farmers and I put them on a ship to sell them to a destination.
- I'm the oldest person on the team but run all IT and support.
- Accessing sufficient quality cattle numbers is difficult; I am curious to see whether forecasting can improve the quality and health of animals.

What are my beliefs and values?

- I believe that too much data overcomplicates this simple trade.
- I believe simple, semi-automated spreadsheets are the way to go, but they are currently very messy.
- I value the automation of data entry to simplify the process.
- Animal welfare is integral to my job as an exporter. Having quality cattle stems from good practices and can increase my revenue.

What are my needs?

- I need tools that are easy to use and simplify the process of exporting cattle, like a summary of a spreadsheet to have instant access 10 the information that are relevant tome.
- I don't have any ambition to share more Information In the future, but I do need meaningful data that provides me with qualitative analysis and feedback.

4.4.2. Persona 2 – Progressive Paula

Meet Progressive Paula

Deep knowledge of compliance processes	Active in the community
Forward-thinking	Develops own tools and forms
Early technology adopter	

What are my motivations?

- I use tools such as Microsoft Access and build an inhouse data base to store our files. Hence, I'm very motivated to improve current data collection systems to have more meaningful data.
- I am motivated to bring the industry together and develop a single, standardised system that provides accessible information for everyone to solve our challenges.

What are my behaviours?

- I'm an early adopter of technology - the department uses our systems and forms as best practice examples.
- I'm collecting more data than necessary, because it can help our business' bottom line and improve animal health and welfare.
- I like to keep connected and involved with other stakeholders from our export community.

What are my beliefs and values?

- My biggest problem is to ensure that our team knows what's going on and I believe that the tool for that needs to be simple and precise.
- I believe that sharing more meaningful data through the use of easy-to-use technology can result in better overall outcomes.
- I'm a big believer in animal welfare and the improvements I could make through more meaningful and correlated animal welfare data. However, current measurements are not representing a true picture and it is difficult to assess animal health and welfare based on an average of 3,500 head in a shipment.

What are my needs?

- The department wants everything – I need clear lines of what's important to capture and share to improve the export supply chain.
- I need tools like an easy-to-use smartphone app to collect and access real-time data that provides instant feedback.
- We as an industry need to work together to improve data collection, standardisation and help others to understand the importance of meaningful data.
- If regulators are providing digital systems there needs to be a support and contact structure in place to help with problems 24/7.

4.4.3. Persona 3 – Challenging Catherine

Meet Challenging Catherine

Deep industry knowledge	Develops own data points
Focused on animal needs	Frustrated with the current situation
Capable of connecting with digital solutions	

What are my motivations?

- The current data points have no meaning. I'm motivated to change the way the industry thinks about data collection and start with "why" to collect data that is useful.
- Our trade lives and dies with the health and treatment of an animal. I'm motivated to simplify data collection to have more time for my actual job – caring for animals.
- More and more data is being collected that doesn't make a difference. I'm motivated to create manageable data that provides better insights and informs our decision-making.

What are my behaviours?

- I use my traditional data collection methods because current digital systems don't help me with doing my job one hundred percent.
- I collect other data points that have an actual impact on the welfare of an animal on top of the provided indicators, which have minimal meaning.

What are my beliefs and values?

- I believe that people are capable of connecting with digital solutions as long as they are useful and do the job one hundred percent.
- I believe that average data is meaningless and doesn't provide any insights into what is actually happening.

- I value meaningful data collection and correlated analysis that help me understand the journey of an animal to act rather than react.
- Animal health and welfare is our social license to operate – but I believe the current data collection exercise takes away important time to tend to animals without having a real impact.

What are my needs?

- I need meaningful and manageable data points with a different scaling system that provide me with an actual picture of what is happening across the supply chain.
- The industry needs to start at the end and work to the front. We need to formulate the questions the industry wants to have answered to collect the right data.

4.4.4. Persona 4 – Regulative Rick

Meet Regulative Rick

Focused on compliance	Believes technology could make compliance easier
Fears misuse of data	Wants data standards for compliance
Believes compliance is key to assure animal welfare	

What are my motivations?

- I am motivated to create tools and solutions to assist and simplify the data capturing of livestock across the entire supply chain.
- Compliance is the only way to keep this trade alive as the way to ensuring of proper procedures and management of live exporting is maintained across the industry
- I care about the public perception of the live export industry and believe that compliance is the key to assure animal welfare.

What are my behaviours?

- I am focused on driving data through the industry.
- I collect data needed for regulatory requirements using provided forms and systems.

What are my beliefs and values?

- I believe in the correct usage of data captured and the correct guidelines and provisions to assist and assure the correct and proper use of data.
- I believe in the automation of data collection wherever it is useful and can be used.
- Animal health and welfare is the main factor and consideration when data is being collected to provide assurance of acceptable animal health.
- I value the integrity of the industry.

What are my needs?

- People are struggling to adopt to regulatory systems and forms. I want technology to make compliance easier rather than more complex.
- I want to understand the role of government regarding industry data and compliance.
- I would like to see specific data standards to know the benefits of my data.

5. Analysis and synthesis of data

Building on the industry engagement, an iterative process of analysis and synthesis was undertaken. Using synthesised data, a map of the current data landscape was produced to analyse each layer and identify data gaps, as well as trends across the supply chain. In addition, data points were weighted based on their value for personas and their impact on the focus areas of animal welfare, supply chain efficiencies and market access. The following section uncovers the analysis of each layer and the respective data in more detail to inform opportunities and value propositions for the industry.

5.1. Map of current data landscape

Using synthesised data from stakeholder interviews, a mapping exercise was conducted to bring together each element and represent the linkages in a current state format. An interactive map (Figure 11) has been created to visualise the complexity of elements and linkages in a simple way. From a birds-eye viewpoint a full overview of the supply chain can be seen, along with the areas which have a high frequency of interaction. Narrowing in on individual nodes presents specific detail of the nature and use of data at stages in the supply chain in detail.

The map below represents an overview of the full map of the current data landscape. In the following analysis, each layer is shown in greater detail and has been interpreted individually to uncover the impact and trends of data points across supply chain nodes and personas.

The map is available as a separate document, allowing readers to zoom in to read the detail shown in the Figures below.

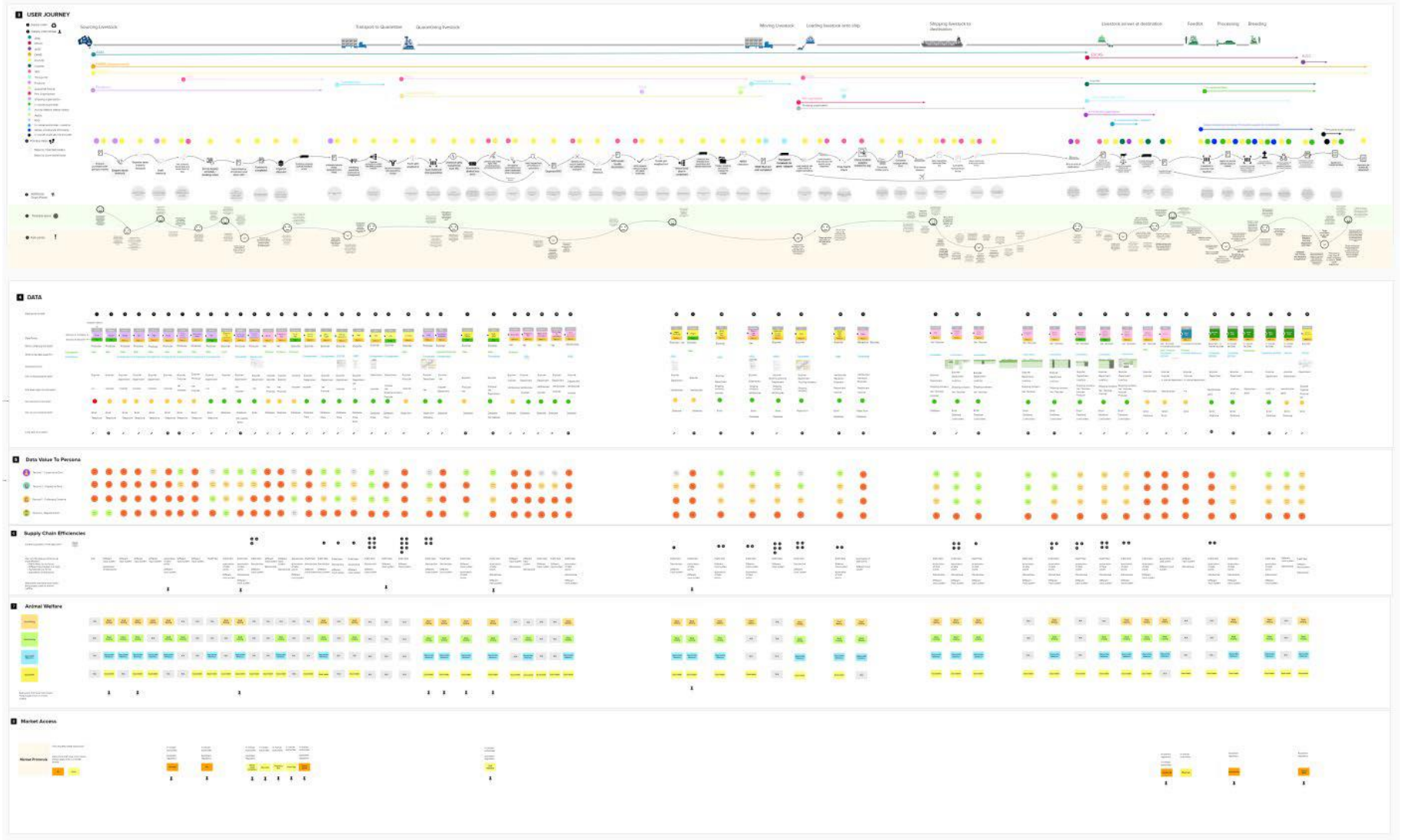


Figure 7 - Current state livestock export data map

5.2. Uncover layers of current data landscape

Insights from the stakeholder interviews were synthesised to identify key insights, themes, and priorities at an industry level. Synthesised data was then added into the data collection framework to validate supply chain node, data type, benefit, capability area and value proposition. The sections below break down the current state data stocktake map (Figure 11) to show the project team's analyses and findings.

5.2.1. Supply chain nodes

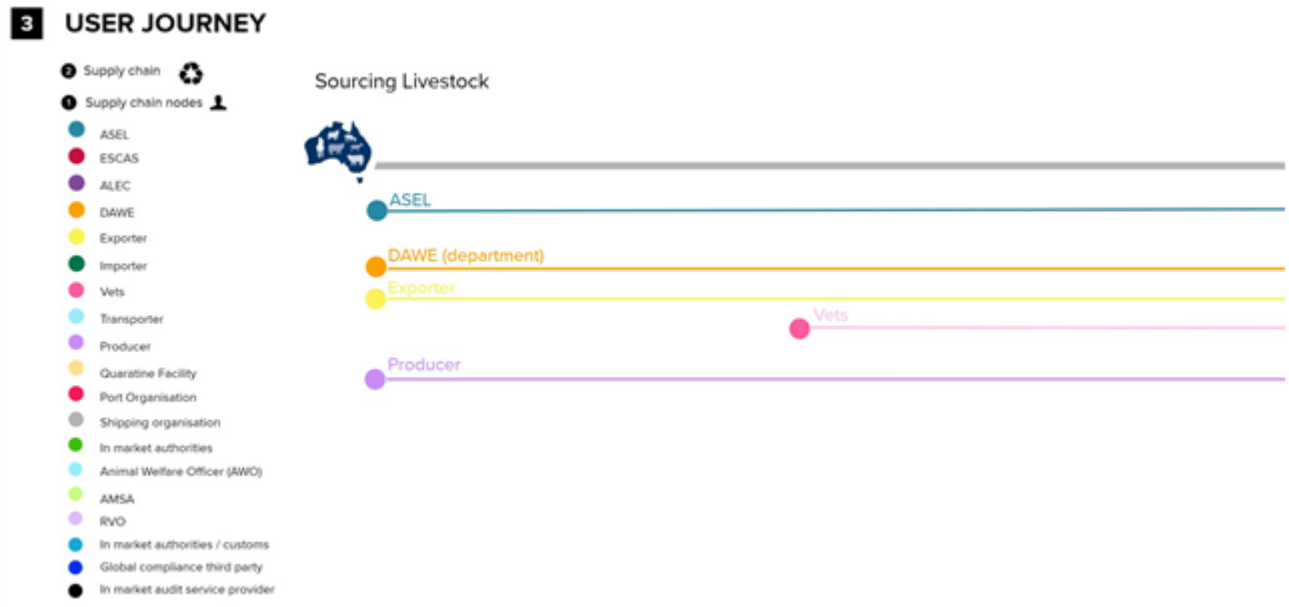


Figure 8 – Excerpt of supply chain nodes

Data collected was used to determine each of the nodes across the supply chain and the timeframe each participant is involved in the process. Mapping each node, enabled the identification of where nodes overlap and at what point each of them collect or input data across the supply chain.

Analysis of the different supply chain nodes shows that:

- Up to 20 different supply chain nodes involve collecting data for regulatory purposes
- Multiple node participants have common requirements for similar data points. Exporters, veterinarians, and producers are collecting duplicate data (simultaneously) and sharing data points for commercial and compliance requirements such as ASEL 3.2

5.2.2. User journey

Following the identification of supply chain nodes through user interviews, a user journey map was created for the livestock export industry by synthesising the process steps taken by each stakeholder along the supply chain. There are several differences in the process steps across the supply chain, depending on the size of export company, breed of livestock and location of both livestock and importing countries.

- Larger exporting companies may use stock agents to source livestock as opposed to others that source livestock directly from producers, demonstrating more variation in data collection methods in the industry

- Different processes can also vary across states and quarantine facilities. For example, more advanced quarantine facilities have more efficient ways of capturing data (i.e., RFID readers) as opposed to others, indicating different levels of digital infrastructure and maturity across supply chain nodes and participants in the industry

- Most users have similar processes in place; some vary due to different import compliance requirements and the commercial appetite for data

Across the user journey map, the project team has indicated in black where steps are “used by most” and in light grey where steps are “used by some” supply chain node participants. Coloured dots above each user step indicate a shared process by multiple node participants. Additional information is further captured as touch points under each step where needed.

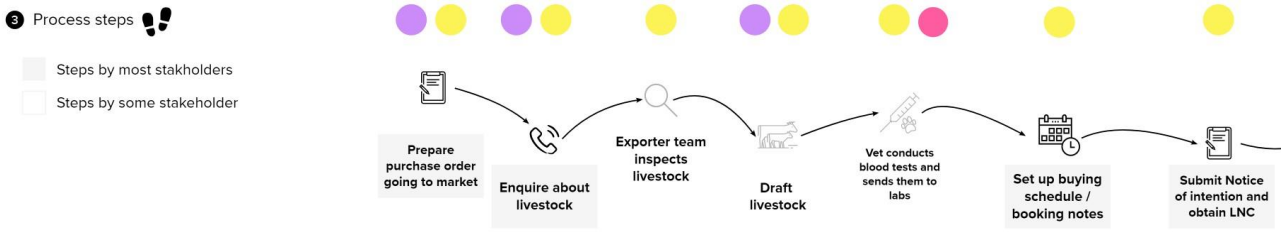


Figure 9 – Excerpt of user process steps

5.2.3. Themes – Pains and gains

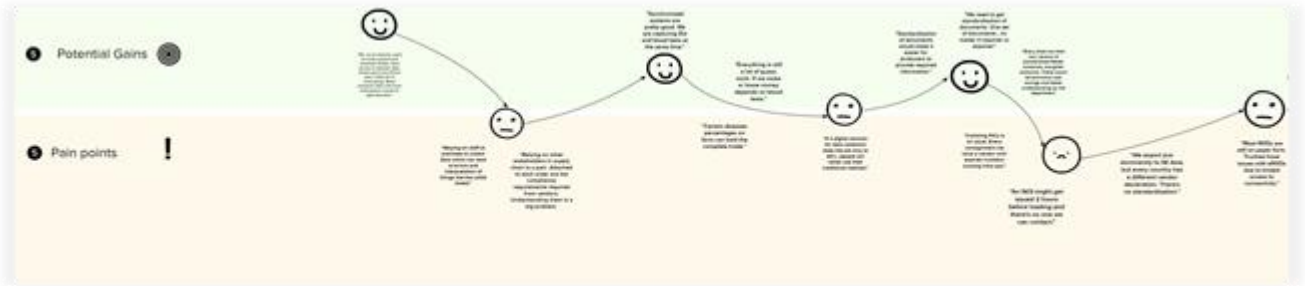


Figure 10 – Excerpt of user pains and gains along supply chain

Supply chain node participants experience certain processes in different ways, resulting in varying pains and gains. Mapping the pains and gains expressed by users during interviews helped to identify where the biggest problems occur along the supply chain. Using three different types of feelings visualised through “smiley / frowning face icons” and supported by actual quotes provides us with an authentic view of individual gains and pains across user steps.

- Stakeholders pointed out that the value of the collected data is limited in relation to animal welfare due to average scoring systems and complex data collection methods

- Stakeholders emphasised the usefulness of standardised forms and benchmarks across the industry

- Mistakes on forms due to limited knowledge are causing issues along the supply chain for stakeholders

- Most stakeholders acknowledged data is very relevant; however, complexity and volume of data, especially in early stages of a consignment, results in pressure points for involved parties

- Limited feedback from regulators in relation to in-market regulations have been indicated as pain point by multiple stakeholders.

Following the mapping of stakeholder emotions along the supply chain, pains and gains were categorised into common themes to highlight roadblocks and gaps along the supply chain. Based on these themes, key insights were developed to inform value propositions and mitigation strategies. Following this mapping exercise, pains were themed into different categories to further identify potential solutions for the livestock export industry.

Theme 1 – Connectivity and digital capability

Connectivity and digital capability are enablers of supply chain efficiency. However, current data indicates a wide spectrum of digital maturity and capability across the livestock export supply chain, resulting in pain points and roadblocks for the future of the industry. Connectivity issues further contribute to this and need to be considered when developing solutions.

Theme 2 – Accuracy of data

Inaccuracy of the collected data leads to time inefficiencies and reduction of productivity. Common issues along the livestock export supply chain include mistakes on forms and inaccurate data being shared along the supply chain. This results in potential delays of the export process, higher costs due to hold ups and might impact animal health and welfare.

Theme 3 – Different and complex systems

Across the supply chain there are many different collection and bespoke systems used to collect and share data. This increases complexity as data is being collected across discrete, unsynchronised systems. Using non-standardised bespoke systems reduces accessibility and can lead to limited sharing opportunities for data along the supply chain.

Theme 4 – Movement of data

Traceability and communication are a result of the ease of data movement along the supply chain. Pain points from stakeholders are highlighting some of the challenges and roadblocks the industry is facing. Developing the right systems to move data can enable efficiencies and improved animal welfare through better traceability, feedback, and feed forward, access to data and coordination of supply chain node participants.

Theme 5 – Time inefficiency

A lack of time efficiency directly impacts productivity and takes away time allocated for ensuring animal welfare. Current data collection methods and systems are focused on regulations rather than the outcomes. Further contributing to time inefficiencies are duplication of data collection and the abilities of staff to collect accurate data.

Theme 6 – Value of data

Most data points along the supply chain are collected for regulatory requirements without producing additional productivity benefits for the industry. Especially data collected on ships holds limited value to participants to improve efficiencies and animal welfare. However, users indicated that a better

understanding of data and revised collection measures could drive productivity benefit. Addressing these issues can enable increased accuracy and feedback along the supply chain and lead to more value not only for businesses, but also regulators, as quality of the livestock at point of disembarking is incentivised back through the supply chain.

5.2.4. Data points across supply chain

Figure 11 - Excerpt of collected data points along the supply chain

Data points were synthesised and aligned with each process step to show where data is being collected along the supply chain. Using the data collection framework, attributes for each data point (collection method, data use, accuracy, mandatory, who's requesting, who else might want the data, sensitivity, how it's shared/collected, static/dynamic) were also collected. Additional artifacts such as regulatory documents collected during interviews have also been assigned to a data point grouping (i.e., NVD form). Most data points are mandatory due to compliance requirements across the supply chain.

5.2.5. Value of data points to personas

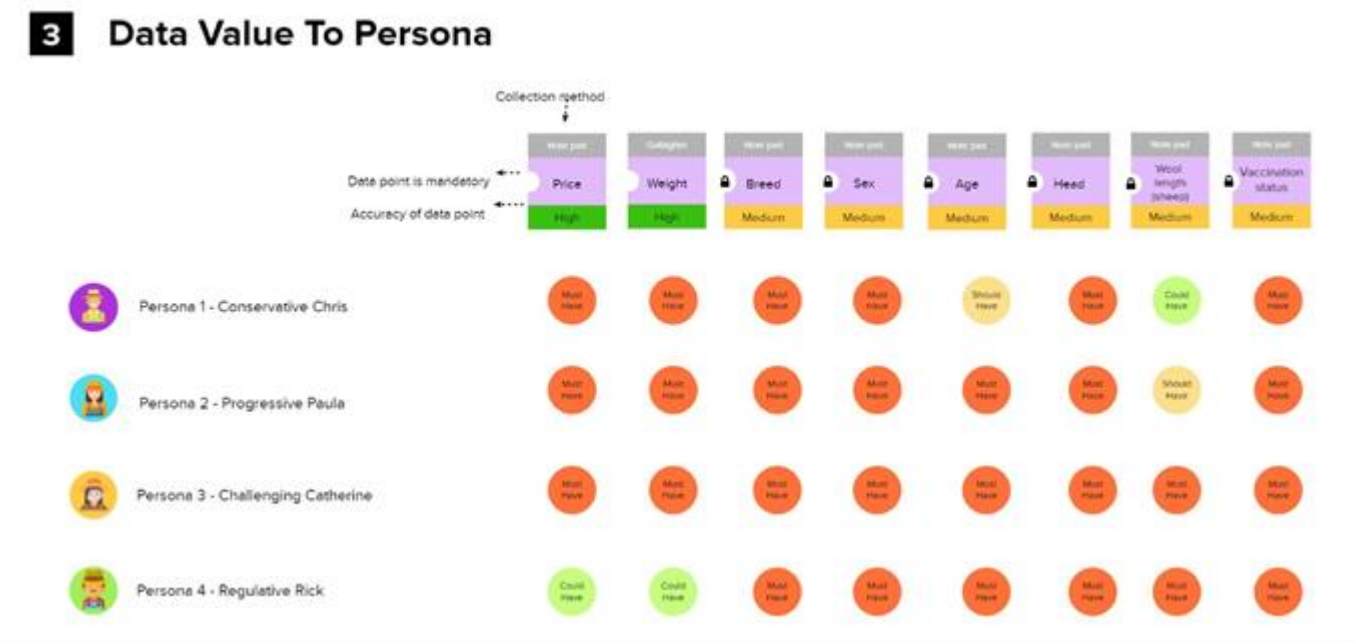


Figure 12 – Excerpt of data value to personas

After identifying and categorising users into four different personas, the value of data points was mapped to the personas using a MoSCoW prioritisation method (see Figure 16).

- Persona 1, Conservative Chris, is seeing more value in specific productivity data. However, compared to the other three, Chris views data only necessary for accomplishing a trade rather than exploring feedback and feed forward opportunities
- Persona 4, Regulative Rick's focus is on regulation, with almost all data points relevant to provide evidence of compliance with government requirements
- Personas 3 and 4 have an equal split between 'Must Have' and 'Should Have', indicating that most data points are relevant to the supply chain but differ on productivity value. A focus on identifying the true purpose of a data point would create greater value for both personas
- Personas see greater value in data points in the earlier stages of the supply chain process, collecting relevant information for commercial and protocol requirements. Further along the supply chain the value of data points to each persona varies extensively. This could be a result of duplication and the perceived value of animal welfare indicators past the point of loading.

5.2.6. Animal welfare

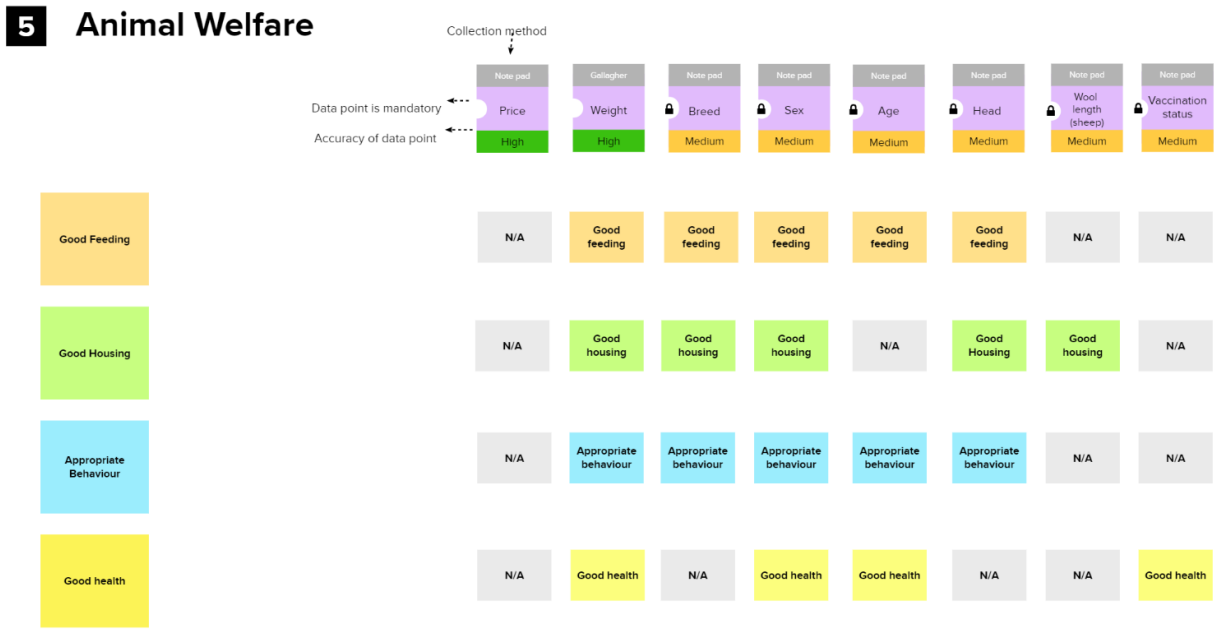


Figure 13 – Excerpt of animal welfare data stocktake

Each data point was analysed and assessed against the principles of good animal welfare – good feeding, good housing, appropriate behaviour, and good health.

- Most data points have relevance for animal welfare but are limited in accuracy and value by collection methods
- Most relevant data points for animal welfare include weight, sex, and RFID (radio frequency identification)

5.2.7. Supply chain efficiencies

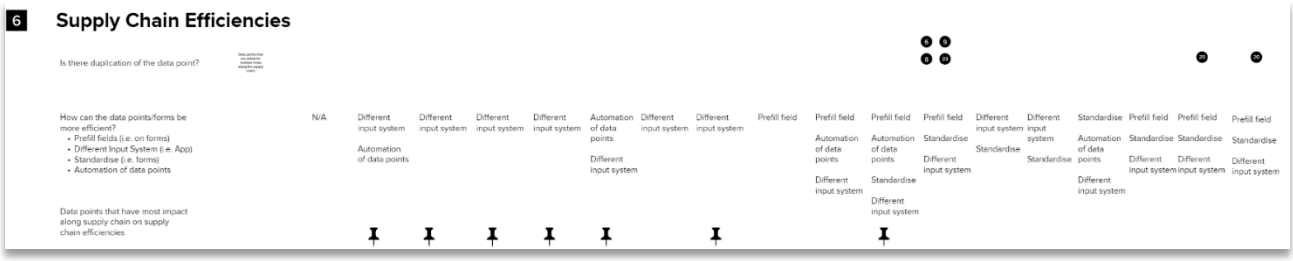


Figure 14 – Excerpt of data duplication in supply chain efficiency

From the above data landscape, key supply chain inefficiencies were mapped across each of the data points into three key sections. The duplication of data points across the entire supply chain was a common theme, and these duplications were mapped and identified across the supply chain.

- Data points were analysed to determine how their collection could be more efficient to make the

data points less complicated or to save time across the supply chain through the recommendation of prefill fields, different input systems, standardisation, or the automation of data points

- Data points that have the most impact on supply chain efficiencies were mapped and identified.

5.2.8. Market access/in-market

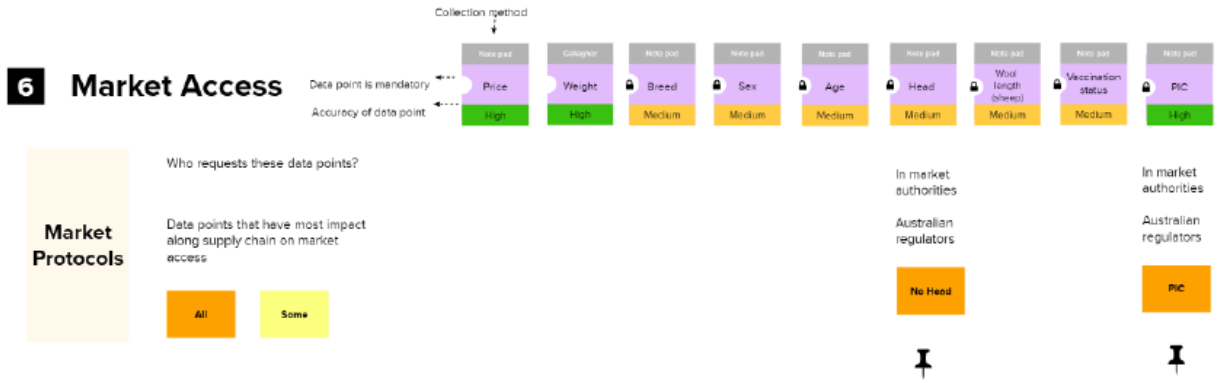


Figure 15 - Excerpt of relevant data points for market access

Data points along the supply chain were assessed based on their relevance to market access and in-market activities.

There are two different aspects to consider - Australian (sending) and in-market (receiving) requirements. Both differ in purpose of the required data points.

Australian authorities' main concern is around animal health and welfare data for compliance with regulation, whereas most data required by importing countries is based around livestock health and biosecurity.

- Each importing country has different in-market data requirements
- Data requirements for compliance differ for each importing country
- Complexity of in-market requirements results in difficult relationships between exporters and importers, as well as increased challenges in providing Australian authorities with sufficient data.

6. Findings

Based on the analysis of data points across the livestock export supply chain, the project team uncovered six key insights that highlight roadblocks and industry needs. Building on the value of these insights, a total of nine key value propositions were developed and aligned to the LEP RD&E Program's focus areas (animal health and welfare, supply chain efficiencies and market access) to inform future initiatives and R&D projects. In addition, associated risks with the development of new systems and processes are addressed below. Following the identification of new value propositions for the industry, an insight – driven roadmap was developed to provide the industry with a structured pathway to deliver value.

6.1. Key insights

Insight #1 – Value of data

The synthesised data and analyses identified that data points were being collected for regulatory purposes without greater productivity benefit for stakeholders. Data collected at the beginning of the supply chain (i.e., producer to quarantine) does bring some productivity benefit to stakeholders; however, from quarantine onwards most data being collected is for compliance reasons and not providing any greater productivity benefit. This highlights an opportunity to re-assess the data points being collected for industry wide value and benefit.

Insight #2 – Complex and different systems

High complexity of regulatory forms, processes, and duplication of data along the supply chain has resulted in many stakeholders (primarily exporters) developing their own bespoke systems, processes, and forms to collect and organise data. The result of high complexity, bespoke systems and varied digital capabilities is that often exporters have a 'go to' person/s who handle the organisation of the data. This highlights an opportunity to simplify collection methods and management of data for industry wide benefit.

Insight #3 – Supply chain efficiency

The accuracy and efficiency of data points across the supply chain are impacted by common collection methods (i.e., Excel and notepad). Duplication of data, blank data fields, lost documents, and version control are common across the supply chain which compromises efficiency. Common collection methods have created inconsistent data entry by means of open text fields and hand-written notes.

Insight #4 – Animal welfare

Current data collection is focused on compliance and uses a scoring system that provides limited value in the collected data (i.e., quote: "what does a 1-5 scale even mean when everybody just enters 3"). Therefore, assessing animal welfare on a data average may compromise animal health and welfare. Furthermore, a lack of value in data reduces the ability for exporters to draw conclusions on animal performance during consignments. Developing animal welfare KPIs could provide the industry with clear data standards, simplified data collection, as well as improved data quality.

Insight #5 – In-market

Limited in-market data standards and public pressure create various challenges for the livestock export industry. Particularly, providing regulators with sufficient data on in-market compliance is a laborious task involving multiple stakeholders. To address certain in-market challenges and provide a collective response

to regulators, exporters collaborate in-market to address regulatory challenges, share in-market non-commercial knowledge, as well as tasks around data collection. This could provide the industry with an opportunity to establish a working group that works collaboratively on challenges and encourages a dialogue between exporters, regulators, and other stakeholders.

Insight #6 – Feedback and feed forward

Up to 20 supply chain node participants are collecting and sharing, mostly with regulators, over 400+ data points. However, hardly any data points are used to provide feedback and feed forward along the supply chain. For example, veterinarians voiced concerns over not having enough background information on livestock coming from quarantine onto ships - an issue that may hinder the treatment of an animal, compromising overall animal health and welfare. Providing stakeholders with consignment specific information along the supply chain could yield opportunities for the livestock export industry and improve overall performance for exporters.

6.2. Value propositions for the livestock export industry

As part of the service design methodology, the Value Proposition Canvas helps to understand and visualise an exporter and other stakeholders' perspectives, their jobs, pains, and gains. It further connects these with a value map to highlight products and services that can relieve stakeholder pains and create gains to advance animal welfare improvement, supply chain efficiency and market access. The diamonds in the image below display key value propositions derived from key insights and pain point themes. Highlighting a fit between a user's job and the value map, these value propositions can inform the LEP RD&E Program's roadmap and goals of advancing animal welfare improvements, supply chain efficiency and market access.

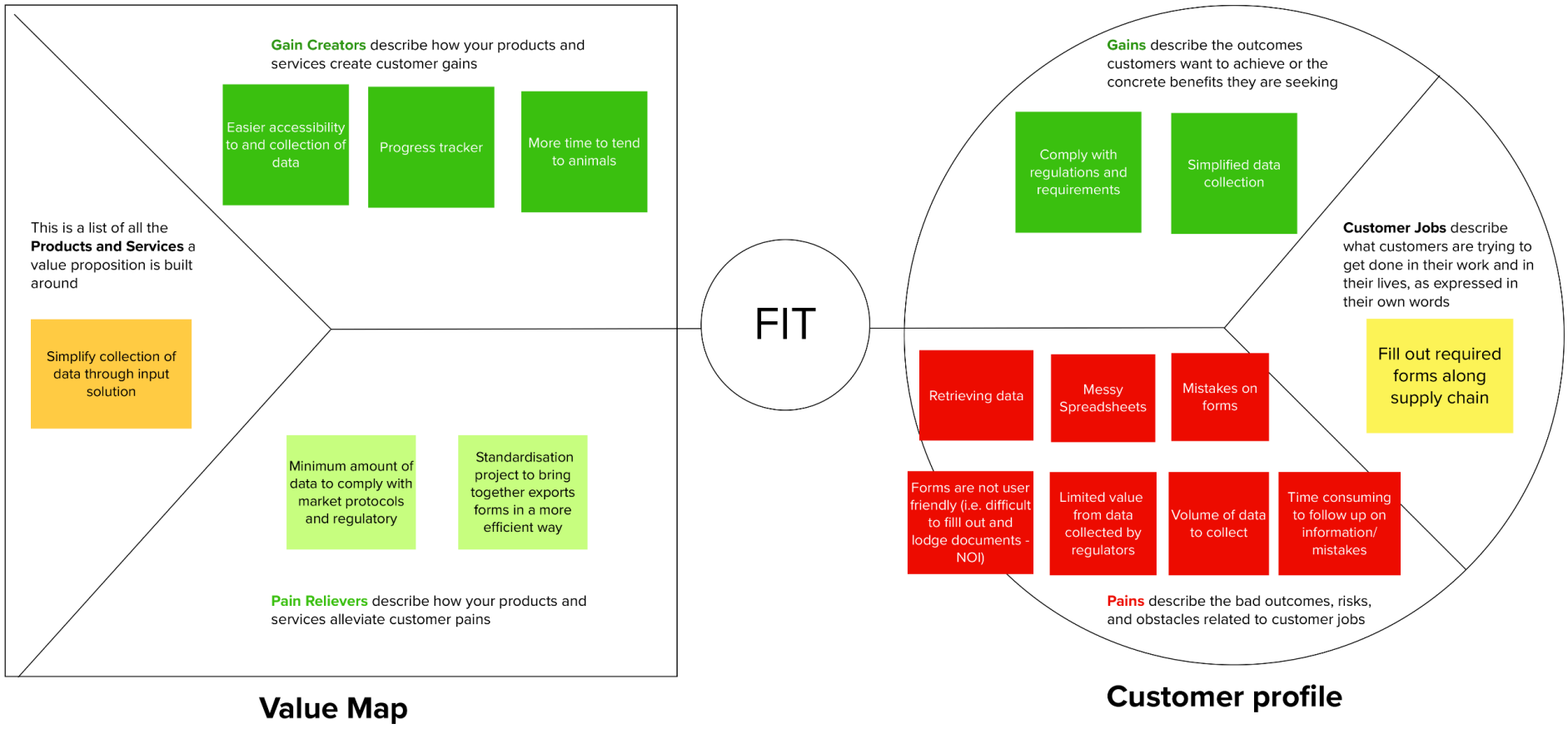


Figure 16 – Example of value proposition canvas

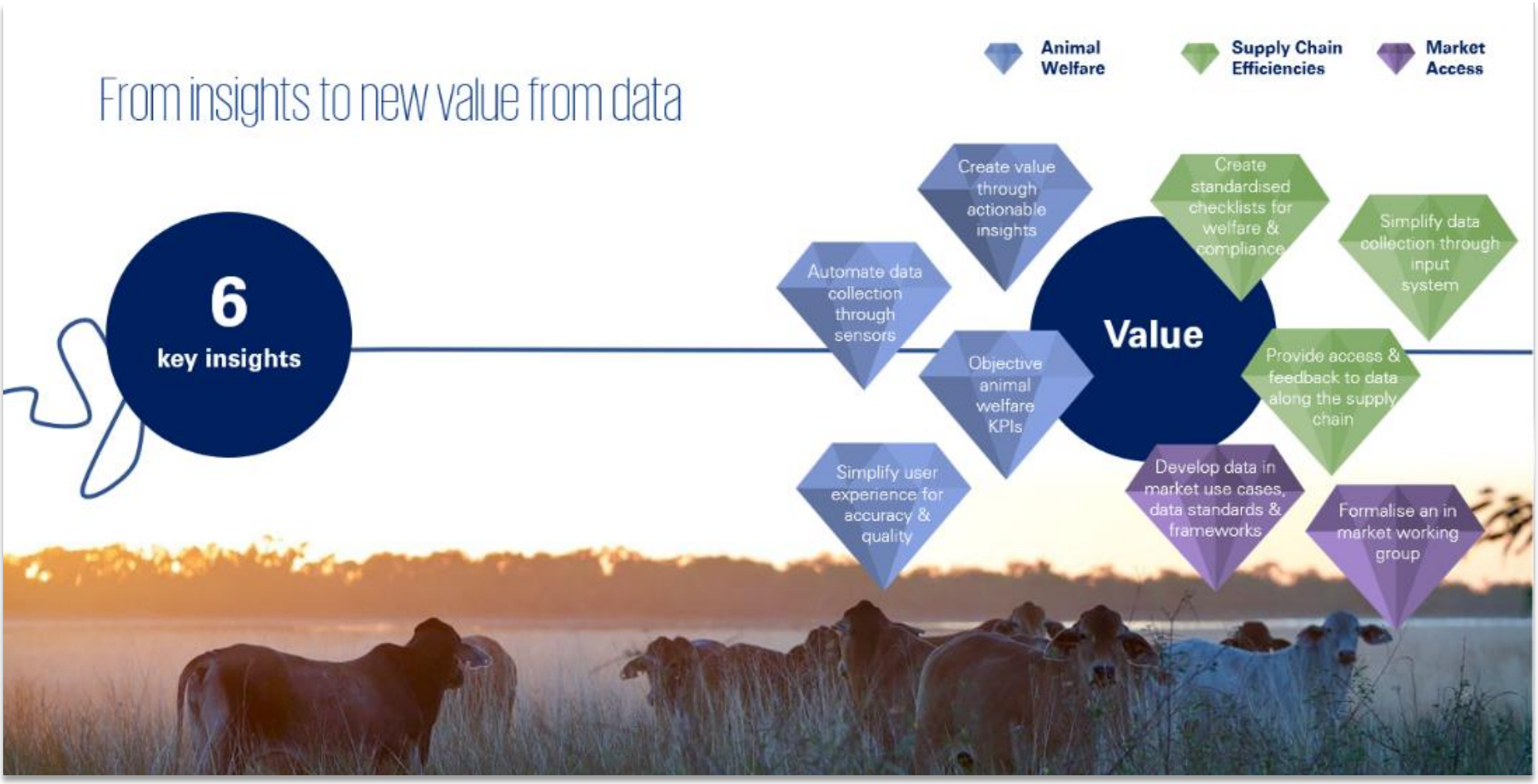


Figure 17 – Value propositions (diamonds) across the focus areas of the LEP RD&E Program

6.2.1. Focus area – Animal welfare

Value proposition #1 – Objective animal welfare KPIs

Livestock exporters are required to provide regulators with sufficient data on animal welfare. However, the lack of value in data points for industry stakeholders has decreased the accuracy of data standards along the supply chain. Developing objective animal welfare KPIs has the potential to ease the burden of regulatory requirements by focusing on the value and quality of data, rather than the quantity. Additionally, adding value by clarifying the purpose of each data point will increase accuracy of data. These KPIs can improve animal welfare, while providing additional data on performance.

Value proposition #2 – Simplify user experience for accuracy and quality

Accuracy and quality are important to produce valuable data for performance, regulation, and animal welfare. However, bespoke systems, common collection methods and a limited data scoring system are causing issues for supply chain node participants to assess animal health and welfare. Developing a new input solution including clear data collection guidance can simplify the user experience and improve the accuracy and quality of the collected data. For example, using images of the supplied animal feed with clear measures such as dry and wet can help users provide increased data value on animal health and welfare.

Value proposition #3 – Create value through actionable data insights

Data collected through a new input solution together with new measures on animal welfare and performance (i.e., animal welfare KPIs) can create new opportunities for actionable data insights. Stakeholders perceive most data along the supply chain as pure compliance data without any productivity benefit. Additionally, most data points are unrelated and have limited impact on animal health and welfare. Based on accurate animal welfare KPIs, certain data points could be analysed to benchmark animal welfare metrics and help achieve strategic goals of advancing animal health and welfare along the supply chain.

Value proposition #4 – Automate data collection through sensors

Providing good animal health and welfare along the supply chain is subject to accurate data and available time to care for the animals. However, common collection methods increase subjectivity of data and reduce efficiency, as well as accuracy. Using sensors to automate animal welfare data collection or other tools such as randomised pen selection on ships, quarantine, feedlots can contribute to advanced objective measures of animal welfare data and increase time efficiencies that could be used to tend to animals.

6.2.2. Focus area – Supply chain efficiency

Value proposition #5 – Create standardised checklists for welfare and compliance

Livestock exporters are providing more than 400 known data points to regulators, importers, and other stakeholders along the supply chain. However, collection methods have impacted accuracy and efficiency of data points. For example, mistakes on national vendor declaration forms are causing issues in providing regulators with sufficient data and are time consuming to fix. Adding to the problem of inaccuracy and inefficiency is the high complexity in data requirements, which has resulted in duplication of processes and forms. Partly addressing the issues around duplication and confusion of data requirements, especially for in-market protocol requirements, is the LEP RD&E Program's current project looking to standardise export declarations for South East Asian cattle markets. However, besides protocol requirements, creating overall clear standards through data checklists for welfare and compliance will further reduce issues around duplication and complexity. Tools such as a progress tracker or easier accessibility will provide exporters

and other stakeholders with clear data instructions that can be used to identify and escalate issues such as missing documents.

Value proposition #6 – Simplify data collection through input system

Current collection methods are limiting advancements in efficiency and data accessibility across the livestock export supply chain. Additionally, the high complexity of data requirements has resulted in the duplication of bespoke systems, forms, and processes. This further reduces the industry's competencies to produce meaningful data and causes issues with inter-operability of systems along the supply chain. Developing a data input system could provide the industry with a common solution that utilises data checklists and simplifies data collection while supporting data sharing with supply chain participants. For example, an input solution could visualise a progress tracker and provide real-time training during the collection of data points to improve the overall data quality and accuracy.

Value proposition #7 – Provide access and feedback to data along the supply chain

Improving the overall quality and accuracy of data through new data collection methods not only reduces inefficiencies, but also allow opportunities for permitted feedback and feed forward along the supply chain. For example, providing full access to veterinary information and feedback from quarantine to the ship voyage could improve overall animal welfare. Furthermore, industry data could be used to benchmark against data requirements on animal welfare to provide a better picture on regulatory information and improve consignment performance. Therefore, it would provide exporters with data value beyond mandatory data requirements, while improving efficiencies and other strategic focuses such as animal welfare.

6.2.3. Focus area – Market access/in-market

Value proposition #8 – Formalise an in-market data working group

Exporters are accountable for animal health and welfare along the whole supply chain and required to provide regulators with sufficient data evidence on compliance. However, in-market data collection and sharing are posing various challenges for exporters to provide sufficient data on in-market livestock traceability to Australian regulators. Other challenges include limited data standards, geographical conditions, as well as in-market audit requirements. Especially the latter is a complex data task for exporters, given it has implications for animal welfare. Some exporters and ESCAS managers already work together to address these challenges by sharing tasks and audit requirements. Building on this example, an industry wide working group including regulators would provide an opportunity to work collaboratively on industry challenges, as well as uniting the industry and reducing operational risks.

Value proposition #9 – Develop in-market use cases, data standards and frameworks

Challenges mentioned above including the complexity in-market data requirements are hindering the industry from exploring its full potential to grow. In-market animal health and welfare is one of the biggest concerns for regulators. Therefore, the Department of Agriculture, Water and the Environment has substantial data requirements in place for traceability and auditing. While this has improved in-market animal health and welfare through increased recognition and adoption of Australian standards, it has further increased complexity and frustration for importers, as well as exporters. Developing in-market use cases, data standards and frameworks through the described working group could allow for an ease of regulatory burden, as well as improve trade relationships and transparency of data usage. Furthermore, in-market frameworks could be utilised to adopt similar principles in other markets. However, it is important to develop data standards and use cases collaboratively with regulators to strengthen trust and increase adoption.

6.3. Risk assessment for a connected livestock export ecosystem

Based on the identified value propositions and key insights, an assessment has been conducted to assess the risk, the impact and likelihood of the risk, as well as the effect on the industry itself. Each risk could potentially be a roadblock for the industry's advancement of the development of a connected livestock export ecosystem. As part of the risk assessment, actions in the form of a mitigation plan are provided in the table below.

Table 2 – Risk assessment for a connected livestock export ecosystem

AREA	RISK	IMPACT	LIKELIHOOD	EFFECT ON INDUSTRY	MITIGATION PLAN
Animal welfare KPIs	Government will not endorse animal welfare KPIs	High	Low	Add to current confusion on how to measure animal health	Collaborate with DAWE to understand their requirements
	Low adoption of new animal welfare KPIs by industry	High	Medium	Low confidence in animal welfare standards	Make KPIs simple to collect and understand to create value back to industry
Introduction of new data collection methods (e.g., input systems - sheep counter)	Low adoption due to low digital literacy in some industry stakeholders	Medium	High	Reduced ability to engage with digital systems. Duplication of systems to meet maturity level	• Industry digital maturity assessment. • Create simple systems that align with user digital maturity level. • Upskill industry with just-in-time training e.g., within digital solutions
	Lack of connectivity in parts of the supply chain	High	High	Limited connection, limited data sharing and collection of data	Build agnostic solutions with off-line modes to capture and share data
	Bespoke systems & solutions that do not accurately address industry problems	High	High	High complexity from duplication of bespoke systems	Create a simple and versatile system that addresses user needs
Data management	Lack of data governance, security, privacy, standards & purpose	High	High	Limited confidence in data generally Limited scalability Potential misuse of data	In collaboration with LE industry, define specific use cases for data governance, standards, security, privacy, purpose
Social licence to operate	Difficulties collecting data in-market (i.e., Indonesia)	High	Medium	Potential to impact export arrangements / license	• Collaboration between ESCAS managers to share data collection and standard forms on

AREA	RISK	IMPACT	LIKELIHOOD	EFFECT ON INDUSTRY	MITIGATION PLAN
					non-commercial activities • DAWE – develop a Smart Export Auditing System to reduce burden and duplication on exporters
	Inaccurate compliance data along the supply chain	High	Medium	Additional time spent re-completing compliance forms	• Automate & simplify data collection through sensors along the supply chain • Pre-fill compliance forms • Standardise forms & checklists for common data points

7. Conclusions, recommendations and roadmap

7.1. Conclusion

From sourcing livestock to in-market facilities, this project has shown that exporters care deeply about animals, work collaboratively on solving challenges and develop tools to increase efficiencies, while providing substantial compliance data to regulators to sustain the livestock export trade. However, current regulatory data requirements are affecting the livestock export industry by adding increased complexity to a simple trade, as highlighted in stakeholder engagement.

The data stocktake project has uncovered six major pain point themes, out of an overall 81 stakeholder pain points, which are related to the complexity of regulatory data requirements including accuracy of data and data communication along the supply chain. These complexities have contributed to inefficiencies and the duplication of bespoke systems, processes, and forms to meet regulatory data requirements. Furthermore, the experienced complexity has resulted in the perception by stakeholders that data collection along the supply chain is purely for compliance reasons without any productivity value. However, these and other insights uncovered in this project, can provide the LEP RD&E Program with clarity around roadblocks along the supply chain, as well as opportunities to reduce complexity and increase productivity. The opportunities outlined in this report hold the key to creating true value for stakeholders of the livestock export supply chain and informed nine key value propositions for the industry. The value propositions are not to be seen in isolation, but rather play a part for a bigger vision of a connected data ecosystem for the livestock export industry to digitally transform the industry and build true value.

This section explores three recommendations to address challenges and complexity to improve the livestock export trade for all stakeholders, including regulators. This is followed by the presentation of a roadmap that represents a three-year timeline to develop a connected data ecosystem. In addition, a Research & Development plan has been developed to align the LEP RD&E Program's strategic goals with recommendations within the roadmap.

7.2. Recommendations

Recommendations from this project have the potential to make a significant impact on the digital transformation of the live animal export industry by 2025 and beyond.

1. Develop industry data capability for the livestock export industry:

    a. Establish an industry data taskforce or working group to drive the implementation of the industry data roadmap

    b. Validate industry-wide digital maturity levels and key capability gaps to inform a digital skills and capability development program for the industry

    c. Develop a collaborative data strategy with the livestock export industry and with the regulator to maximise adoption through enablement of regulatory and productivity benefits that will support long term industry growth. The foundation for a data strategy must reflect the key insights from the data stocktake.

2. Develop a livestock export industry platform solution to improve collection and sharing of data across the supply chain. Explore linkage opportunities with other livestock industry data projects. Use insights from this data stocktake and undertake a progressive experimentation process that thoroughly engages industry stakeholders and regulators.

    a. Experiment 1 – Design and test new data collection methods, including automation, IoT sensors and data standardisation

    b. Experiment 2 – Create new value from data through analytics and improved user experience solutions

    c. Experiment 3 – design and build a reporting application for dual productivity and regulatory benefits

3. Design and develop sensor-enabled capture of the animal welfare indicators outlined in the SAWS report and ensure they can be applied in a practical way in the livestock export context (e.g., on ships, quarantine, feedlots).

    a. Establish a higher degree research program and collaboration between DAWE, a university (veterinary science) and the LEP RD&E Program to develop an evidence base for animal welfare indicators and KPIs

    b. Conduct an R&D project to develop and validate sensor-enabled objective animal welfare measurement KPIs with livestock export veterinarians, exporters, and producers

    c. Build evidence-based animal welfare indicators and KPIs into a shared dashboard tool to increase consistency and value for all stakeholders, noting that this requires data collected over time.

    d. Conduct an R&D project to explore the potential use of data to redefine commercial arrangements and incentives based on evidenced livestock quality and welfare condition scores throughout the voyage, leading to better quality stock delivery to end customers. Identify options and consider barriers and implications to nodes in the value chain from objective data-enabled contract arrangements.

7.3. Implementation roadmap – conceptualising a connected data ecosystem

Building on the value identified in this project, a three-horizon roadmap was developed to assist the LEP RD&E Program with its strategic planning process. It links the LEP RD&E Program's strategic goals to detailed R&D work and shows milestones needed to reach the outcomes in each timeframe. Following the roadmap will help the LEP RD&E Program to transition the industry from the current state identified in the data stocktake project, to a desired future state and a connected data ecosystem.

The roadmap below highlights six insight-driven pathways that frame an approach to enable innovative solutions and deliver value across the whole industry. Three pathways at the bottom of the roadmap are based on the focus areas of animal welfare, supply chain efficiency and market access and highlight solutions to respond to industry dynamics. The other three pathways focus on the LEP RD&E Program's enterprise strategy including a technology path, operational path, and an ecosystem path. This will help the LEP RD&E Program to realise the full value potential of the connected data ecosystem through defined data governance, improved data collection, as well as analytics and feedback.

The three horizons at the top of the roadmap provide a detailed timeframe to assist the LEP RD&E Program in creating value gradually by using a structured approach that can be streamlined and scaled over time. However, some of the R&D projects displayed in the roadmap have already commenced, including the standardisation of forms and the automatic sheep counter. The key in the top corner provides a colour code to identify these in-flight projects, operational projects the LEP RD&E Program can potentially commence internally and future R&D projects, as well as technology projects that might require outside expertise.

Using an insight-driven roadmap will help the LEP RD&E Program define a starting point to build a sustainable foundation for the future of a connected ecosystem. This will reach the industry's desired outcomes such as data automation, as well as access to real-time data and analytics.

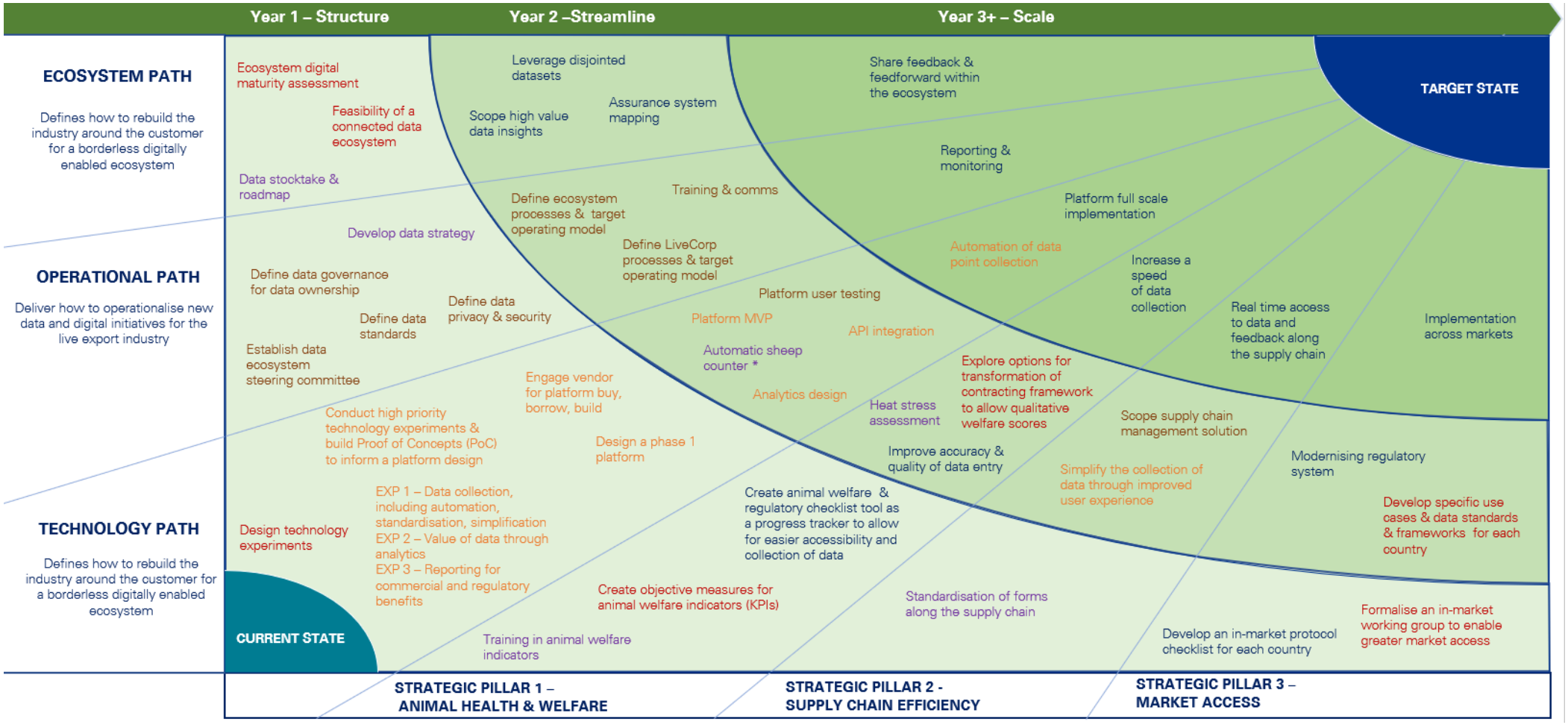


Figure 18 – Roadmap for a connected livestock export data ecosystem

7.4. R&D Plan

Following the development of an insight-driven industry roadmap to deliver value across the industry, it is important to understand its alignment with the LEP's R&D goals to identify opportunities for investment. The LEP's *RD&E Blueprint* outlines five goals that relate to animal welfare, supply chain efficiencies and market access. Furthermore, each goal includes specific priorities set by the LEP to support the overarching desired outcomes. In the table below, LEP goals are aligned with the data stocktake project to highlight future R&D investment opportunities for the development of a connected data ecosystem, as well as deliver value within each goal.

Table 3 – Project alignment with the LEP RD&E Program

LEP RD&E Blueprint goal	Priorities aligned to stocktake project	Recommendation for further research and development	Roadmap location
Goal 1 Transparency of animal welfare	Build industry capabilities in data collection and analysis to enable benefits from transparency, benchmarking, reduce subjectivity, boosted supply chain productivity and efficient regulatory reporting to be achieved.	Conduct an R&D project to validate industry-wide digital maturity level and key capability areas.	An ecosystem digital maturity assessment is part of year 1 of the ecosystem path in the roadmap.
	Develop tools and techniques for more effective and timely identification and assessment of animal health and welfare and promote their uptake and adoption.	Design technology experiments for data collection, supply chain management, reporting and analytics for animal welfare.	Design technology experiments the first step in year 1 of the technology path in the roadmap.
Goal 2 Understanding and addressing animal health and welfare risks in the supply chain	Improve understanding of, and identify effective controls for, animal health and welfare risks that operate along the supply chain, including in overseas markets, along with timely prevention management strategies.	Conduct an R&D project to develop and validate objective animal welfare KPIs – potential for a research honours/master program and collaboration between DAWE, University (veterinary science) and LEP RD&E Program	Create objective measures for animal welfare indicators (KPIs) is part of year 1 of strategic pillar 1.
Goal 3 Improving the uptake, adoption and commercialisation of better animal health and welfare practices and tools	Improve the training environment to encourage uptake of leading animal health and welfare practices across industry		

LEP RD&E Blueprint goal	Priorities aligned to stocktake project	Recommendation for further research and development	Roadmap location
	There is no priority related to the recommended R&D project.	Conduct R&D project to explore options for transformation of the contracting framework to allow qualitative welfare and health / quality scores to inform incentivised compensation to operators in a trade.	Strategic pillar 1 Animal welfare in year 2
Goal 4 Improving supply chain efficiency and regulatory performance	Facilitate feedback of information on the health and welfare of livestock supplied to livestock export by producers and suppliers and provide actionable feedback on how welfare outcomes in the livestock export supply chain can be improved.	Conduct an R&D project to develop and validate objective animal welfare KPIs – potential for a research honours/master program and collaboration between DAWE, University (veterinary science) and the LEP RD&E Program.	Create objective measures for animal welfare indicators (KPIs) is part of year 1 of strategic pillar 1.
Goal 5 Supporting better market access conditions for Australian producers and exporters	Support better exporter and importer control and assurance over animals in-market to reduce the risks of leakage and poor animal welfare outcomes	Conduct an R&D project to develop specific use cases, data standards and frameworks for each country.	Develop specific use cases, data standards and frameworks for in-market operations is part of year 2 of strategic pillar 3 to streamline market accessibility.
		Conduct an R&D project to develop an industry endorsed collaboration model to manage non-commercial activities in-market.	Formalise an in-market working group to enable greater market access is part of year 1 of strategic pillar 3.

8. Appendix

8.1. Interview questions

The following questions were asked of those consulted on the project:

1. Where does your business currently sit digitally?
2. Are you currently working on any solutions for data?
3. Do you have current digital capability?
4. How long do you see this taking?
5. Talk us through the steps you take to export livestock
6. What data are you collecting during this step?
7. Is the data mandatory?
8. How are you collecting this data?
9. Where do you store this data?
10. How often do you collect this data?
11. How accurate is the data?
12. What do you use the data for?
13. Who's requesting the data?
14. How do you share the data?
15. What data creates the most value for your business along the supply chain?
16. What areas of concern or blackspots do you see around data collection?
17. What solution do you believe would make the biggest improvement to your business?
18. What data would you like to have?

8.2. Collected forms and artefacts

Table 4 – Overview of artefacts and forms collected during stakeholder engagement

Artefact/form	Description	Provided by
LIVEXCollect Air End of Journey (EOJ) reporting tool	Consignment setup, transit and transhipment stops, journey comments and discharge, health report, birth and abortion and mortality records of the exporting of livestock via air travel to comply with ASEL	LiveCorp
LIVEXCollect voyage forms	Voyage setup, daily observations, daily deck records, health report, births and abortions and mortality records for on ship records to comply with ASEL	LiveCorp
Vendor and property of origin declaration	The owner of the cattle is required to sign and send this document with the accompanying contract between the exporter, agent, and vendor prior to delivery to the quarantine facility.	Livestock Shipping Services Pty Ltd
Pregnancy testing/spay declaration	A declaration from vendor to confirm when the livestock was pregnancy tested and conformation that they were not detectably pregnant	Bondstock Rural Exports Northern Territory Government SEALS AUSTREX Halleen
Property of origin disease freedom vendor declaration	The vendor declares that no lame, blind, sick, or substituted animals are progressed through the supply chain	Bondstock Rural Exports
Vendor declaration property management on disease freedom of livestock for export to Indonesia	Declaration of compliance for pre-export conditions to Indonesia	Frontier
Vendor declaration property management on disease freedom of livestock for export to Vietnam	Declaration of compliance for pre-export conditions to Vietnam	Frontier North Australian Cattle Company
Vendor declaration by property management on disease freedom of livestock for export to South East Asia	Declaration of compliance for pre-export conditions to South East Asia	Australian Cattle Enterprises SEALS Halleen
Cattle tick – meeting my general biosecurity obligation (GBO)	Details of the risk minimisation required for the movement of cattle tick carriers prior to cattle tick certification	Government template
Pre-Export Preparation & Transportation Declaration	This declaration is to certify the livestock prepared and handled for export have met ASEL requirements.	International Livestock Export
Feeder/Slaughter Cattle Protocol Vendor Declaration	Declaration of compliance for pre-export conditions to Indonesia, Malaysia, Philippines, Vietnam, and Thailand	AUSTREX

Artefact/form	Description	Provided by
National cattle/sheep health declaration	Declaration that vendor is the owner or the person responsible for the husbandry of the cattle and has adequate animal health and welfare practices	Department
Vendor declaration by property management on disease freedom of livestock for export to Sabah	Declaration of compliance for pre-export conditions to Sabah	SEALS
Exporter supply chain assurance system Control and Traceability Declaration	The declaration that livestock are handled, transported, and slaughtered in accordance with OIE recommendations	Department - ESCAS
Livestock Export Licence and Approved Arrangement	An application form for a vendor to attain or renew livestock export license Apply for new arrangement and export programs	Department
NOI, CRMP and ESCAS for Live-stock Exports by Sea	Includes consignment summary, consignment risk summary plan, exporter supply chain assurance system as well as the submission of NOI, CRMP and ESCAS	Department
Application for Export Permit and Health Certificate	For licensed livestock exporters to apply for an export permit and health Certificate to export livestock under their approved arrangement	Department
National Vendor Declaration	National identification and traceability system	Integrity Systems Company
ESCAS animal welfare audit standards and auditor checklist	Audit checklist for all destinations and species including feeder and slaughter, as well as goats, sheep, and buffalo	Department
Notice of intention to load livestock	The notice of intention to department including shipping and exporter details	Department
ESCAS animal welfare audit standards and auditor checklist	Provided checklists for welfare of Australian cattle/ buffalo and sheep/ goats to help auditors assess compliance with OIE animal welfare standards	Department