

**Independent Review
of the proposed
installation of DEXA
in AUS-MEAT
registered processing
facilities**

Report - 9 June 2017

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Dear Peter and Lachie

In February 2017 Ernst & Young (EY) was asked by the Australian Meat Processor Corporation (AMPC) and the Australian Meat Industry Council (AMIC) to undertake an Independent Review (The Review) of the November 2016 proposal by Meat and Livestock Australia (MLA) for the investment of \$150 million to install Dual Energy X-ray Absorptiometry (DEXA) units into up to 90 AUS-MEAT registered processing plants (The Proposal). We note that elements of The Proposal have developed since its initial release.

As you know, AMPC is the Rural Research and Development Corporation (RDC) that supports the red meat processing industry throughout Australia, representing all beef, sheep and goat meat processors. With 105 members operating in 133 meat processing establishments (representing over 97% of Australia's red meat processing capacity) AMPC's mandate is to provide Research, Development and Extension (RD&E) services that improve the sustainability and efficiency of the sector¹.

AMIC is the Peak Council that represents retailers, processors, exporters and smallgoods manufacturers in the post-farm-gate meat industry. As the Peak Council, AMIC confers with members, governments and industry groups to influence policy and provide technical and other advice to the industry².

MLA delivers research, development and marketing services to Australia's cattle, sheep and goat producers. With approx. 50,000 livestock producer members (with stakeholder entitlements) MLA seeks to be the recognised leader in delivering world-class research, development and marketing outcomes that benefit Australian cattle, sheep and goat producers³.

Australia's red meat & livestock industry is a major component of our national economy, and is particularly important in rural and regional Australia. Red meat processing is, on several measures, now one of Australia's largest manufacturing industries. It is heavily trade-exposed, and subject to international price and competition pressures.

However, while facing many risks, the opportunities for the industry are bright, given the global demand for high quality and safe red meat products. A strong focus on the consumer, the effective use of technologies in all their aspects, underpinned by a common understanding of it's 'purpose' and whole-of-industry collaboration, are vital ingredients to realise the industry's potential - to the benefit of all participants and the wider Australian community.

It is clear that there is interest and commitment by key players in achieving greater objectivity and transparency in many aspects of the interconnected web of commercial and related relationships that exist between the various arms of the industry. In essence The Proposal is seeking to apply an industry-wide solution, utilising a financing method, to obtain an uplift in objectivity and productivity.

The Proposal has served to significantly focus discussions and debate about these objectives, and whether and how they should and could be met.

¹ AMPC website - About AMPC, accessed April 2017

² AMIC website - About AMIC, accessed May 2017

³ MLA website - About MLA, accessed April 2017

We asked key stakeholders on a number of occasions, including through publishing the detailed 2nd Issues Paper, to provide us with all information they believe was relevant and which could be used publicly in this report.

In preparing this report we engaged with major industry bodies, independent experts, and directly with a number of large and small producers and processors. We believe that this consultative and evidence-based approach has been a critical part in providing you with an independent, objective, balanced and forward-looking report.

Given that, ultimately, the adoption of new technologies and operating models will require decisions of companies and boards, many of whom are your members, we believe that our direct and unfiltered discussions with some of those organisations has been an important and informative part of our Review. They have provided critical insights.

It is clear that this is an area where technology is developing quite rapidly. Indeed, there have been some significant developments in the short time that this Review has been underway.

AMPC and AMIC commissioned The Review in order to allow you to consider The Proposal based upon independent analysis, including economic analysis, and in relation to the current state of applicable technologies. Accordingly the Review has considered the strategic, financial, technical, commercial, operational, governance and implementation aspects of what has been proposed.

Our report makes a number of observations and recommendations which, if adopted, we believe will assist you, your members and the wider industry to make informed and evidence-based decisions going forward.

We strongly recommend that these initiatives are taken forward as consultatively and collaboratively as possible given the significant transformational change that is being considered, and the opportunities that exist.

As noted above, your members, the many red meat processing companies in Australia, will over time want to make business decisions about many of the issues considered by this Report. We trust that the Report's research and analysis provides strong clarity and assistance to them in that regard.

I would like to thank AMPC and AMIC; the many other industry bodies, individuals and experts who also assisted The Review; and my EY colleagues who contributed their time, insights and advice.

As you know, this report was originally provided to you on 5 June 2017, and distributed to a limited number of people. Following that, and after a conversation involving AMPC, MLA and us on 8 June, we have now included more current and specific information about the use of DEXA to inform OCM, and particularly to measure Lean Meat Yield.

Yours sincerely



Andrew Metcalfe AO

Federal Government Lead Partner
Oceania Central Agencies Lead Partner
Independent Review Leader

9 June 2017

Disclaimer

This final report (report) was prepared at the request of the Australian Meat Processor Corporation (Client) and Australian Meat Industry Council as part of the Independent Review into whether the proposed investment in Dual Energy X-ray Absorptiometry (DEXA) technology is a prudent operational and commercial decision. It is not appropriate to be used for any other purposes.

Any party other than the Client who accesses this report shall only do so for their general information and this report should not be taken as providing specific advice to those parties on any issue, nor may this report be relied upon in any way by any party other than the Client. A party other than the Client accessing this report should exercise its own skill and care with respect to use of this report, and obtain independent advice on any specific issues concerning it.

In carrying out our work and preparing this report, Ernst & Young (EY) is conducting an Independent Review on the instructions of the Client. As a result, this report specifically has taken into account the views and considerations of a range of industry, local and international subject matter experts as part of its observations. The report has been constructed based on information current as of 9 June 2017, and which have been provided by the Client and other stakeholders. EY also accessed media articles from external sources and have relied on this information for the purposes of preparing this report. Beyond 9 June 2017, material events may occur, which are not reflected in the report.

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User Guide: How this report is structured

This Report articulates our independent observations across the strategic, financial, technical, operational, commercial, governance and implementation aspects of The Proposal.

The Review has taken the approach of keeping each section of this Report separate and discrete, to assist readers as far as possible. Therefore, there may be the appearance of key data points in more than one area of the Report.

The Report is structured as follows:

Introductory sections	
Letter of transmission	
Disclaimer	
User guide: how this report is structured	
Table of contents	
Glossary	
Executive summary (including key observations and strategic recommendation)	

Section	Title	Description
1	Approach to the Review	Sets out the background to the commissioning of The Review, its Terms of Reference, and the methodology undertaken.
2	The Australian red meat and livestock industry	Provides a contextual and detailed overview of Australia's red meat and livestock industry. It describes its size and scale as well as its overall importance to Australia's broader agriculture sector. Finally, it provides information about the key industry participants, and highlights the significant challenges and opportunities facing the industry.
3	Understanding OCM and DEXA	Provides information about objective measurement, objective carcass measurement and associated technologies (including DEXA). The section also provides information about past and ongoing research programs relating to these areas.
4	The Proposal	Provides an outline of The Proposal which includes: OCM; the proposed DEXA technology solution; the rationale for an expedited rollout; the proposed financing arrangement; the expected benefits, costs and funding options; the proposed ownership and use of data; and the indicative technology installation schedule. This is a consolidated view of our understanding of what has been proposed, based on the information that has been made available to The Review.
5	The views of industry bodies and experts	Provides an overview of the feedback received directly through interviews with industry bodies and several local and international experts. This section also notes a number of media releases and media articles relating to some of the feedback received.
6	What we were told by producers and processors	Provides direct and unfiltered perspectives from a number of producers and processors that were obtained through an extensive series of interviews. This research was conducted by EY Sweeney, a major full-service market research firm. The methodology used enabled these informed industry operators to provide a range of practical insights, perceptions and expectations relating to The Proposal.
7	The Review's insights and observations	Summarises The Review's insights and observations that have resulted from Sections 1-6, including from our broad industry consultations, review of the documents The Review was provided with, and further independent research conducted. The observations have been aligned according to the strategic, technical, financial, commercial, operational, governance, and implementation aspects of The Proposal.
8	A possible way forward for the industry	Provides a point of view to assist the industry to consider how to go forward from here. It also provides broader views on the proposed shifts the industry could consider with regard to its long term sustainability and success.

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Glossary⁴

Agent (livestock agent): Acts for the producer/vendor to secure a sale and earn commissions. Agents are active in a variety of sales channels including saleyard auctions, direct sales and over the hooks transactions.

ALMTech: Refers to the 'Advanced measurement technologies for globally competitive Australian meat' (ALMTech) project, which was established in 2016 under the Commonwealth Government's Rural Research & Development for Profit program. The project focuses on the enablement of beef, sheep and pig farmers to have access to more accurate descriptions of the key attributes that influence the value of their livestock including: carcass lean meat yield; eating quality; and compliance to market specifications.

AUS-MEAT: Industry organisation which manages a number of meat industry product standards and also accredits and audits meat processing plants.

Australian Livestock Exporters' Council (ALEC): ALEC is the peak industry body representing the livestock export sector. It is responsible for setting industry policy, providing strategic direction and representing its members at all levels. Their mission is to lead the development and growth of the sector through an improvement the livestock export business environment; promote professional excellence and secure our standing with the Australian public and our customers.

Australian Lot Feeders' Association (ALFA): ALFA is the peak national body for the feedlot industry in Australia. Feedlots are an important industry in Australia. Their mission is to lead the industry in a manner that fosters excellence and integrity; improves the feedlot business environment; and ensures its community standing.

Australian Meat Industry Council (AMIC): AMIC is the Peak Council that represents retailers, processors and smallgoods manufacturers and is the only industry association representing the post-farm-gate Australian meat industry. As the Peak Council, AMIC confers with members, governments and industry groups to influence policy and provide technical and other advice to the industry.

Australian Meat Processor Corporation (AMPC): AMPC is the Rural RDC that supports the red meat processing industry throughout Australia, representing all beef, sheep and goat meat processors. Their mandate is to provide RD&E services that improve the sustainability and efficiency of the sector.

Benefit Cost Ratio (BCR): A BCR attempts to identify the relationship between the cost and benefits of a proposed project. Benefit cost ratios are most often used in corporate finance to detail the relationship between possible benefits and costs, both quantitative and qualitative, of undertaking new projects or replacing old ones.

Boning room: An area of an abattoir where the carcass is cut into smaller portions.

Carcass: The body of an animal after being dressed (i.e. the removal of an animal's head, feet, hide and internal organs during processing).

⁴ Note: Descriptions of the roles of industry bodies were taken from their websites, accessed May 2017

Cattle Council of Australia (CCA): The CCA is the peak producer organisation representing Australia's beef cattle producers. The objective of the Council is to represent and progress the interests of Australian beef cattle producers through consultation with, and providing policy advice to, key industry organisations, relevant Federal Government Departments and other bodies regarding issues of national and international importance.

Commission buyer: Acts on behalf of a third party to purchase cattle. Major acquirers of cattle generally employ their own 'corporate' salaried buyers and rarely use commission buyers.

Chemical Lean (CL): Chemical Lean is defined as the amount of lean red meat compared to the amount of fat in a sample of meat, using an approved method of sampling and testing. The CL of a pack is included in the trade description as a minimum percentage (e.g. 75CL, where 75% of the pack will be lean red meat and 25% of the pack will be fat).

Colorimeters and beef cam: OCM technology which can measure eating quality, the colorimeter uses colour dimensions in predicting beef tenderness.

Computer Axial Tomography (CT): OCM technology which can measure carcass composition, CT uses a system where an emitting x-ray source is rotated around the body with the resultant x-rays collected by a ring of detectors after passing through the carcass.

Dual Energy X-ray Absorptiometry (DEXA): The technology being proposed in The Proposal, this is a low-radiation technology that beams x-rays with different energy levels through a body in which its resultant scans are much more accurate at discriminating between density and tissues than conventional x-ray technology [i.e. Single Energy X-Ray (SEXA) technology].

EQ: Eating Quality is an overarching term used to describe the quality of various components of a carcass, which are typically driven by consumer preferences, and determined by a number of measures including, though not limited to, glycogen and pH, marbling and tenderness.

Feedlot: Farms where cattle are fed a high protein grain-based diet to reach market weight.

Finished: Cattle that have reached market specifications and are ready for slaughter/processing.

Grading: Process by which processors assess quality aspects of cattle carcasses. Involves a general assessment of the carcass, by a trained assessor, who classifies the carcass based on qualities such as fat depth and colour, muscle shape and size, and any detrimental characteristics such as injury or bruising.

Lean Meat Yield (LMY): Lean meat yield is the amount of lean meat, fat and bone that can be boned out from a carcass and is displayed as a percentage of carcass weight.

LiveCorp: LiveCorp is a not-for-profit industry service provider with approximately 61 members and associate members involved in the export of Australian livestock. Operating independently of, but in conjunction with MLA, LiveCorp is owned and controlled by industry members with the principal function of managing industry funded programs and services.

Meat & Livestock Australia (MLA): An organisation that delivers research, development and marketing services to Australia's cattle, sheep and goat producers. MLA is funded by industry levies.

Meat Standards Australia (MSA): MSA is a grading system proven to remove the subjectivity of buying and cooking Australian beef and lamb. All products identified with the MSA symbol have met strict criteria to ensure they achieve consumer expectations for tenderness, juiciness and flavour. When a cut of beef or lamb meets the MSA standard it is cut to, or labelled with a recommended cooking method which confirms that cut has achieved the standard for eating quality when prepared by the recommended cooking method.

Near-infrared reflectance technology (NIR): OCM technology which can measure eating quality, NIR utilises spectroscopic methods to measure the quantity of reflectance in the near-infrared region.

Objective Carcase Measurement (OCM): OCM refers to the processes and technologies that have the potential to be used to better measure carcase attributes to predict eating quality, disease or contamination, precise boning cutting lines, and lean meat yield. (This relates to the specific definition provided by the MLA as part of The Proposal).

Objective Measurement (OM): Further to the concept of OCM, which includes measurements of a carcase and its components, is the concept of Objective Measurement (OM) which is inclusive of 'whole of value chain' measures such as on-farm and animal health measures.

Over the hooks (OTH): Where cattle are sold direct to the processing plant and the producer is paid based on a price grid. The weight of the processed carcase along with the carcase grade is used to determine price.

Paddock sales: Cattle are inspected on the vendor's property by the buyer and are sold straight out of the paddock. Price is generally negotiated on a dollars per head (\$/hd) or cents per kilogram liveweight (c/kg) basis. The sale may be negotiated by an agent on behalf of the vendor.

Point measurement and yield equations (current 'manual' grading methods): OCM technology which can measure carcase composition various point measurement devices in lamb and cattle, including carcase rulers in advanced probe technology.

Project 150: This is another name by which "The Proposal" has been publicly referred to.

Price Grid: A schedule of price and carcase attribute data used to determine the price paid per kilogram to a producer for their cattle or sheep. Prices are arranged on the grid based on the final weight of the carcase, along with its graded attributes. The grid may also include premiums and discounts that will apply for carcase attributes.

Purpose: 'Purpose', in the way used in this report, is a key ingredient for a strong, sustainable, scalable organisational culture. It is defined as being an unseen-yet-ever-present element that drives an organisation; and when extrapolated to an industry, it can be a strategic starting point, a product differentiator, and an organic attractor of industry participants and customers.

Red Meat Advisory Council (RMAC): RMAC Ltd is a not-for-profit company limited by guarantee that is supported by the [Articles of Association](#) and the [Red Meat MOU \(MOU\)](#). RMAC provides leadership on cross-sectoral issues and consults with the Minister for Agriculture and Water Resources on agreed whole of industry matters and is the custodian of the MOU, MISP and industry reserves.

RGBD technology (Wii cameras): OCM technology which can measure carcase composition, the RGBD camera technology and data acquisition software is an advancement from VIA in which it uses a number of small cameras to collect a large number of images and integrate them into a three-dimensional image.

Saleyard: A physical auction market where buyers and sellers trade livestock. There may be separate sales for store and prime cattle.

Saleable meat yield (SMY): SMY is the proportion of the carcase that can be processed and sold to the consumer. It is the 'yield of bone-in or boneless cuts plus manufacturing meat that has been trimmed to a desired fat coverage or level'. SMY of a carcase can be a relevant commercial definition for processors to use in valuing the carcase, but it can vary widely according to trim specifications for a particular market.

Slice shear force: OCM technology which can measure eating quality in which the moderate relationship between shear force and tenderness saw the development of a slice shear test that could operate at line speed.

Sheep Meat Council of Australia (SCA): The Sheepmeat Council of Australia (SCA) is the peak national body that represents and promotes the interests of lamb and sheepmeat producers in Australia. Their core business is policy development and lobbying. Additionally, the Council's key role is scrutinising the performance of and setting the strategic imperatives to be pursued by levy funded bodies, in particular, Meat & Livestock Australia (MLA), Animal Health Australia and the National Residue Survey.

Tendertec probe: OCM technology which can measure eating quality, the tendertec probe is a mechanical probe which measures resistance when inserted into the muscle of a chilled carcass.

The Proposal: This refers to the 10 November 2016 announcement and proposal by MLA for the investment of \$150 million to install Dual Energy X-ray Absorptiometry (DEXA) units into up to 90 AUS-MEAT registered processing plants.

Ultrasound: OCM technology which can measure carcass composition in which ultrasound can measure eye muscle area and back fat in live animals.

Value Based Trading (VBT) - Transfer of ownership based on a set of measures that estimate the value of the product and are used to establish the transfer price.

Value Based Marketing (VBM) - Specifies the 'value' characteristics of the live animal prior to sale commitment and using these measures to offer the animal to prospective purchasers. The accuracy of live animal measurements in describing post-slaughter value will need to be accurate enough for VBM to substitute for VBP.

Value Based Pricing (VBP) - Process by which a buyer (e.g. processor) will pay a seller (e.g. producer) based on the specific 'value' characteristics of the carcass (or potentially the live animal in the future) after the commitment to sell has been made. Although price for different values is usually agreed prior to sale, the actual value of the product is unknown until after the commitment to sell/buy.

Video Image Analysis (VIA): OCM technology which can measure carcass composition. VIA works by capturing images either on the whole carcass or the chiller assessment system on quartered carcass to predict SMY.

Executive summary

This executive summary is designed to be a high-level synopsis of the report. It combines the issues explored in each section with summaries of the specific observations contained in detail in that section. It also provides The Review's strategic observations and key recommendations.

Background/context (sections 1 & 2)

The Australian red meat and livestock industry (the industry) directly contributes approximately \$7bn a year to Australia's Gross Domestic Product (GDP). It is Australia's largest food manufacturer, and a significant employer in rural and regional areas, employing some 200,000 Australians on farm, in meat processing and at wholesale and retail businesses.

As Australia's 2nd largest manufacturing sector, the red meat processing industry generated \$18.8bn for the Australian economy, 74% or \$13.3bn of which were via exports. It is also Australia's largest contributor of industry value-add and the 2nd largest employer (35,291 people) by sector.

As a trusted supplier of high-quality red meat, Australia is well positioned to benefit from increasing international demand for red meat. However, the industry faces a number of strategic risks that may impact its ability to capitalise on these opportunities.

The 10 November 2016 proposal by MLA (The Proposal) to facilitate the installation of a particular Objective Carcase Measurement (OCM) technology across the Australian red meat industry indicated that "this initiative would pave the way for scientific measurement of saleable meat yield (SMY), future value based marketing and industry-wide productivity gains through processing automation, genetic improvement and data-based on-farm decision making"⁵.

The announcement further indicated that The Proposal "would acquire a commercial loan on behalf of industry to finance the \$150 million one off cost of installing Dual Energy X-ray Absorptiometry (DEXA) technology in up to 90 AUS-MEAT registered slaughter facilities".

We note that elements of The Proposal have developed since its initial release.

In February 2017 the Australian Meat Processor Corporation (AMPC) and Australian Meat Industry Council (AMIC) appointed Ernst & Young (EY) to undertake an independent review (The Review) of The Proposal which specifically focused on the accelerated installation of DEXA technology in up to 90 AUS-MEAT registered processing facilities. The terms of reference provided to The Review were primarily focused on the use of DEXA in beef, noting its current use and levels of success in lamb. The Review was commissioned to advise on the strategic, financial, technical, commercial, operational, governance and implementation aspects associated with The Proposal.

To give effect to its Terms of Reference, The Review has sought to examine a range of considerations of The Proposal including; the strategic rationale; robustness of approach taken in arriving at the proposed technology; financial and commercial models and assumptions; proposed structure of operations and appetite from the broader red meat industry. To that end, it is the aim of The Review to present information allowing considerations about whether the proposed roll-out of DEXA technology is an appropriate and prudent operational and commercial decision for the industry at this time.

⁵ MLA media release on 10 November, accessed March 2017

Methodology (section 1.3)

EY has approached The Review in a consultative, collaborative and transparent manner. We have listened to and sought to understand the viewpoints from industry stakeholder groups in addition to conducting our own research and analysis. Stakeholder engagement occurred through interviews, surveys, communication of matters under consideration through Issues Papers and submission of feedback and suggestions to The Review mailbox (dexa.independent.review@au.ey.com).

Two Issues Papers were published with the aim to provide a broad context of the industry, examine aspects of The Proposal and identify a series of further considerations as well as to obtain further feedback and contribution from the industry and interested parties in response to the matters being examined.

The outcomes of The Review's research and enquiries are in this report.

Understanding Objective Carcase Measurement (OCM) and The Proposal (sections 3 & 4)

OCM technology refers to the objective technology which can be used to specifically measure carcase traits more accurately than by subjective means. It is important to recognise that, further to the concept of OCM, which includes measurements of a carcase and its components, is the concept of Objective Measurement (OM). OM is inclusive of 'whole of value chain' measures. The red meat industry's OM strategy aims to develop 'whole of value chain' measurement systems that ensure Australia's high cost production and processing sectors increase returns through improved efficacy and efficiency, and enable value chain alignment with customer's willingness to reward⁶.

Current OCM research programs include the 'Advanced measurement technologies for globally competitive Australian meat, or the 'ALMTech' project, which was established in 2016 under the Commonwealth Government's Rural R&D for Profit program. This program is in partnership with RDCs, Commercial Companies, State Departments and Universities, and includes dedicated research into five programs, one of which looks specifically at the 'Development of Lean Meat Yield (LMY) technology'⁷.

The Proposal involves the proposed use of OCM to address carcase grading complexities in which the output of LMY data from a DEXA scan will include measurements for meat, fat and bone composition in addition to AUS-MEAT feedback. Secondly, this information would act as standardised data feedback to livestock production with the opportunity to pass this information back along the value chain. It is also anticipated by The Proposal that the installation of DEXA will reduce the barriers to adoption for OCM and other automation technology solutions in the future.

The proposed DEXA units to be installed are in a purpose-built lead-walled section within processing facilities, with the choice of location being left up to processors. The data from these units would be collectively stored and used for collective R&D and marketing, or to create solutions to providers more generally. Calibration of each DEXA unit is required, in which the auditing function is proposed to be carried out by AUS-MEAT.

The Proposal contemplates an accelerated industry-driven DEXA installation to provide expected benefits of transforming the industry towards livestock production and marketing through objective data and value measurements. This is ultimately anticipated to return \$220m of value to the supply chain per annum by 2020. The Proposal has also outlined the specific issues anticipated from a market-led installation which include further industry consolidation in the processing sector; challenges in defining audit processes and standardisation of DEXA installations; and an overall delay in shifting the industry to value-based operations that would improve productivity and better meet consumer needs.

⁶ MLA - Objective Measurement Strategy, accessed April 2017, pg.1

⁷ ALMTech Operating Plan, 2016, pg.1

The cost of the industry-wide installation is estimated by The Proposal to be \$150m. The Proposal noted that the originally proposed funding structure comprised of a government concessional loan through the Commonwealth Regional Investment Corporation, to be underwritten by MLA and serviced through the apportionment of producer levies over the loan repayment period. We note that elements of The Proposal have developed since its initial release.

Consultations with the industry (sections 5 & 6)

The Review engaged with a number of industry bodies and experts to seek their views on a range of aspects relating to The Proposal. Some stakeholders believe that benefits would accrue from the implementation of The Proposal, creating a positive impact on the industry by enabling value based transactions and improving confidence of the producer community.

However, the use of DEXA as the preferred OCM technique received mixed levels of support from within the industry bodies and experts interviewed. While some specialists believe that the technology needs to be proven for beef, a few industry bodies have come out in support of the implementation of the DEXA technology in its current form. For lamb, the mandate is more positive, with most stakeholders confident of successful use of DEXA for OCM.

A few respondents have a view that processors should adopt OCM based on their business case viability, while others believe an industry-led rapid adoption is the way forward to prevent consolidation within the processors, mitigate issues with standardisation of grading and auditing requirements. On the use and ownership of any data generated should The Proposal be adopted, the interviews suggest that there needs to be greater clarity in the proposed arrangements of the data use.

Some stakeholders interviewed by The Review suggest that The Proposal should explore alternative funding opportunities to help make the project sustainable in the long run.

Our direct consultations with some producers and processors indicated that they recognise the need for the industry to pursue a progressive approach. Many also consider cooperation a critical component of growth and success for the broader industry. The specific producers and processors that we directly interviewed broadly consider that trials would provide both parties with informed and credible insights into the merits and relevance of DEXA technology to individual businesses.

Producers have advised that they expect OCM technologies to increase objectivity and transparency of carcase measurement, overcome carcase grading and pricing frustrations, potentially contribute to the fine tuning of breeding strategies, and identify inefficient stock.

Processors expect DEXA will enable optimised boning, potentially lifting the revenue from saleable meat to producers, and reducing the cost of processing.

While many are scanning the international market for relevant technology, and a handful have decided DEXA is relevant to their business model, most processors we directly spoke with considered a thorough assessment of DEXA technology (including DEXA pilot installations) would represent a constructive step forward for all involved.

The Review's insights and observations relating to the Terms of Reference (section 7)

1. Strategic considerations

There is recognition of the identified industry needs and support for objective measures. However greater clarity on how DEXA performs as a solution would be beneficial. The strategic need for OCM has been prioritised consistently across industry strategic plans, where there exists strategic alignment of key industry issues. Conversely, there is less coverage in the strategic plans when it comes to the need for cultural change solutions, which if addressed, would likely drive increased trust between supply chain participants.

Furthermore, there are differing views and priorities when it comes to what objective measures would be of the most benefit to the industry including LMY, Saleable Meat Yield (SMY) and Eating Quality (EQ). The value placed on the various characteristics of a carcass is strongly influenced by the end market to which processors are providing products. As such, individual objective measures and the ways in which they can be prioritised, is based on their differing importance to supply chain participants.

There are several factors which are considered with the overall value of the carcass, with LMY being but one input. Therefore, the impact of the specific OCM technology installation on the direct uplift in prices paid for carcasses, will depend on the way in which LMY is weighted in the pricing grids determined by individual processors. However, the long term increase in quality of stock as a result of data feedback influencing herd development is likely to increase prices paid, aligned with the increase in quality. OCM data output will enable products to be better matched and processed according to consumer preferences in domestic and international markets.

2. Technical considerations

In the context of The Proposal and based on the information available to The Review, it remains unclear as to the whether other solutions, including non-technology solutions, were considered. This is particularly the case for addressing grading concerns, whereby the recommendations made by the ACCC to increase frequency of grading audits and the publication of audit results could be considered.

Furthermore, consultations with the industry suggest a considerable portion remain unconvinced that a technology investment of this size is the right solution to meet the needs of the industry at this time. Should the consideration of possible solutions be undertaken and provided to the industry, it would provide them the opportunity to participate in the decision making process on how best to meet the needs, opportunities and challenges which may or may not require a large technology investment.

In the consideration of alternative OCM technologies, The Review sees that DEXA, on the basis of current research, is potentially one of the most suitable technologies in meeting the technical requirements of the industry. However, an industry-defined criteria, if developed, would have been beneficial to further evidence that DEXA is the most suitable option based on accuracy and other factors which enable standardised measures industry-wide. DEXA can also be prioritised over EQ technologies, which are less advanced and not as pertinent given the current accuracy of MSA grading.

3. Operational, Governance and Implementation considerations

The feedback and engagement with the various industry bodies, producers and processors reiterates the need for more information through pilot programs in beef to enable evidence based decision making by the broader industry and the processing sector in particular given their differing needs and business models. Key developments are showing that, while the use of DEXA as an objective measurement technology in beef appears to have promise, it has yet to be categorically proven that it can objectively measure carcasses of all types and characteristics for the purpose of predicting LMY.

Additionally, the level of complexity and management surrounding both the use of the proposed DEXA technology in processing facilities and the ownership and use of the accompanying data produced, necessitates a significant level of structured oversight and governance. This would also include overseeing the collective negotiation of commercial use of data and IP. There is also a perceived lack of scale by the sole supplier to meet the needs of the industry, creating a potential risk to The Proposal if the supplier faces difficulties to deliver and at scale. Furthermore, there are issues as to the level of IT infrastructure support (both hardware, and software) to manage, encrypt, transmit and analyse (calibrate and gather insights for industry wide use) the data that would be produced as a result of running DEXA in processing plants.

4. Financial and commercial considerations

There are a number of benefits and costs in which The Review has been unable to identify or validate the inputs for a Benefits-Cost Ratio (BCR) assessment on the information made available to us. These include costs which relate to auditing the DEXA units, training staff in using the DEXA machine, overall program governance costs, a program management office, employment of program and project managers; and decommissioning costs at the end of the DEXA lifecycle.

The Proposal envisions that processors will operate and maintain the DEXA unit, while the ownership is retained by MLA. These terms should be considered carefully by processors choosing to participate in The Proposal, if electing to use DEXA to enable automated boning which we understood could require an additional investment (e.g. of approximately \$4-5m⁸).

Furthermore, The Review has been provided with The Proposal's benefits of \$910m by 2026 as derived from the benefit calculations included in the OM Strategy Report⁹. However, The OM Strategy Report and The Proposal benefits do not reconcile, as the OM Strategy Report was commissioned to measure benefits of OM technology more broadly.

A BCR, if calculated, would be a useful comparator for the industry to evaluate The Proposal for investment purposes. This would need to include total cost ownership including operating costs, full economic benefits and their associated risks and timing. The Review recommends that expected BCR scenarios should be prepared based on pilot findings and as agreed through industry consultation.

Correspondence has confirmed that the proposed financing model is in draft. The Review recommends that a financing options analysis is performed and has outlined a list of potential debt funding options and matters to be considered. Where shared financing arrangements are proposed, the conditions should clearly stipulate how the benefits are to be realised, and shared, amongst peak industry councils and their members.

A possible way forward for the industry (section 8)

In this increasingly global and competitive industry, The Review has concluded that there needs to be careful and ongoing consideration about how to best position the Australian industry and Australian producers and processors. However, the driver for any business decision should be consumer-led; as consumers drive industry demand, and thus a more consumer centric approach to introducing new developments could assist in the industry's transformation.

Additionally, the industry should consider a more staged and incremental approach to new operating models as disruptive and potentially transformative as that proposed. This would allow for consideration of all the issues identified in our Review to enable trials to be conducted and evaluated, and gather further evidence including how this might affect the range of different business models that exist in the industry.

⁸ Estimated figure for additional lamb automation technology based on an interview with MLA on 24 March 2017

⁹ Development of supply chain objective measurement (OM) strategy and value proposition to stakeholders, Greenleaf Enterprises, Miracle Dog and Scott Williams consulting, 2016, pg. 19-21, 26-27, 36-39

Key observations

There is a strong desire for the success of the industry, but there are many non-competitive and competitive factors at play. Earlier reviews, reports and plans have called for greater collaboration between the industry players, and we echo that sentiment. That does not mean that the industry should delay progress in the absence of consensus; but rather that leaders seek to cooperate and work towards their common goal of a successful, sustainable, internationally competitive industry; with the consumer of its products at the centre of all it does.

The industry has major opportunities to sustainably grow and prosper, but faces many risks. It is heavily trade exposed, and has very high operating costs compared to international competitors. It faces competition from other sources of protein. Technological advances, high levels of collaboration across the value chain (noting the understandable competitive tensions that will always exist), and a relentless focus on the needs of the customer are preconditions to success.

The Proposal is bold and ambitious. It has focused discussion and debate in the industry about several key aspects of technological advances - objective carcass measurement, automation, data ownership, and data-driven improvements to production and processing.

Our consultations indicate that there is general acceptance across the industry about the need for, and benefits of Objective Measurement, including Objective Carcass Measurement; and that the adoption of OCM will, over time, potentially enable greater trust in commercial relationships and potentially lead to an uplift in productivity across the value chain. However, it is clear from our consultations, research and analysis, that questions remain and that there is no alignment of views at this point.

Some key stakeholders have advised that they agree with the specific OCM technology advanced in The Proposal. According to the information available to The Review, it has been and is being used successfully with sheep/lamb processing, and is being used to enable automated processing in beef by a major processor. Also, according to the information available to The Review, it is in the initial stages of being used to determine LMY in beef in a commercial setting.

In addition, some stakeholders believe that an increasing focus on Lean Meat Yield as a key supply chain 'signal' may inhibit industry diversity and specialisation, which may have unintended and detrimental impacts to industry competitiveness, particularly in export markets.

The Review agrees that the potential benefits of the collection and use of data derived from OCM technology appear to be significant, and valuable, both to individual companies and to the industry as a whole. This is consistent with the experience of many other industries and companies. However, there are questions as to whether, and how, this can be achieved on an industry-wide basis.

There have also been questions raised about whether the proposed widespread installation of high cost capital equipment, owned by a RDC, at the post-slaughter stage of processing plants, is an activity that should be undertaken by RDCs. The Review notes that one stated rationale for The Proposal is to enable the collection of datasets to enable further research and development.

It is clear that there are major questions about data collection, ownership and use, and intellectual property. Some stakeholders have commented that uptake of such technology should only be at the request of processors; The Review notes this is consistent with The Proposal's offer of a voluntary roll-out.

Our research concludes that all the potential impacts on producers, processors and the wider industry have yet to be fully identified, explored and considered. The Review believes that a significant amount of industry wide change management activity and stakeholder engagement is necessary: so that all stakeholders are clear on the potential implications of The Proposal, not only

for the broader industry but for their specific businesses as well.

Looking forward: consistent with the strategic lens of our Terms of Reference and following our consultations, research and analysis, The Review has also focussed on the future of these issues for the industry.

These potential technological and data-driven advancements represent too important and transformative an opportunity to be missed. However, the necessary level of shared purpose and collaboration for such transformational change is not yet present. More must be done to build those essential preconditions for progress.

The Review has concluded that this area is one which requires overall industry participation and alignment. It impacts on both pre-competitive and competitive areas of the many processor and producer businesses involved. Being a “shared space” it thus needs to involve both key Research and Development Corporations and all industry representative bodies.

The ALMTech program, which involves all RDC key players, and/or the governance arrangements suggested by the OM Strategy Report, would appear to be possible structures well placed to support this strategic alignment.

Strategic recommendations

1. The industry should advance OCM initiatives: (including the technologies to be researched and trialled, and potentially to be voluntarily deployed by processing companies according to their business model when commercially proven) in an open, consultative and collaborative manner and driven by a clear common purpose.
2. As these issues directly relate to the research and development activities of both the processing and production sectors, AMPC and MLA need to work together to achieve alignment, as they both have key roles in taking these initiatives forward.
3. One way to achieve recommendations (1) and (2) would be for industry governance arrangements relating to technological developments to be revitalized.
4. To provide the necessary levels of transparency, there should be a series of conferences or open workshops to allow industry participants to be briefed by experts on progress with OCM to date; enabling a clear and agreed roadmap for the future to be established.
5. ALMTech should consider updating its work plan, timetable, and key performance indicators.
6. AMPC and MLA, either through the ALMTech structure or in some other way, should work with AMIC and individual processing companies to explore how the potential benefits of an industry wide data-base of key objective measures could be achieved; and to consider its implications, including the impact on the intellectual property and commercial operations of individual processing companies.

A close-up photograph of a person's hand holding a red marker, drawing a red 'W' inside a green circle on a white surface. In the background, other people are visible, some holding pens and a glass of water. A grey semi-transparent box is overlaid on the left side of the image, containing the text '1. Approach to The Review' in yellow.

1. Approach to The Review

1. Approach to The Review

This section provides the background, terms of reference and methodology undertaken throughout this Review.

1.1. Background

On 10 November 2016 MLA announced a plan to install Objective Carcase Measurement (OCM) technology across the Australian red meat industry. The announcement indicated that “This initiative would pave the way for scientific measurement of saleable meat yield (SMY), future value based marketing and industry-wide productivity gains through processing automation, genetic improvement and data-based on-farm decision making”. The announcement further indicated that MLA “Would acquire a commercial loan¹⁰ on behalf of industry to finance the \$150 million one off cost of installing Dual Energy X-ray Absorptiometry (DEXA) technology in up to 90 AUS-MEAT registered slaughter facilities”¹¹.

In February 2017 the Australian Meat Processor Corporation (AMPC) and Australian Meat Industry Council (AMIC) commissioned Ernst & Young (EY) to undertake an independent review of The Proposal which specifically focused on the accelerated installation of DEXA technology in up to 90 AUS-MEAT registered processing facilities.

Since MLA’s announcement and EY’s appointment, The Review notes that there has been further developments with regard to the proposed plan. These developments have been examined and reflected in this report (where appropriate), as part of The Review’s aim to present relevant information and considerations regarding whether investment in DEXA technology is an appropriate and prudent operational and commercial decision for the industry at this time.

This Review has been led by Andrew Metcalfe AO, a Partner in EY, and a former Secretary of the Commonwealth Department of Agriculture, Fisheries and Forestry.

1.2. Terms of Reference

MLA’s announcement stated that while smallstock DEXA technology is ready for commercial deployment, DEXA research and development in beef is nearing completion and ready for commercial installation trials in early 2017. Further, the announcement also highlighted the findings of the recent *Australian Competition & Consumer Commission (ACCC) Cattle and Beef Market study*, which is said to support the Cattle Council of Australia’s focus on how the competitiveness of Australian beef and cattle markets could be improved by the adoption of objective carcase measurement.

Consequently, the terms of reference provided to The Review was primarily focused on the use of DEXA in beef while noting its current use and levels of success in lamb¹². As such, The Review sought to examine a range of considerations of The Proposal including the:

- ▶ **Strategic considerations** including the strategic rationale and ‘problem statement’ that The Proposal is attempting to solve
- ▶ **Technical considerations** including the robustness of the approach taken in arriving at the proposed technology (i.e. considerations of other technology solutions and levels of success)

¹⁰ MLA recently advised The Review that they are exploring alternative funding models to those originally proposed

¹¹ Media release, 10 November 2016: MLA to install objective measurement across industry

¹² The MLA Funding Proposal notes that of the AUS-MEAT registered processors, 38 focus only on beef, 11 on sheep only and ~40 process multiple meat types (e.g. beef, sheep, pig, goat an offal)

- ▶ **Operational, governance and implementation considerations** including commercial readiness and proposed structure of operations that would govern the execution of the proposed plan
- ▶ **Financial and commercial considerations** including the models and assumptions that form the basis for the costs, payback period, funding options and linkage of benefits back to the funders and the broader industry
- ▶ **Appetite from the broader red meat and livestock industry** in this undertaking, including potential areas of opportunity or concern

In examining the appetite from the broader red meat and livestock industry, The Review was also asked to conduct a ‘voice-of-the-industry’ which was designed to bring the vital perspectives and unfiltered views of producers and processors to light. The rationale was that these informed industry operators would be well placed to provide a range of practical insights, perceptions and expectations which represent critical considerations for the industry.

This collective understanding was necessary to provide AMPC, and AMIC, and the broader industry with the required information to assist them to reach evidence based and well informed views about The Proposal.

1.3. Methodology

EY has approached The Review in a consultative, collaborative and transparent manner. We have listened to and sought to understand the many viewpoints from industry stakeholder groups in addition to conducting our own research and analysis.

Stakeholder engagement occurred through interviews, surveys, Issues Papers; and by the submission of feedback and suggestions to The Review mailbox (dexa.independent.review@au.ey.com).

We extended several invitations to key organisations to provide us with all the relevant materials that they could, on the basis that any documents needed to be able to be publicly used in this report. We were accordingly provided with a number of papers and reports relevant to The Proposal.




We asked key stakeholders on a number of occasions, including through publishing the detailed 2nd Issues Paper, to provide us with all information they believe was relevant and which could be used publicly in this report.

The range of stakeholders engaged as part of this Review include:

Peak Industry Councils ¹³	Research and Development Corporations	Producers and processors
		
<ul style="list-style-type: none"> ▶ Red Meat Advisory Council (RMAC) ▶ Cattle Council of Australia (CCA) ▶ Sheepmeat Council of Australia (SCA) ▶ Australian Lot Feeders' Association (ALFA) ▶ Australian Livestock Exporters' Council (ALEC) 	<ul style="list-style-type: none"> ▶ Meat & Livestock Australia ▶ Australian Meat Processor Corporation 	<ul style="list-style-type: none"> ▶ A series of producer and processor organisations of varying sizes, geographic locations, market focus and business models

¹³ LiveCorp were engaged in The Review in the same manner as all other stakeholders, however an interview was not taken up

Peak Industry Councils ¹³	Research and Development Corporations	Producers and processors
<ul style="list-style-type: none"> Australian Meat Industry Council (AMIC) 		

Academic and Independent Experts	Providers of OCM Technology*	Interested Parties
		
<ul style="list-style-type: none"> Several local and international food quality and meat sciences experts and technology specialists 	<ul style="list-style-type: none"> Engineering organisations specialising in DEXA and related technology solutions 	<ul style="list-style-type: none"> A range of individuals and organisations from the broader industry that engaged via a dedicated mailbox

* The Review has also undertaken site visits to related technology facilities.

The Review has also been provided with a wide range of research and consultancy reports relevant to The Proposal.

The Review is also mindful of recent/ongoing inquiries into these matters and the recent ACCC report; *Cattle and beef market study – Final report, 2017*. In addition, we have also included the recent MLA and AMPC publicly released report; *Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders*¹⁴.

The Review has also noted the 22 May 2017 announcement by the MLA to invest up to \$10m to co-fund the installation of DEXA objective measurement systems in four red meat processing facilities.

On 27 March 2017, The Review's 1st Issues Paper was published on the AMPC website where, based on initial consultation with the industry, independent subject matter experts and EY's research, a number of initial questions were raised to invoke industry feedback and dialog.

On 3 May 2017, The Review's 2nd Issues Paper was publicly launched via a media briefing in Sydney. The aim was to provide a broad context of the Australian red meat and livestock industry, examine aspects of The Proposal for the installation of DEXA in AUS-MEAT registered processing facilities, and identify a series of further considerations as well as to obtain further feedback and contribution from the industry and interested parties in response to the matters being examined.

The intended outcome of The Review's research and enquiries is to provide an informed and independent view to the AMPC and AMIC as to whether adopting The Proposal represents a prudent decision at this point in time. This includes considerations of other arrangements that should be examined prior to decisions being made for a whole-of-industry investments in OCM technology, options that are available to the industry to move forward and which of these present, in our view, the most practical direction to take.

This report was originally provided to AMPC and AMIC on 5 June 2017, and distributed to a limited number of people. Following that, and after a conversation involving AMPC, MLA and us on 8 June, we have now included more specific information about the current use of DEXA to inform OCM, and particularly to measure LMY. This appears at pages 15, 51, 52, 54 and 137.

¹⁴ *Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders - Final report, 8 May 2017,*



2. The Australian red meat and livestock industry

2. The Australian red meat and livestock industry

This section is contextual and provides an overview of the size and scale of the red meat and livestock industry, key industry participants and highlights the significant challenges and opportunities facing the industry.

2.1. Overview

The Australian red meat and livestock industry directly contributes approximately \$7bn a year to Australia's Gross Domestic Product (GDP). It is Australia's largest food manufacturer, and a significant employer in rural and regional areas, employing some 200,000 Australians on farm, in meat processing and at wholesale and retail businesses (illustrated in Figure 1 below). Thousands more people are involved in supplying the industry with services such as transport, supply of merchandise and other professional services¹⁵. The industry is heavily trade exposed, exporting approximately 70% of its product.

Figure 1: Australian red meat and livestock industry value chain



Source: EY analysis of MISP 2020

¹⁵ Meat Industry Strategic Plan (MISP) 2020, 2015, pg.6

2.2. The red meat producing industry

“[The industry is]...the single largest contributor to the annual value of Australian agricultural production: more than half of Australian farms produce beef cattle, representing \$11 billion (or approximately 21 per cent) of agricultural production value in 2014-15” - ACCC Cattle and beef market study¹⁶

The red meat producing industry is made up of beef, sheepmeat and goatmeat sectors. There are approximately 71,659 cattle production businesses in Australia with a 58% representation of all farms with agricultural activity¹⁷ and 39,512 agricultural businesses with sheep and lambs¹⁸. While Australia is a relatively small producer of goatmeat, it is still the world’s largest exporter of goatmeat.

The sectors noted above are exposed to a range of uncontrollable factors such as weather patterns, downstream demand and price variations. Varying rainfall has played a significant role in the industry’s performance over the past five years influencing operational decisions such as when to sell livestock and expand herds. Extreme examples include droughts and floods, but even modest temperature variations or the timeliness of rainfall can have a significant effect on pastures and crops used to feed livestock. In response to changes in feed availability, cattle producers (for example) will turn off or purchase stock to increase or decrease stocking rates, resulting in fluctuations in cattle supply¹⁹.

Revenue growth from 2012-17 has fluctuated with an annualised growth of 2.0%, with 2015-16 being particularly strong largely due to rapidly rising demand for Australian beef in export markets²⁰.

While revenue in 2016-17 is estimated to reach \$4.9bn, this is expected to fluctuate in the next five years, influenced by weather patterns and herd rebuilding activities. Additionally, the sheep and beef cattle farming industry is expected to be comprised of fewer large farms²¹. This is reflected in the forecast decline in the number of enterprises and establishments. This decline is influenced by technology which is anticipated to play a greater role in the expansion of farms, allowing farmers to become more efficient and improve their economies of scale.

The producing value chain is comprised of primary producers and feed lotters. Each have a similar but distinctive role in raising animals up to the point of slaughter.

¹⁶ ACCC Cattle and beef market study – Final report, 2017, pg.3

¹⁷ ABS Agricultural Commodities factsheet, 2014-15

¹⁸ ABS Agricultural Commodities factsheet 2014-15

¹⁹ ACCC Cattle and beef market study – Final report, 2017, pg.39

²⁰ IBIS World Sheep-Beef Cattle Farming in Australia, 2017, pg.4

²¹ IBIS World Sheep-Beef Cattle Farming in Australia, 2017, pg.4

2.2.1. Primary producers

The term 'primary producers' in the Australian red meat and livestock industry is used to describe the grass fed beef cattle, sheep and goat farms. In Australia, cattle spend 85-90% of their lives in an extensive pasture environment feeding on grass prior to being sent to feedlots to raise livestock to marketable weight²².

The majority of beef cattle farms can be separated into two production regions, northern and southern Australia; reflecting differences in climate, pasture, industry infrastructure and proximity to markets. Average herd size differs significantly between farms in northern and southern Australia. In northern Australia average herd size is 1,576 head per farm, with the majority of cattle held on a relatively small number of very large properties. For southern Australia, a large number of relatively small-scale farms result in the average herd size of 412 head per farm²³.

The majority of Australian beef cattle producers are cow-calf operators, maintaining a herd of breeding cows and a relatively small number of bulls for the production of calves²⁴.

The prime lamb producers however are predominately located in the Riverina, the wheat-sheep zone of New South Wales (NSW), the Victorian and NSW Murray region and the high rainfall areas in south-west Victoria and eastern South Australia²⁵.

2.2.2. Feedlotting

A feedlot is a type of animal feeding operation which is used for intensive animal farming. In Australia, feedlots are only used to bring livestock to marketable weights²⁶. The main benefits of lot feeding are greater control and flexibility in the production and marketing of livestock²⁷.

The cattle feedlot sector has a value of production of approximately \$2.5bn and employs some 28,500 people directly and indirectly. The ability to deliver consistency with respect to cattle quality and quantity (regardless of seasons) is a desirable trait for customers in both domestic and international markets. Approximately 40% of Australia's total beef supply and 80% of beef sold in major domestic supermarkets is sourced from the cattle feedlot sector²⁸.

There are approximately 450 accredited feedlots throughout Australia with the majority located in areas that are in close proximity to primary producers and grain supplies. Queensland is the largest state in terms of cattle numbers on feed with approximately 60%, followed by NSW with 30%, Victoria with 7% and the remainder shared between South Australia and Western Australia²⁹.

²² ALFA website - Myths and Facts about the Australian Feedlots Industry, accessed April 2017

²³ ACCC Cattle and beef market study – Final report, 2017, pg.6

²⁴ ACCC Cattle and beef market study – Final report, 2017, pg.17

²⁵ MLA website - Fast Facts Australia's sheep industry, 2016, pg.1

²⁶ ALFA website - Myths and Facts about the Australian Feedlots Industry, accessed April 2017

²⁷ MLA website - Lotfeeding and intensive finishing, accessed April 2017

²⁸ ALFA website - About the Feedlot Industry, accessed April 2017

²⁹ ALFA website - About the Feedlot Industry, accessed April 2017

2.3. The red meat processing industry

The processing value chain in the Australian red meat and livestock industry is comprised of live transport, processors (abattoirs), cold transport, marketing and distribution, and wholesale and retail distribution channels.

In 2015-16 the red meat processing industry generated \$18.8bn for the Australian economy and \$13.3bn in exports³⁰. There are approximately 135 processing plants (89 of which are AUS-MEAT certified) representing a 97% of the total processing capacity³¹. This equated to 8.1m heads of cattle in 2014-15³².

The red meat processing sector is Australia's 2nd largest manufacturing industry by revenue, the largest contributor of industry value-add and the 2nd largest employer (35,291 people) by sector³³.

2.3.1. Live transport

Live transport encompasses the transportation of red meat livestock from farms to other farms, feedlots, saleyards, and meat processing facilities and for live export. Most domestic livestock are transported by land, while exports are predominately transported by sea and air. To ensure the welfare of livestock on these journeys, and to maintain the quality of the red meat product, a national guide and quality assurance system has been developed. Red meat producers are provided with the national guide to assist them with the transportation of livestock³⁴.

The costs of transport significantly influences the profitability of the livestock transported. The weight and condition of livestock deteriorates with distance and time travelled. This increases the likelihood that the eating quality of the animal will be lower, impacting a processor's ability to fulfil its supply contracts with certainty and the prices paid to producers³⁵.

Climate change is increasingly having an impact on livestock transportation with flood disrupting major logistics networks in the northern states' and reduced stock grazing areas in Queensland caused by drought. Should temperature change continue in drought affected states such as Queensland, a proportion of current grazing land may become unsuitable for the same type or density of production currently employed. This may necessitate a reduction in stock numbers or the use of more heat and drought tolerant breeds. Movement of stock to more temperate locations may take livestock away from the current supporting and processing infrastructure, necessitating increased transport time, cost and may negatively impact cattle conditions³⁶.

³⁰ IBIS World Meat Processing in Australia, 2015, pg.21

³¹ AMPC Annual Report 2015-16, pg.1

³² ABS Agricultural Commodities, 2014-15

³³ IBIS World - Meat Processing in Australia, 2015, pg.33

³⁴ MLA website - Animal Welfare, accessed April 2017

³⁵ ACCC Cattle and beef market study – Final report, 2017, pg.44

³⁶ AMPC Strategic risks facing the Australian red meat industry, 2016, pg.24

2.3.2. Processors

Processors in the Australian red meat and livestock industry primarily slaughter livestock; bone, freeze, preserve or pack red meat; pack meat into tins; manufacture meals from abattoir by-products; and render lard or tallow³⁷.

Meat processing costs in Australia are high by world standards due to the comparatively expensive regulatory compliance requirements, labour and energy costs. The industry is capital intensive, limited by operating inefficiencies, such as abattoirs operating on a single shift schedule instead of double shifts, and less opportunities locally to achieve significant economies of scale³⁸.

The industry operates with low to medium profit margin, which is expected to decrease over the five years through to 2020-21; with the expected fall in global prices³⁹ (and exchange rate fluctuations) being the key factor. Meat processors previously benefiting from lucrative export markets will face higher levels of competition as global supply increases. Despite the fall in global prices hurting exporter profit margins, investment in plant upgrades and advancements in technology are expected to improve industry efficiency⁴⁰.

Over the past five years, many industry players have invested in processing plant upgrades and expansions, such as new slaughter floors and boning rooms, and improved chillers and freezers⁴¹.

However, the capital intensive and low margin nature of the industry suggests that the choice to adopt new technology needs to be carefully considered against a range of key factors, such as: business model, plant size, production capacity, potential benefits, risk appetite, the ability to impact margins and overall market conditions.

2.3.3. Cold transport

Cold transport refers to the transportation of slaughtered livestock from the processor to the wholesaler and retail distribution sales channels. The primary objective is to uphold the safety and quality of the meat while being transported. Cold meat temperature needs to be maintained at certain levels to reduce the deterioration process, particularly microorganism development, throughout the processing and transportation value chain⁴².

2.3.4. Industry marketing arrangements

The Australian red meat and livestock industry marketing arrangements are established by the *Australian Meat and Livestock Industry Act 1997*, under which the government, by legislative instrument, has assigned MLA, AMPC and LiveCorp certain governing responsibilities. MLA is the marketing body for the Australian meat producers industry, AMPC is the marketing body for the Australian meat processing industry, while LiveCorp is the livestock export marketing body. All bodies coordinate marketing efforts with the objective of securing the best outcomes for the industry as a whole. Relationship agreements outline agreed roles and responsibilities, funding planning and service delivery arrangements⁴³.

³⁷ IBIS World Meat Processing in Australia, 2015, pg.2

³⁸ IBIS World Meat Processing in Australia, 2015, pg.21

³⁹ IBIS World Meat Processing in Australia, 2015, pg.8

⁴⁰ IBIS World Meat Processing in Australia, 2015, pg.9

⁴¹ IBIS World Meat Processing in Australia, 2015, pg.7

⁴² Food and Agriculture Organisation of the United Nations (FAO) website - Cold preservation of meat products, accessed April 2017

⁴³ Department of Agriculture and Water Resources website - Red meat industry structure, accessed April 2017

The coordinated marketing approach, as set out in the Meat Industry Strategic Plan (MISP) 2020, key objectives are to improve attitudes towards Australian red meat and livestock, and increase wholesale demand in red meat and livestock⁴⁴. These marketing objectives are focused on three markets: developing export markets, developed export markets and the domestic market.

Marketing and promotions in the domestic market focus on increasing sales volumes and shifting consumer attitudes to beef and lamb⁴⁵. Domestic marketing activities are focused on increasing consumer demand, particularly where it is unfeasible for individual enterprises to take the initiative, either through lack of commercial incentive or insufficient resources⁴⁶.

The Australian community is becoming more interested in the production of beef, lamb and food. However, many Australians living in major cities have little direct knowledge of farm operations. To address this, programs have been created to⁴⁷:

- ▶ Support cattle and sheep industries to maintain the community's trust in their integrity and ethics by building understanding
- ▶ Support industry to prevent consumers reducing their beef and lamb consumption for perceived environmental or animal welfare reasons
- ▶ Create a human bond between cattle and sheep producers and the community

Exports are a major focus for marketing efforts due to over 70% of the industry's production being exported⁴⁸. Marketing and promotions in the export market are focused on underpinning the quality and safety systems in export markets⁴⁹. The industry conducts customised marketing and market access activities in conjunction with a range of programs and activities across the globe. Recent export marketing campaigns have focused on building the integrity of Australia's red meat products⁵⁰.

AMPC have highlighted that consumers, broadly, have become increasingly aware of social license factors such as animal welfare, water consumption and scarcity of clean water, greenhouse gas emissions (particularly from beef), erosion production and biodiversity impacts of expanded cattle territories, and increasing concerns over global food security and efficiency of production⁵¹. AMPC have expressed a growing need to increase industry awareness of animal welfare matters and potential to leverage this as a marketing differentiator⁵².

⁴⁴ MISP 2020, 2015, pg.21

⁴⁵ MISP 2020, 2015, pg.21

⁴⁶ MLA website - Domestic Marketing, accessed April, 2017

⁴⁷ MLA website - Promoting the Industry, accessed April 2017

⁴⁸ ACCC Cattle and beef market study – Final report, 2017, pg.7

⁴⁹ MISP 2020, 2015, pg.20

⁵⁰ AMPC - Annual Report, 2015-16, pg.22

⁵¹ AMPC 2025 Strategic Plan, 2016, pg.26

⁵² AMPC strategic risks facing the Australian red meat industry, 2016, pg.48

2.3.5. Wholesale and retail sales channels and distribution

Livestock are primarily sold from primary producers to lot feeders, restockers, major supermarket chains, live exporters and processors⁵³. Producer location, climate, farm size, production system and access to sales channels and industry infrastructure have a significant influence on farmers' production and sales decisions. The following points outline aspects of the wholesale and retail sales channels and distribution.

- ▶ *Lot feeders*: generally purchase relatively lightweight livestock, to meet customer needs and maximise the margin captured from feeding cattle to slaughter ready weight
- ▶ *Restockers*: this is a producer or agent who purchases cattle/sheep/lambs and returns them to the farm. They purchase livestock of various weights to meet different needs. If intending to feed livestock to slaughter weight, restockers are likely to purchase relatively light animals
- ▶ *Major supermarket chains*: purchase relatively lightweight young livestock of specific weight and quality characteristics, largely from feedlot operators. Cattle are slaughtered by accessing service kills from major processors
- ▶ *Live exporters*: operators supplying Australia's largest market, Indonesia, are restricted by a live weight imposed by the importing government. However, smaller volumes of heavier cattle are purchased for export to markets without weight restrictions, such as Vietnam, the Philippines and Malaysia
- ▶ *Processors*: purchase livestock of various weights and, other carcass characteristics to meet customer needs. Abattoirs operated by major processors are able to slaughter cattle of all weights; allowing them to adapt to changes in market demand and cattle supply
- ▶ *Producers*: may also retain ownership of finished cattle, accessing service kills offered by some processors, before selling beef to wholesalers and exporters or directly into domestic or export markets
- ▶ *Butchers*: source beef directly from processors and/or wholesalers, in the form of carcasses or primal cuts, or access service kills from processors for the slaughter of cattle purchased in saleyards or directly from producers. Further processing for shelf-ready cuts, including manufactured products and ready meals, generally occurs onsite⁵⁴

Producers sell through a number of channels, including direct arrangements with purchasers (e.g. over the hook, paddock sales and forward contracts), saleyards and sales/auctions⁵⁵. Major sales channels include:

- ▶ *Over the hooks (OTH)*: Livestock are delivered by producers directly to processors, with change of ownership occurring when carcasses are weighed shortly after slaughter and trimming. The carcass is then graded by a processor employee, using both standard industry grading and specific proprietary grading standards. The price received by the seller depends on the carcass weight and grade. This is calculated by referencing the price grid that was offered to the cattle producer at the time the sale was agreed⁵⁶. OTH is considered the most common direct sales method with approximately 90 per cent of the cattle purchased by processors and supermarkets acquired directly from producers using OTH.

⁵³ ACCC Cattle and beef market study – Final report, 2017, pg.18

⁵⁴ ACCC Cattle and beef market study – Final report, 2017, pg.34

⁵⁵ ACCC Cattle and beef market study – Final report, 2017, pg.26

⁵⁶ ACCC Cattle and beef market study – Final report, 2017, pg.26

- ▶ *Paddock sales*: Livestock are inspected on the producer's property by a buyer or agent and sold from the paddock. The change of ownership occurs as per the agreement made between the seller and buyer, with cattle generally purchased on a dollars per head basis⁵⁷
- ▶ *Forward contracts*: Arrangements to supply cattle of a particular quality and number to a buyer at a given time for an agreed price. Forward contracts can include various terms defining delivery, change of ownership and pricing mechanisms, such as a pre-agreed price or price grid⁵⁸
- ▶ *Saleyard auctions*: While most slaughter-ready livestock in Australia are sold OTH (as outlined above), saleyard auctions are also a major and important sales method. Producers transport the animal to a saleyard for sale (to the highest bidder) on any given day with the change of ownership occurring at the conclusion of bidding⁵⁹. Sale yards tend to be most favoured by producers who have small herds and sell in small lot sizes, but are occasionally used by larger producers when saleyard prices offer higher returns. An animal may pass through the saleyards more than once during its lifetime as it changes hands from a breeder, to being fattened, to being sold for slaughter⁶⁰
- ▶ *Online sales*: Livestock can be sold through an online auction platform, such as 'AuctionsPlus', livestreaming of physical saleyard auctions or direct purchases from producers, primarily stud sales. Direct purchases from producers and livestreamed saleyard auctions are extensions of saleyard auctions and paddock sales processes. However, 'AuctionsPlus' differs from these two methods because cattle are assessed prior to sale by accredited personnel who provide a description and photographs of livestock for display online. The seller outlines sale terms prior to auction, including bidding and collection conditions, with results posted online immediately after completion⁶¹

In general, producers use the sales channel they believe will maximise the return on their livestock. However, this is influenced by access to the selling method, the sale process, market specifications and buyer preferences. In recent years, cattle and beef industry participants have voiced concerns about anti-competitive conduct and market structures. Including complaints and allegations about anti-competitive behaviour at saleyards, misuse of buyer power, and an unfair distribution of profits in the supply chain. Concerns about industry practices and the impact on farm profitability tend to vary between small-scale and large-scale producers. For instance, small-scale producers have a greater reliance on saleyards than large-scale producers, who often sell direct to abattoirs. This can result in small-scale producers having fewer options when selling prime cattle⁶².

There are several characteristics of saleyard auctions which make them susceptible to anti-competitive conduct. For example, as identified in the *ACCC Cattle and beef market study - final report*⁶³, repeated interactions between regular buyers provides an opportunity to develop shared strategies and influence the outcome of an auction, quickly dealing with those who break away from these strategies. Weak saleyard competition will have a broad impact on the industry, as auction prices act as an important price benchmark for other saleyards and for other sales channels.

There is significant concern in the industry, mainly from cattle producers, about pre-sale versus post-sale weighing of cattle at saleyard auctions and how this affects commercial outcomes⁶⁴.

⁵⁷ ACCC Cattle and beef market study – Final report, 2017, pg.26

⁵⁸ ACCC Cattle and beef market study – Final report, 2017, pg.27

⁵⁹ ACCC Cattle and beef market study – Final report, 2017, pg.26

⁶⁰ ACCC Cattle and beef market study – Final report, 2017, pg.78

⁶¹ ACCC Cattle and beef market study – Final report, 2017, pg.27

⁶² ACCC Cattle and beef market study – Final report, 2017, pg.3

⁶³ ACCC Cattle and beef market study - Final report, 2017, pg.10

⁶⁴ ACCC Cattle and beef market study – Final report, 2017, pg.10

2.4. Supporting industries

Supporting activities in the Australian red meat and livestock industry value chain are comprised of animal health services, scientific and technical services, financial services and insurance, health care and social assistance, and accommodation and food services. They underpin continual improvement in the quality of animals produced and the operational viability of the industry.

2.4.1. Animal health

Animal health refers to the well-being and physical development of Australian beef cattle, sheep and goat livestock. The MISP 2020 outlines the core priorities of animal health are continuous improvement of animal welfare, minimising risk and impact of emergency disease and minimising the impact of endemic disease⁶⁵.

The Australian Animal Welfare Strategy (AAWS) provides a national framework to identify priorities, coordinate stakeholder action and improve consistency across all animal use sectors.

There are a number of industry bodies that contribute to the MISP 2020 and AAWS animal health objectives including AMPC, MLA, LiveCorp and ALEC.

MLA's Animal Welfare Program focuses on livestock production, including on-farm management, livestock handling, and transport and product quality. Animal welfare R&D is undertaken on the farm, at feedlots, and the various stages of livestock exports and red meat production. This program is in line with the International priorities of the Office International des Epizooties (OIE), the world animal health organisation, and the Australian Government's national strategic framework - the Australian Animal Welfare Strategy (AAWS)⁶⁶.

AMPC works with processors to ensure that their employees are trained and competent when handling livestock, as well compliance with the National Animal Welfare Standards.

LiveCorp works closely with industry stakeholders to continuously improve performance in animal health and welfare through the provision of technical services and Research, Development and Extension (RD&E)⁶⁷.

ALEC also plays an active role in promoting the interests of the livestock export sector including; industry's investment in improving animal welfare, encouraging the adoption of best practice across the industry and advising members on challenges and changes to the operating environment⁶⁸.

⁶⁵ MISP 2020, 2015, pg.18

⁶⁶ MLA website - Animal Welfare, accessed April 2017

⁶⁷ LiveCorp website - About us, accessed April 2017

⁶⁸ ALEC website - About ALEC, accessed April 2017

2.4.2. Scientific and technical services

Scientific and technical services refers to R&D activities in the Australian red meat and livestock industry. As previously mentioned, MLA is the RD&E body for the Australian meat producers industry, while AMPC is the RD&E body for the Australian meat processing industry, and LiveCorp the livestock export RD&E body. All bodies coordinate R&D efforts with RMAC, Peak Industry Council members, producer groups, Commonwealth Scientific and Industrial Research Organisation (CSIRO), leading Australian universities and international research⁶⁹.

The R&D program is largely funded by producer levies, with matched funding from the Federal Government. Levies are also collected by the processing, lot feeding and live export sectors, for investment in projects that support the red meat supply chain beyond the farm gate.

In 2014-15 MLA invested \$92.9m in red meat R&D projects, covering areas as diverse as genetics, environmental sustainability, feeding and finishing and meat safety⁷⁰.

The programs are broad and cover areas including:

- ▶ Animal health
- ▶ Welfare and biosecurity
- ▶ Grazing and pasture management
- ▶ Genetics and breeding
- ▶ Feeding, finishing and nutrition
- ▶ Environment and sustainability
- ▶ Human nutrition
- ▶ Business management
- ▶ Automation and value chain technologies

AMPC is the Rural Research & Development (RDC) that represents the red meat processing industry throughout Australia. The Core Program represents AMPC's primary RD&E program, focused on addressing key issues facing the processors in terms of productivity, profitability, sustainability, integrity and capability. The Core Program is divided into five distinct program streams: processing technologies, environment and sustainability, processing hygiene, quality and meat science, capability, extension and education, and industry improvement and economic analysis⁷¹.

AMPC has noted that the Memorandum of Understanding (MOU) and MLA relationship constraints resulting from overlapping R&D roles and responsibilities in the industry, and lack of clear definition in the relationship agreements⁷². The AMPC 2025 Strategic Plan focuses on resolving these restraints and defining of roles in the relationship agreements over the next few years LiveCorp, through the Livestock Export Program (LEP), invests in RD&E to enhance the productivity, sustainability and competitiveness of the livestock export industry and to support an industry culture of continuous innovation, improvement and growth. Over 70% of the LEP's investment in RD&E is in animal welfare and targeted at supporting the continuous improvement of livestock health, welfare and management throughout the supply chain.

Approximately 20% of the RD&E investment is targeted at projects that aim to enhance the livestock export industry's supply chain capability and risk management profile. The remaining investment is targeted towards projects that support improved market access and development for Australian livestock⁷³.

⁶⁹ MISP 2020, 2015, pg.29

⁷⁰ MLA Website - Research and Development, accessed April 2016

⁷¹ AMPC website - Research Development and Extension, accessed April 2017

⁷² AMPC 2025 Strategic Plan, 2016, pg.26

⁷³ LiveCorp Website - About R&D, accessed April 2017

2.4.3. Other activities

Other activities refers to welfare and support services for producers and processor and their workers. These encompass financial services and insurance, health care and social assistance and accommodation and food services.

Financial service and insurance includes, though not limited to, personal and commercial loans, overdrafts facilities, trade finance, wealth management services, and general insurance policies.

Health care and social assistance primarily refers to measures provided by the Australian Government which support farm families, farm businesses and rural communities to prepare for, manage through and recover from hardships. Services include (though not limited to); farm business concessional loans scheme, farm household allowance, managing farm risk program, managing weeds and pest animals, rural financial counselling services and drought communities program⁷⁴.

2.5. Opportunities and trends

The world's population growth forecast presents a significant opportunity for the Australian red meat and livestock industry. By 2030, the Asia-Pacific population specifically, is expected to increase by 700m people to 4.6bn⁷⁵. Meanwhile the global real per capita incomes are expected to increase by 60% to 2030. As population and per capita income growth are closely correlated, it is estimated that an increase in red meat demand of 25% will occur between now and 2030, as well as an increase in demand for markets specifically seeking high quality red meat and livestock products⁷⁶.

"These forecasts present an enormous opportunity for Australia's red meat and livestock industry in terms of geographical proximity to key markets, and as a recognised supplier of safe, nutritious and ethically-produced products" - MISP 2020⁷⁷

However, these opportunities are also accompanied by several industry trends, including:

Increasing consumer awareness and change in consumer demands	Increasingly challenged resource environment	Improved trade and market access	Strong emerging market growth
<ul style="list-style-type: none"> ▶ Changes in consumer protein preferences ▶ Focus on provenance and supply-chain traceability ▶ Organic and 'disease-free' ▶ High-quality and healthy consumption ▶ Changing demographics ▶ Increasing demand for convenience foods 	<ul style="list-style-type: none"> ▶ Agricultural resource depletion ▶ Decreases in biodiversity ▶ Increasing water demand and constraints 	<ul style="list-style-type: none"> ▶ Increasing amounts of Free Trade Agreements ▶ Simpler and more direct distribution channels ▶ Greater demand for Australian produce ▶ Technical trade barriers and biosecurity ▶ Increasing competition between Australian and international industry ▶ Emergence of global corporate players in the protein supply industry 	<ul style="list-style-type: none"> ▶ Increasing size of middle class and wealthy ▶ Higher disposable incomes ▶ Greater demand for western and luxury goods

⁷⁴ Department of Agriculture and Water Services website - Supporting farmer and rural communities, accessed April 2017

⁷⁵ MISP 2020, 2015, pg.8

⁷⁶ IBIS World, Meat Processing in Australia 2015, pg.20

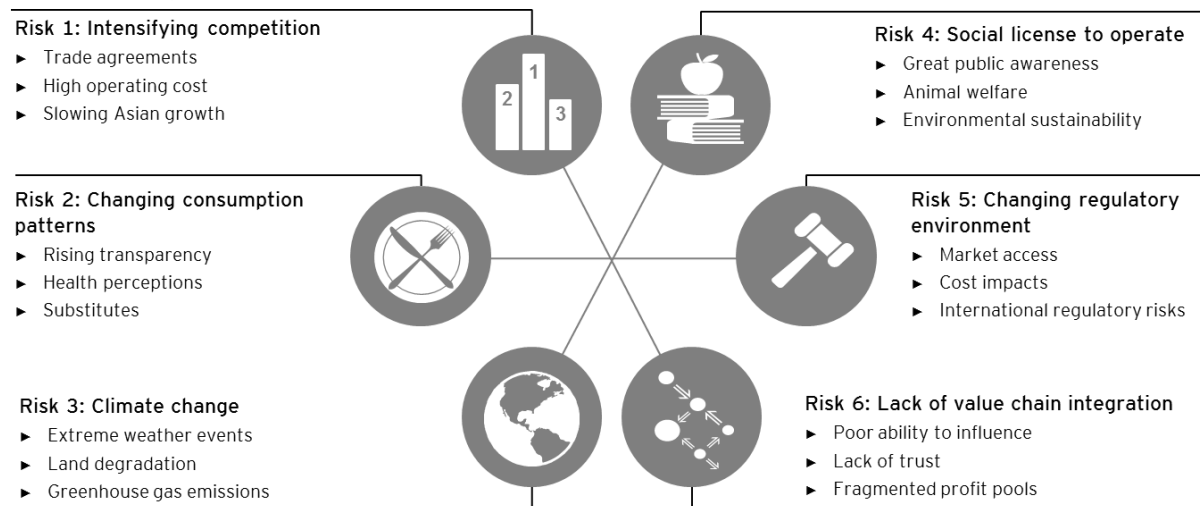
⁷⁷ MISP 2020, 2015 pg.8

Ongoing climate change	Increased regulatory complexity	Increased use of technology, data and R&D	Rising export dependence
<ul style="list-style-type: none"> ▶ Changes to weather patterns ▶ Increased severity and incidence of extreme weather ▶ Salinisation and acidification of soil 	<ul style="list-style-type: none"> ▶ Enhanced regulatory standards ▶ Increasing levels of self-regulation ▶ Increasing requirement for economic stewardship 	<ul style="list-style-type: none"> ▶ Increased automation through supply chain ▶ Increasing opportunities to use data to drive efficiencies ▶ R&D to boost productivity ▶ Rise in digital agriculture ▶ Increased use of Blockchain in strengthened governance 	<ul style="list-style-type: none"> ▶ Increasing amounts of FTAs ▶ Simpler and more direct distribution channels ▶ Greater demand for Australian produce

Source: EY analysis

In addition, the strategic risks (illustrated in Figure 2 below) facing the industry will only compound today's trends.

Figure 2: Industry strategic risks



Source: AMPC Strategic Risks Facing the Australian red meat and livestock industry, 2016

All these risks have the potential to exacerbate the productivity challenge that the Australian industry has both on- and off- farm. Off-farm costs are consistently higher than all major competitors, while on-farm productivity performance is now below productivity improvement being secured by major competitors⁷⁸.

⁷⁸ MISP 2020, 2015, pg.9

However, it has been suggested that integration of the value chain has the potential to address some of these productivity issues by:

- ▶ Promoting a clear, concerted and consistent effort across the industry to identify upcoming opportunities⁷⁹
- ▶ Encouraging pooled investment in systems that underpin Australia's reputation as high quality, safe, ethical and sustainable red meat provider
- ▶ Allowing greater sharing of information and promoting economies of scale, driving down cost⁸⁰

Without closer integration the industry will be operating with a higher degree of fragmentation than its peers, it will not be able to market as effectively, nor be as responsive to customer demands⁸¹.

The Australian red meat and livestock industry is now part of a global industry, with more than 70% of local production exported to international markets⁸². Business models that have been productive in the past are being disrupted and the industry is having to change and adapt to ensure continued profitability and sustainability.

In Section 4 of this document, we discuss The Proposal to install new technology into selected processing facilities with the objective of enhancing the long term productivity of the Australian red meat and livestock industry.

⁷⁹ MISP 2020, 2015 pg.10

⁸⁰ AMPC Strategic Risks Facing the Australian red meat industry, 2016, pg.9

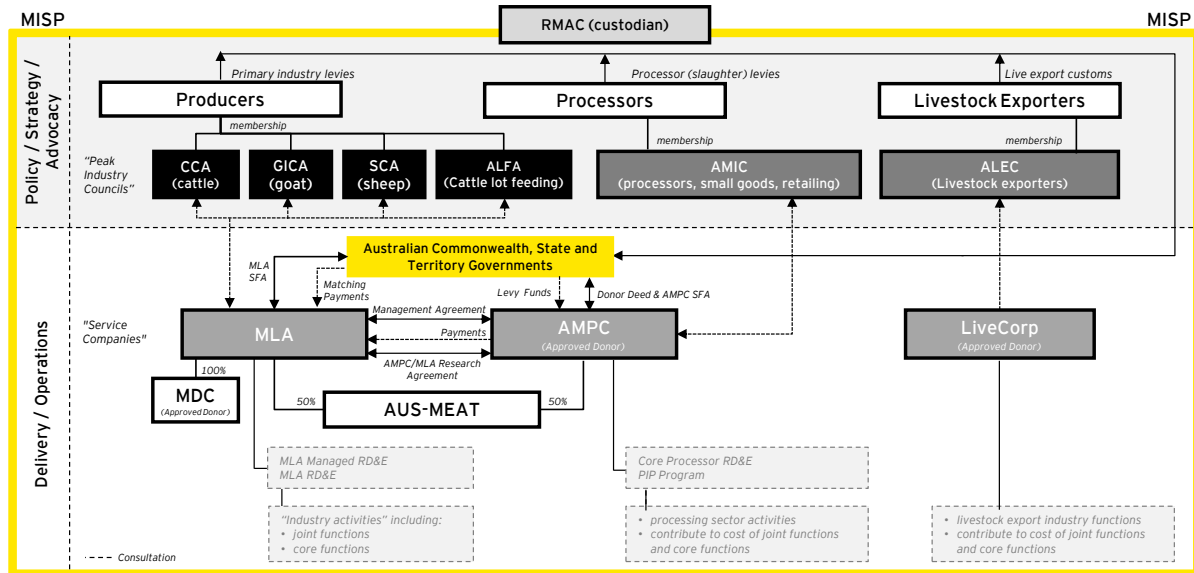
⁸¹ AMPC Strategic risks facing the Australian red meat industry, 2016, pg.32

⁸² ACCC Cattle and beef market study – Final report, 2017, pg.7

2.6. Industry structure

The Australian red meat and livestock industry is comprised of a number of policy, strategy and advocacy bodies and Research and Development Corporations (RDCs). These parties are supported by the Australian Government and State and Territory Governments. The structure and interactions of each agency within the industry is illustrated in detail in Figure 3.

Figure 3: Detailed structure of the Australian red meat and livestock industry



Source: EY analysis

2.6.1. Red Meat Advisory Council (RMAC)

RMAC provides leadership on cross-sectoral issues and consults with the Minister for Agriculture and Water Resources on agreed whole of industry matters. RMAC is the custodian of the MOU, MISP and industry reserves.

RMAC administers and uses income from the reserves to: cover peak council participation costs; coordinate maintenance of the MISP; review and provide support to industry relationships.

The MISP, developed by RMAC, frames the overarching strategic priorities for Australia's red meat and livestock industry. This comprises of the production, processing and live export sectors of Australia's beef, sheep meat and goat meat supply chains⁸³.

MISP 2020 was developed in 2015 with the direct input from major red meat and livestock co-investors including levy payers, Federal, State and Territory Departments of Agriculture, CSIRO, the University sector and agribusiness⁸⁴.

The MOU sets out the Industry Partnership between the signatories and incorporates the definition of agreed roles and responsibilities; funding, planning and service delivery arrangements; the MISP; industry reserves and R&D.

⁸³ MISP 2020, 2015, pg. 3

⁸⁴ MISP 2020, 2015, pg.3

2.6.2. The industry peak bodies

The Australian red meat and livestock industry peak bodies represent the producers and processors, including; the Cattle Council of Australia (CCA), Sheepmeat Council of Australia (SCA), Goat Industry Council of Australia (GICA), Australian Lot Feeders' Association (ALFA), Australian Meat Industry Council (AMIC), and the Australian Livestock Exporters Council (ALEC). Their roles are to:

- ▶ Provide leadership, set strategic direction and formulate policies
- ▶ Respond and provide policy advice to the Minister on whole of industry issues and on the sector it represents
- ▶ Cooperate through RMAC with other Peak Industry Councils in developing MISP vision and imperatives
- ▶ Develop jointly with the industry service companies goals for achieving MISP strategic imperatives
- ▶ Consult with other Peak Industry Councils to ensure consistent MISP approaches
- ▶ Assess the performance of industry service companies in service delivery and goal achievement
- ▶ Consult widely and propose levy motions for member consideration at service company meetings and advise the Minister

2.6.3. Government

The Australian red meat and livestock industry has primary responsibility for its own affairs and strategic direction. The Commonwealth, State and Territory Governments primarily contribute to the industry through existing industry forums and bodies, and administering the legal frameworks within their jurisdictions. Further details of the roles and responsibilities of the government parties are outlined below.

2.6.3.1. Commonwealth Government

The Commonwealth Government primarily administers assistance and support to the industry through the Department of Agriculture and Water Resources (the Department). The Department's role is to implement policies and programs that build a more profitable, resilient and sustainable sector. These include research and development funding, setting and maintaining of laws and regulation, biosecurity, facilitating industry partnerships and expanding market access and trade opportunities.

However, a large range of other departments and agencies are also relevant to the industry including (but not necessarily limited to) the Department of Industry, Innovation and Science, Austrade, the Department of Health, the Australian Pesticides and Veterinary Medicine Authority, Food Standards Australia New Zealand (FSANZ) and the Department of the Environment and Energy.

Biosecurity is a critical part of the Commonwealth Government's efforts to prevent, respond to and recover from pests and diseases that threaten the Australian economy and environment. These practices include: disinfecting, signage, maintaining boundary fences, checking for strays, restricting visitor and vehicle movements, ensuring all machinery brought onto the property is cleaned, good husbandry, ensuring purchases are from reliable sources, inspecting the flock or herd regularly, quarantining new stock⁸⁵.

⁸⁵ Department of Agriculture and Water Resources website - Animal Pests and Disease, accessed April 2017

The Department works to protect the economy, environment, and the community from the negative impacts of pests, disease, weeds, and contaminants⁸⁶.

The Department also works closely with the industry on market access and development opportunities and in furthering the interests of the industry in dealing with overseas governments and in multilateral negotiations⁸⁷.

Furthermore, the Commonwealth Government maintains and administers the legal framework under which the red meat industry operates. The *Australian Meat and Live-stock Industry Act 1997* is the primary piece of legislation that governs the industry's legal and structural arrangements. A MOU underpins these arrangements.

Signatories to the memorandum include the industry peak bodies, R&D bodies and the Commonwealth Government⁸⁸. The MOU sets out the Industry Partnership between the signatories. This incorporates the definition of agreed roles and responsibilities; funding, planning and service delivery arrangements; the MISP; industry reserves; research and development; and the schedules⁸⁹.

The Commonwealth Government also provides matching R&D funding, collects and disperses levies and facilitates the management of issues of national importance.

2.6.3.2. State and Territory Governments

The State and Territory Governments are responsible for day to day production, operational and infrastructural matters in the Australian red meat and livestock industry⁹⁰. The focus of these matters primarily relate to animal health and the quality and safety of red meat for consumer consumption.

Animal health matters incorporate disease surveillance and control, chemical residues in animal products, livestock identification and traceability, and animal welfare within the borders of the State⁹¹. Additionally, red meat safety and quality covers the regulation and monitoring of meat safety across the entire food industry supply chain from producer to consumer.

The legislation and programs administered differ from state to state. For example, the Queensland Government's *Biosecurity Act 2014* restricts geographical movements of animals to minimise the risk of disease or insect infestation⁹².

The two main programs that all State and Territory Governments' are involved in are the SAFEMEAT and Animal Health Australia (AHA) partnerships.

⁸⁶ Department of Agriculture and Water Resources website - Biosecurity, accessed April 2017

⁸⁷ Department of Agriculture and Water Resources website - Red meat livestock industry infrastructure, accessed April 2017

⁸⁸ Department of Agriculture and Water Resources website - Red meat livestock industry infrastructure, accessed April 2017

⁸⁹ Department of Agriculture and Water Resources website - Red meat livestock industry infrastructure, accessed April 2017

⁹⁰ Department of Agriculture and Water Resources website - Biosecurity, accessed April 2017

⁹¹ Department of Agriculture and Water Resources website - Australia's animal health system, accessed April 2017

⁹² IBIS World - Beef Cattle Farming in Australia, 2017, pg.28

SAFEMEAT is a partnership established between the Commonwealth Government, State and Territory Governments' and the industry to ensure the integrity of Australia's Red Meat & Livestock Industry. This is achieved by the provision of Government oversight and the promotion of management systems to deliver a safe and hygienic product⁹³.

AHA is a partnership set up between the Australian Government, State/ and Territory Governments', major livestock industries and other stakeholders to strengthen Australia's national animal health system and maximise confidence in the safety and quality of Australia's livestock products in domestic and overseas markets⁹⁴.

2.6.4. Research and Development Corporations

2.6.4.1. MLA

MLA delivers research, development and marketing services to Australia's cattle, sheep and goat producers. With approximately 50,000 livestock producer members (with stakeholder entitlements) MLA seeks to be the recognised leader in delivering world-class research, development and marketing outcomes that benefit Australian cattle, sheep and goat producers⁹⁵.

MLA's stated mission is:

*"Working in collaboration with the Australian Government and the wider red meat industry, MLA's mission is to deliver value to levy payers by investing in initiatives that contribute to producer profitability, sustainability and global competitiveness."*⁹⁶

MLA is a company, limited by guarantee under the *Corporations Act 2001*. MLA membership is open to anyone who raises (producer), finishes (lot feeder) or trades (trader) in livestock (cattle, sheep, goats). MLA is funded by:

- ▶ Statutory levies from producers (49,845 members)⁹⁷
- ▶ Statutory charges from livestock exporters and statutory levies from processors for joint activities
- ▶ Independent participants

A Statutory Funding Agreement between MLA and the Australian Government facilitates R&D, matching funding and the management of levy monies.

⁹³ Department of Agriculture and Water Resources website - Red meat livestock industry infrastructure, accessed April 2017

⁹⁴ Department of Agriculture and Water Resources website - Red meat livestock industry infrastructure, accessed April 2017

⁹⁵ MLA website - About MLA, accessed April 2017

⁹⁶ MLA website - About MLA, accessed April 2017

⁹⁷ MLA website - About MLA (accessed April 2017)

2.6.4.2. AMPC

AMPC is the Rural RDC that supports the red meat processing industry throughout Australia, representing all beef, sheep and goat meat processors. Their mandate is to provide RD&E services that improve the sustainability and efficiency of the sector⁹⁸.

Standing that it is committed to working with its stakeholders, AMPC seeks to achieve an efficient application of levy funds through its RD&E and marketing activities, enhanced by leveraging AMPC's investment through co-investment and collaboration⁹⁹.

AMPC is a company limited by guarantee incorporated under the *Corporations Act 2001*. There are 105 processor members, operating in 135 meat processing establishments. The AMPC represents over 97% of Australia's red meat processing capacity. Operating independently of, but in conjunction with MLA, AMPC receive funding through slaughter levies.

Red meat processor levies are strategically invested in RD&E services aligned to targeted marketing initiatives to deliver outcomes and benefits for both the Australian red meat processing industry and the broader Australian community.

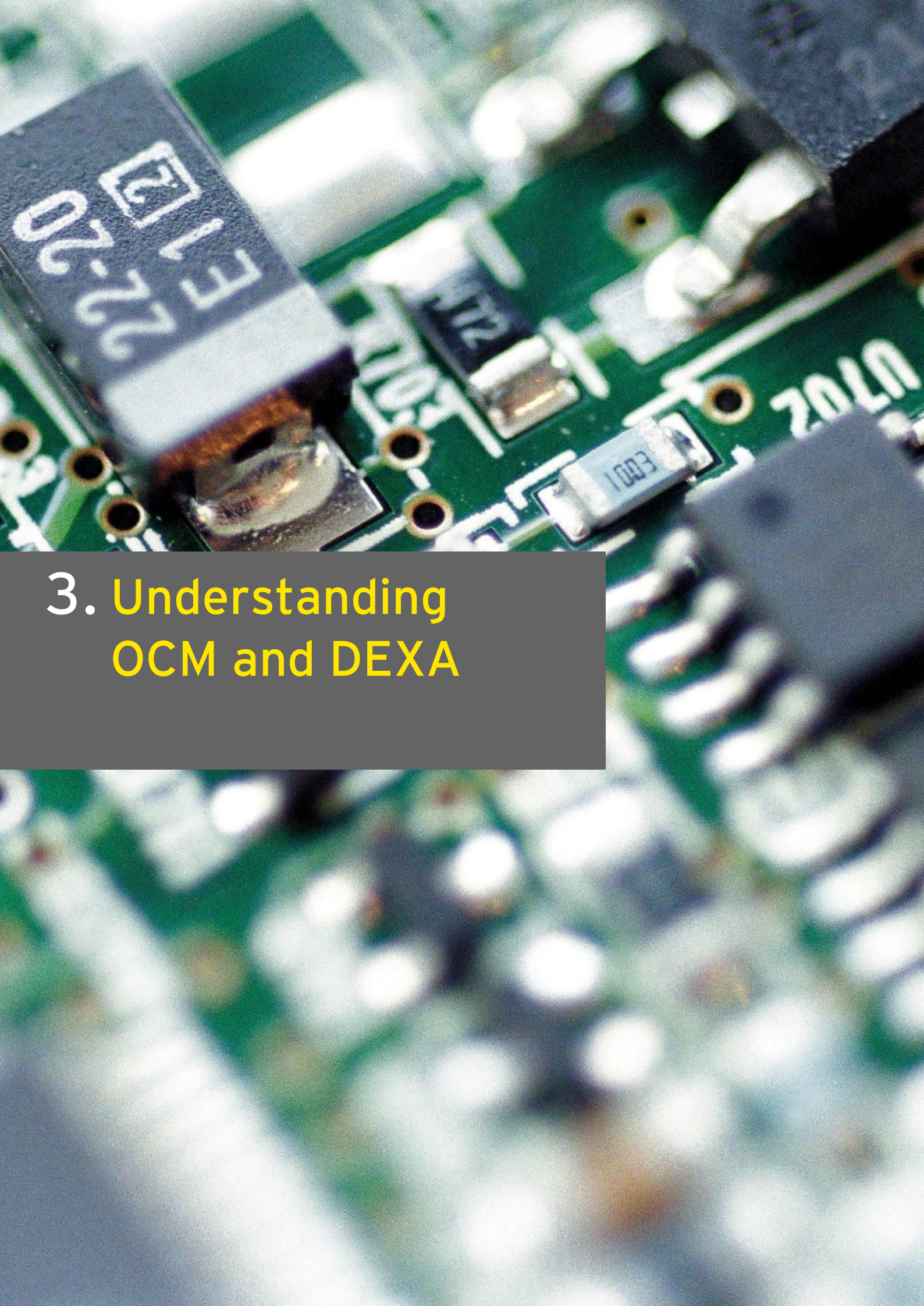
2.6.4.3. LiveCorp

LiveCorp is a not-for-profit industry service provider with approximately 61 members and associate members involved in the export of Australian livestock. Operating independently of, but in conjunction with MLA, LiveCorp is owned and controlled by industry members with the principal function of managing industry funded programs and services.

Funded through statutory levies contributed by livestock exporters, LiveCorp works closely with industry stakeholders to continuously improve performance in animal health and welfare, supply chain efficiency and market access through the provision of technical services and RD&E.

⁹⁸ AMPC website - About AMPC, accessed April 2017

⁹⁹ AMPC website - Stakeholders of AMPC, accessed April 2017



3. Understanding OCM and DEXA

3. Understanding OCM and DEXA

This section aims to provide a basic overview of OCM, OCM technologies, DEXA and current research programs in the application to the Australian red meat and livestock industry. This section has been prepared following The Review's literature surveys and a number of discussions with Australia and overseas experts on OCM technologies and DEXA in particular.

OCM technology refers to objective technology which can be used to specifically measure carcass traits more accurately.

It is important to recognise that further to the concept of OCM, which includes measurements of a carcass and its components, is the concept of Objective Measurement (OM). OM is inclusive of 'whole of value chain' measures.

The red meat industry's OM strategy aims to develop 'whole of value chain' measurement systems that ensure Australia's high cost production and processing sectors increase returns through improved efficacy and efficiency, and enable value chain alignment with customer's willingness to reward¹⁰⁰.

The strategy focuses on a distinct objective for each stakeholder group:

- ▶ Producers - efficient and ethical livestock production
- ▶ Processors - efficient processing through new technology
- ▶ Consumers - meeting demand and driving confidence

For each stakeholder group, there are a number of broad measurement categories that form the basis for OM programs and initiatives.

3.1. Research and development initiatives

Research and development activities in this area have been underway for some years. The most recent major initiative (apart from the Proposal), was the 'Advanced measurement technologies' for globally competitive Australian meat, or the 'ALMTech' project, which was established in 2016 under the Commonwealth Government's Rural R&D for Profit program. This program is designed to 'enable beef, sheep and pig farmers to have access to more accurate descriptions of the key attributes that influence the value of their livestock including: carcass lean meat yield; eating quality; and compliance to market specifications'¹⁰¹.

This program is in partnership with RDCs, Commercial Companies, State Departments and Universities.

The ALMTech project has established a governance structure, see Figure 4 below, to ensure activities are executed in a timely manner within the guidelines of the ALMTech operational plan¹⁰². The structure is comprised of the three committees: (1) steering, (2) executive and (3) the progress review and intellectual property and commercialisation committee.

¹⁰⁰ MLA - Objective Measurement Strategy, accessed April 2017, pg.1

¹⁰¹ ALMTech Operating Plan, 2016, pg.1

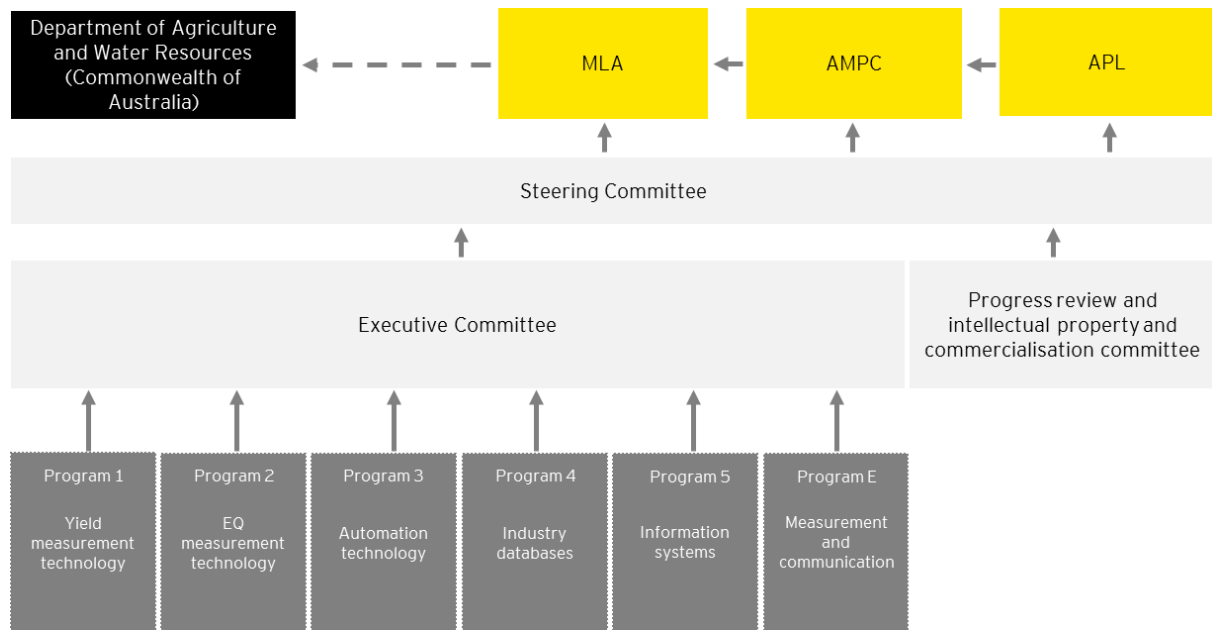
¹⁰² Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg. 6

The Steering Committee provides strategic directions and monitors the project. It is expected to ensure that the project is on-track to achieve its outcomes¹⁰³.

The Executive Committee is responsible for delivering outputs as specified in the annual Operational Plan¹⁰⁴.

The progress review and intellectual property and commercialisation committee acts an independent committee to review and provide input into the project. It also operates as a stakeholder/reference group¹⁰⁵.

Figure 4: ALMTech existing governance structure



Source: *Advanced measurement technologies for globally competitive Australian meat: project Governance, 2016, pg. 6*

ALMTech includes dedicated research into five programs as outlined in Table 1 below over a five year period from 2016 to 2020. The sixth program 'Program E - Measurement and Communication' has been excluded for the purposes of highlighting programs which directly support the research and development of OM technologies and their use in the meat industry. Program 1 looks specifically at the 'Development of Lean Meat Yield (LMY) technology'. Under this is a sub-program 1.2: Design prototype technology for the direct measurement of LMY in an abattoir', which specifically relates to the Proposal by MLA to install DEXA in processing plants.

¹⁰³ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.9

¹⁰⁴ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.7

¹⁰⁵ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.8

Table 1: ALMTech Programs

Program description	Key milestones due by Aug-17	Remaining milestones due by 2020
Program 1 - Development of LMY technology		
<p>This program aims to develop technologies for measuring LMY of live animal's on-farm, and of carcase in abattoirs, enabling the prediction of specific cut weights. Specific OCM technologies being designed and tested as part of the ALMTech project include 'direct measurement' systems such as dual energy x-ray absorptiometry (DEXA) and 'predictive measurement systems' such as 3D imaging for OM of LMY.</p> <ul style="list-style-type: none"> ▶ Subprogram 1.1 - Design prototype technology for direct and indirect measurement of LMY on-farm and establish the business case for its measurement ▶ Subprogram 1.2 - Design prototype technology for the direct measurement of LMY in an abattoir ▶ Subprogram 1.3 - Design prototype technology for the indirect measurement of LMY in an abattoir 	<p>Key milestones:</p> <ul style="list-style-type: none"> ▶ Provide summary of traits identified for calibration for LMY ▶ Report on outcome of 3D imaging measurement of beef carcase composition, and progress in development on farm and in a beef abattoir ▶ Create prototype design for walk through of DEXA on farm ▶ Report on improvements in DEXA precision based on sophisticated image analysis techniques and impact of processing factors on DEXA measurement of beef carcase composition ▶ Report on the outcome of the pre-engineering experimental work to design a prototype DEXA for commercial installation as Beef abattoir 	<ul style="list-style-type: none"> ▶ 17 August 2018 - 4.3* Provide an account of the design and testing of technologies for direct and indirect measurement of LMY in two abattoirs ▶ 17 August 2018 - 4.7* Provide an account of the viability and, if so, installation of prototype technology for the direct and indirect measurement of LMY in two abattoirs ▶ 15 December 2019 - 7.5* Provide an account of the calibration and accuracy of prototype technology for the direct and indirect measurement of LMY in two abattoirs ▶ 18 September 2020 - 8.10* Report on the development of direct and indirect measurement of LMY in abattoirs
Program 2 - Development of Eating Quality (EQ) technology		
<p>This program aims to provide value to the producer by:</p> <ul style="list-style-type: none"> ▶ Improving the accuracy (beef) and/or developing measurement technologies (lamb, pork) for meat quality traits ▶ Allowing (lamb, pork) or improving (beef) the prediction of consumer sensory scores ▶ Allowing for greater segregation of product and extraction of value from consumer ▶ Sub-program 2.1 - NIR/Boar taint ▶ Sub program 2.2 - Imaging cut surface ▶ Sub program 2.3 - Blue sky technologies 	<ul style="list-style-type: none"> ▶ Report on other technologies such as IMF measurement, boar taint measurement & NIR for fast (hot and cold) abattoir measurement ▶ Provide brief scoping report outlining design and laboratory testing of EQ measurement technologies 	<ul style="list-style-type: none"> ▶ 18 August 2018 - 4.9* Provide a brief account of the testing and calibration of prototype technology for measuring EQ in two abattoirs ▶ 15 December 2019 - 4.9* Provide a brief account of the calibration and accuracy of prototype technology for measuring EQ in two abattoirs ▶ 18 September 2020 - 8.11* Report on development technology to measure EQ in abattoirs

Program description	Key milestones due by Aug-17	Remaining milestones due by 2020
Program 3 - Development of robotic technology		
<p>This program focuses on value chain benefits for the producer sector. The design, development, and piloting of additional measurement instrumentation (i.e., in addition to eating quality and yield attributes), will be directed towards automated sorting systems applied on offal, or other carcass down-grading or condemnation factors, and application for robotic automation.</p> <ul style="list-style-type: none"> ▶ Sub program 3.1 - Developing an automation prototype for beef 	<ul style="list-style-type: none"> ▶ Organise workshop to scope automation opportunities in beef abattoirs and report on output ▶ Contract commercial automation company to commence prototype design for of an automated device and report on progress ▶ Provide a brief scoping report outlining testing and calibration of robotic technology 	<p>Key milestones:</p> <ul style="list-style-type: none"> ▶ 15 December 2019 - 7.12* Provide a brief account of the calibration and accuracy of robotic technology measuring offal or carcass down-grading, or condemnation ▶ 18 September 2020 - 8.12* Report on the development of prototype robotic sorting systems for offal or carcass down-grading, or condemnation
Program 4 - Industry databases		
<p>Through advanced measurement technologies, the project will deliver new OM data on LMY and EQ. This program will link these data up and down the value chain through existing industry platforms.</p> <ul style="list-style-type: none"> ▶ Sub program 4.1 - Data flow to industry information delivery systems ▶ Sub program 4.2 - Data flow to industry genetic evaluation systems 	<ul style="list-style-type: none"> ▶ Liaise with MLA and processors to facilitate data flow to industry databases and feedback systems ▶ Provide summary of feedback systems in place which for each ▶ Progress report regarding development of data capture methodology for existing industry data platforms 	<ul style="list-style-type: none"> ▶ 15 December 2019 - 7.13* Provide a brief account of development of data flow to industry information delivery systems ▶ 15 December 2019 - 7.14* Provide a brief account of development of data flow to industry genetic evaluation systems ▶ 18 September 2020 - 8.13* Report on the development of data transfer systems to enable data flow from measurement devices to appropriate industry databases
Program 5 - Data decision systems		
<p>This program is about delivery of systems to utilise the data generated in Programs 1-3 and stored in Program 4 to improve supply chain efficiency and profitability. The strategy is to develop some tools to accurately value carcasses. The tools will include feedback systems to producers and optimisation systems within processing companies.</p> <ul style="list-style-type: none"> ▶ Sub program 5.1 - Carcass value tools ▶ Sub program 5.2 - Data decision tools ▶ Sub program 5.3 - Supply chain engagement 	<ul style="list-style-type: none"> ▶ Report on development of beef value calculator tool ▶ Report on prototype of a data decision tool ▶ Hold three engagement meetings with collaborating supply chains to discuss the use of carcass value tools and data decision tools 	<ul style="list-style-type: none"> ▶ 18 September 2020 - 8.5* Report of the design and development of algorithms to integrate with information systems to link LMY and EQ data with prototype business payment systems ▶ 18 September 2020 - 8.6* Report on the design and development of information systems for improved sorting and management of raw materials on the basis of LMY and EQ to meet customer specifications ▶ 18 September 2020 - 8.7* Report on the modelled impact of prototype value based payment options within the supply chain ▶ 18 September 2020 - 8.8* Report on development of information systems to improve feedback to producers on market compliance, carcass value and animal health

Source: EY consolidation of data within the ALMTech Operating Plan, 2016.

*Milestone numbering - relates to the KPI identifier as outlined in the Commonwealth Grant Agreement between the Department of Agriculture and Water Resources and Meat and Livestock Australia, June 2016

3.2. Standardised beef industry language

In 2016, an Australian beef language white paper¹⁰⁶ stated that ‘beef language can play a role’ in making available streamlined eating quality (EQ) and provenance information with flow-on benefits in simplified carcass sorting, boning and packaging. Further, the beef language can assist in providing a flow of information up and down the value chain - from consumer to conception - carrying market and other signals of benefit to each sector of the value chain’¹⁰⁷.

Since the 1980s, the industry has taken steps to formally describe beef products including the introduction of AUS-MEAT language and Meat Standards Australia (MSA). AUS-MEAT was introduced as a language drawn from industry best practice to classify beef carcasses, dentition and gender as the basis for establishing a global trading platform used extensively within the processing and wholesale sectors. MSA was introduced in the 1990s, when the industry took a strategic decision to focus more on the consumer with the merging of meat science principles and consumer sensory behaviour to extend the meat language to include beef meal outcomes¹⁰⁸.

The beef language white paper outlined that whilst the existing beef languages have served the industry well over a 30 year period, the downfall is that it is restricted to carcasses and cuts. The associated livestock components are far less standardised (or understood) and are not well linked to existing language¹⁰⁹. Additionally, several of the recommendations presented within the white paper make references to OM and standardisation as one of the fundamental enablers to progressive modifications and additions to the current beef language.

‘OM & system integrity’ is outlined as one of the recommendations in which to improve the beef language by increasing the accuracy of attributes of a carcass or its components. Additionally, ‘many of the measurements currently recorded on the slaughter floor, or in the chiller, are subjective scores and as such are subject to variation and interpretation’¹¹⁰. Subsequently, objective technology that can measure beef carcass traits more accurately is stated as a way in which to generate greater confidence in the outputs such as predicted EQ and LMY.

In addition, OM is referenced in the recommendation to improve the ‘Alignment of live animal and carcass languages’¹¹¹. This recommendation is aimed to link the live animal language to the ‘meat’ language, outlining that current seedstock and genetics are too far removed from the commercial cattle and carcass descriptors. The alignment of live animal and carcass languages is recognised to deliver improved communication up and down the value chain, provide greater clarity of market signals, support better decision making and accelerate efficiency gains.

These recommendations also sit alongside others such as to improve the beef language ‘from carcass to a whole of chain language’ and to ‘transition to outcome based language’ where individual traits should be defined in ‘outcome terms’ and linked to a common standards across the industry to achieve transparency and accuracy¹¹².

¹⁰⁶ The Australian Beef Language White Paper, prepared by the Beef Language White Paper Consortium (Biddle, Pattison, Philpott et al, 2016). This paper is dated June 2016 and was published on MLA’s website on 12 April 2017

¹⁰⁷ Biddle, Pattison, Philpott et al, 2016, pg.7

¹⁰⁸ Biddle, Pattison, Philpott et al, 2016, pg.7

¹⁰⁹ Biddle, Pattison, Philpott et al, 2016, pg.7

¹¹⁰ Biddle, Pattison, Philpott et al, 2016, pg.24

¹¹¹ Biddle, Pattison, Philpott et al, 2016, pg.24

¹¹² Biddle, Pattison, Philpott et al, 2016, pg. 11 & 13

3.3. Applications of OCM and DEXA

Based on The Review's understanding, there are three applications of OCM technology in the red meat industry (grading, data feedback, and processing efficiencies and automation).

3.3.1. Grading

DEXA technology is designed to output an objective measure of carcass yield using the measure of LMY. LMY is important to the red meat supply chain as it can have an influence on the market value of a carcass¹¹³. Additionally, other carcass yield values such as SMY are also important in determining market value¹¹⁴.

SMY is the yield of bone-in or boneless cuts trimmed to a desired fat coverage as a percentage of carcass weight¹¹⁵. SMY of a carcass can be a relevant commercial definition for processors to use in valuing the carcass, but it can vary widely according to trim specifications for a particular market. A more precise and less variable definition of carcass yield would be the lean tissue in the carcass as a proportion of weight (LMY)¹¹⁶.

The current method, using point measurements as part of the grading system, has been proven to be a 'less precise estimate of LMY'¹¹⁷ with approximately 30-40% accuracy¹¹⁸. As such, 'whole carcass' measurement systems that do not rely on point measures are required, and they must be relatively easy to implement within the supply chain¹¹⁹.

3.3.2. Data feedback

Through the application of OCM technology, MLA are aiming to establish an industry owned database of objective measures to be used for supporting both individual farm and whole-of-industry scale productivity improvements¹²⁰. Both of these data applications have been outlined below.

3.3.2.1. Proposed individualised data feedback for livestock production

The Proposal indicates that the data output from DEXA technology can act as valuable database of OM, which will be critical to supporting both individual farms and whole-of-industry scale improvements in the future¹²¹. The measure of LMY has been identified as a standard yield estimate that 'can be part of feedback to producers for use in genetic and management programs' (e.g. livestock production activities being feeding regimes, breeding methods or genetic selection¹²²). Additionally, the recommendations from the Australian beef white paper specifically call for an industry standard for LMY and additional measures such as EQ¹²³.

¹¹³ Edwards et al, 2015

¹¹⁴ Edwards et al, 2015

¹¹⁵ Edwards et al, 2015

¹¹⁶ JM Thompson, 2016

¹¹⁷ Gardner et al, 2015

¹¹⁸ Johnson 1987, Perry et al 1993, and Thompson et al 2012

¹¹⁹ Gardner, Starling, Brumby et al, 2016

¹²⁰ MLA Draft Funding Proposal - herein referred to as Funding Proposal, accessed April 2017, pg.7

¹²¹ MLA Funding Proposal, accessed April 2017, pg.7

¹²² Biddle, Pattison, Philpott et al, 2016

¹²³ Biddle, Pattison, Philpott et al, 2016

Despite LMY being recognised as a key measure for producer feedback, it is understood that there also 'should be an accurate alignment of live animal fat and muscle descriptions'¹²⁴ as this would assist in providing the potential for higher rates of genetic and herd improvement in beef cattle¹²⁵.

The ACCC believes that the use of more objective carcase appraisal systems should be a high priority for the industry, and should be supported by industry leaders and relevant policy makers. The introduction of such technology, and the sharing of resulting objective data with livestock producers creates very important opportunities to capture accelerated productivity gains in the livestock production and processing sectors¹²⁶.

3.3.2.2. Proposed industry database for collective research and development

MLA has indicated that it is their view that, at an industry scale, the collection of data would act as a long lasting asset for the red meat industry, 'with the ability to use it for collective research and development, marketing or to provide to solutions providers more generally'¹²⁷.

Additionally, the ACCC report has recommended that 'data produced from objective carcase measurements will be of wider benefit to the industry if aggregated and shared'¹²⁸.

3.3.3. Processing efficiencies and automation

The use of objective measures is able to benefit improved carcase sortation¹²⁹ to customer specifications to increase productivity within a processing plant and enable more accurate pricing decisions to extract increased value from a carcase¹³⁰. This information, as proposed by MLA, can also be used to leverage boning room automation with DEXA technology¹³¹.

A review into industry automation was conducted in 2012¹³², which outlined a number of reasons a meat processing plant may decide to install automation equipment. Including:

- ▶ Improving worker safety and reduce OH&S liability
- ▶ Increasing productivity where the machine can increase the SMY from the carcase or optimise the distribution of cuts across meat quality classes
- ▶ Increasing the throughput of SMY from the plant (providing options for reducing bottle necks where they exist by increasing the capacity)
- ▶ Reducing the management of variability and associated costs in a processing plant (where sourcing, training and inducting labour costs rise)

In combination with other automation equipment and technology, OCM is used to direct the key elements of the processing chain (slaughter, boning, packaging and dispatch) in accordance with initial assessment of the animal and prevailing market conditions.

¹²⁴ Biddle, Pattison, Philpott et al, 2016

¹²⁵ Biddle, Pattison, Philpott et al, 2016

¹²⁶ ACCC Cattle and beef market study, 2017, pg. 77

¹²⁷ MLA Funding Proposal, accessed April 2017, pg.8

¹²⁸ ACCC Cattle and beef market study – Final report, 2017, pg.35

¹²⁹ Sortation is to the process of sorting items into categories or into a set order, especially when done by machine or computer

¹³⁰ Development of supply chain OM strategy & value proposition to stakeholders, MLA, 2016, pg.5

¹³¹ MLA Funding Proposal, accessed April 2017, pg.18

¹³² ACIL Tasman, Assessing the impact of: '3.2-Increasing cost efficiency & productivity', 2012

The review into industry automation outlines the three components of automation in red meat processing:

1. **Information and guidance and sensing systems** that allow for machines to determine how to deal with each carcass
2. **The equipment (end effectors)** that engages with the carcass such as blades, cutters, saws, pullers, etc.
3. **The equipment (robots)** that presents the carcass engaging equipment to the carcass

While there are efficiency gains to be achieved through a reduction in human involvement in the grading process there are further considerations to the removal of all human involvement. The Review understands that human involvement may still be required in the event of a failure of the DEXA system (or components of). Manual backup process/skills may need to be retained should there be a system fault.

3.4. Technology comparison

There are a number of technologies which can be used to predict LMY with varying levels of investment and accuracy¹³³.

3.4.1. Carcase composition technologies

For the purposes of this Review, the following carcase composition technologies have been identified and considered in this document at a high level:

a. Point measurement and yield equations (current 'manual' grading methods)

There are various point measurement devices in lamb and cattle, including carcase rulers in advanced probe technology. The advantage of point measurement technologies are that they are simple and cheap techniques. However, they have varying levels of accuracy and are labour intensive which may only be suitable to abattoirs with smaller throughputs¹³⁴.

b. Ultrasound

Ultrasound has been used to measure eye muscle area and back fat in live animals. This technology requires sufficient contact between the transducer and the animal which generally involves shaving the animal hide and the use of oil¹³⁵. The disadvantages of using ultrasound on a carcase include the bubbles of air that may be trapped in fat after removing the hide, thus the most appropriate measure of fat depth would be immediately after knocking with hide on.

c. Video Image Analysis (VIA)

VIA works by capturing images either on the whole carcase or the chiller assessment system on a quartered carcase to predict SMY. The advantage of the VIA system in Australia is that it provides a useful tool in predicting SMY. However, the disadvantage is that SMY is a method which varies widely according to the trim specifications for a particular market and therefore limits its ability to be used as an industry standard.

d. Dual Energy X-ray Absorptiometry (DEXA)

DEXA is a low-radiation technology that beams x-rays with different energy levels through a body in which its resultant scans are much more accurate at discriminating between density and tissues than conventional x-ray technology i.e. Single Energy X-Ray (SEXA) technology¹³⁶. While DEXA has been proven effective in lamb, research is still being conducted in beef. Further details and analysis of DEXA technology is outlined in Section 3.4.3 below.

e. Computer Axial Tomography (CT)

CT uses a system where an emitting x-ray source is rotated around the body with the resultant x-rays collected by a ring of detectors after passing through the carcase. The advantage of CT scanning is it gives an extremely accurate prediction of carcase composition, and issued in R&D by the industry to train devices to predict carcase composition as the 'gold standard'. Despite it being one of the most accurate and suitable measures for the purposes of R&D, it is unable to operate at current chain speed within processing facilities with the machine needing a set time to cool down in between scans.

¹³³ J.M Thompson, 2016

¹³⁴ J.M Thompson, 2016

¹³⁵ J.M Thompson, 2016

¹³⁶ J.M Thompson, 2016

f. **RGBD technology (Wii cameras)**

The RGBD camera technology and data acquisition software is an advancement from VIA in which it uses a number of small cameras to collect a large number of images and integrate them into a three-dimensional image. The advantage of this technology is that it is calibrated using CT composition (the gold standard), is cost-effective and will not require much space on the slaughter floor. The disadvantages of this technology is that it is still being analysed and tested, the results of which are yet to determine its accuracy and transportability across different datasets¹³⁷.

3.4.2. **EQ measurement technologies**

For the purposes of this Review, the following EQ technologies have been identified and considered in this document at a high level:

a. **MSA grading system**

The MSA model uses the inputs collated or measured on the carcass at the point of grading, and predicts how each cut will eat based on consumer driven preferences. The prediction system has been developed from over 94,000 consumers testing more than 660,000 beef samples. The advantage of MSA is that accuracy testing has proven that the system can classify between 50-70% samples into the correct grade¹³⁸. The disadvantage is the input grading measures used, which are collected manually, are subjective in nature.

b. **Tendertec probe**

The Tendertec probe is a mechanical probe which measures resistance when inserted into the muscle of a chilled carcass. The efficacy of the probe in predicting tenderness was evaluated by several groups including the Beef CRC, and US studies¹³⁹, which concluded that the use of the device was not transportable across different datasets and breeds.

c. **Colorimeters and beef cam**

The colorimeter uses colour dimensions in predicting beef tenderness. A large evaluation¹⁴⁰ has evidenced that there is little accuracy in colour dimensions to the prediction of eating quality over that explained by existing measures in the current MSA model such as pH. Beef cam is a further development of colorimeters which used colour analysis of a VIA image to predict tenderness but the concluded error rate was such that it was not suitable to progress to commercialisation¹⁴¹

d. **Slice shear force**

The moderate relationship between shear force and tenderness saw the development of a slice shear test that could operate at line speed. The slice shear reading at grading was moderately related to the feedback of sensory panels at 14 days however, the industry has not embraced this technology possibly because it is a destructive measurement.

¹³⁷ J.M Thompson, 2016

¹³⁸ J.M Thompson, 2016, Appendix C: Innovation in Carcass Yield and Eating Quality Measurement

¹³⁹ Belk et al (2001) and George et al (1997) as cited by J.M Thompson, 2016,

¹⁴⁰ Wulf and Page (2000) as cited by J.M Thompson, 2016

¹⁴¹ Wyle et al (2003) as cited by J.M Thompson, 2016

e. **Near-infrared reflectance technology (NIR)**

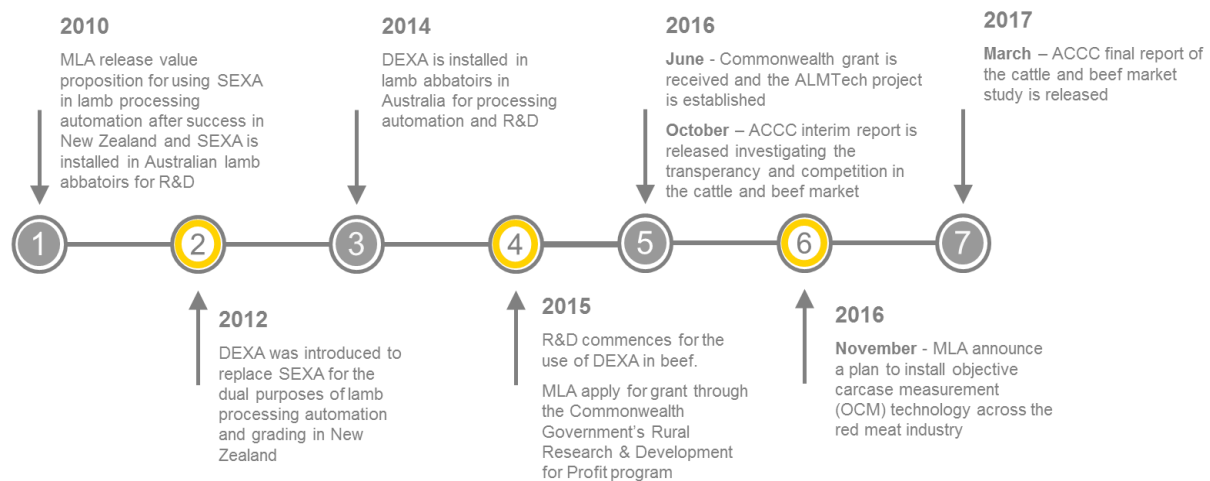
NIR utilises spectroscopic methods to measure the quantity of reflectance in the near-infrared region. The advantages are that it is quick and easy to use and is non-destructive and can predict chemical traits of a wide variety of materials such as protein in wheat. MLA have jointly funded a project with Denmark which showed that NIR can be used as a tool for use in on-line prediction of objective colour, intramuscular fat, pH, muscle glycogen and muscle heme pigment levels. The disadvantages are that NIR was a poor predictor of objective tenderness.¹⁴²

The review is also aware of additional eating quality technologies investigated as part of broader research under the ALMTech project, which include imaging cut surface equipment and more innovative research ideas which the project refers to as 'Blue sky technologies'.

3.4.3. Current known DEXA industry performance

MLA's announcement to install DEXA in AUS-MEAT registered processing plants was preceded by a number of relevant events; including industry R&D using x-ray technology, application for Government funding, the establishment of the ALMTech program which includes a timetable for trialling and developing DEXA for beef by August 2018, and the report by ACCC investigating the transparency and competition within the cattle and beef industry. These events have been outlined below in Figure 5 below.

Figure 5: Key industry milestones for x-ray technology R&D



Source: EY Analysis

DEXA has previously been applied to the medical and fitness industry to measure body composition on humans and was introduced to the red meat industry in 2012 for the purposes of automated lamb boning in New Zealand. DEXA technology in the red meat industry was introduced as a modification to existing SEXA technology which was used in conjunction with a lamb robotic boning system to produce 2D x-ray images to identify cutting lines. Similarly, DEXA is currently applied in beef in a large processing plant, where x-ray images generated are used to precisely guide automated cutting modules¹⁴³. DEXA was considered as a system that would not only meet robotic

¹⁴² De Marchii et al (2013) as cited by J.M Thompson, 2016

¹⁴³ Automated beef boning on our doorstep, The Land, 5 May 2017

requirements for automated boning but it could also enable the determination of LMY¹⁴⁴.

In moving DEXA from human application in the fitness and medical industry to sheep and then beef in the red meat industry there are various considerations to be made. These include the need to increase size, the need to operate at line speed, the need to consider the fault tolerance of the system to operate in a real time processing system, support industries for the sector, etc.

DEXA is successfully being applied in lamb and beef for the purposes of predicting cutting lines and informing automation in major processors in Australia. Additionally, the ALMTech program includes prototyping and testing DEXA for the direct measurement of LMY in an abattoir for:

- ▶ **Lamb** - where installation will rely heavily on synergy with existing automation and upgrade from SEXA to DEXA¹⁴⁵
- ▶ **Beef** - where little automation exists, further clarity is required to demonstrate the value of measuring carcass composition to the supply chain¹⁴⁶

The Proposal to install DEXA is expected to provide an accurate measurement of carcass composition, involving dual X-ray beams to capture direct carcass measures.

These measurements are then input into an algorithm to predict the percent of lean meat, bone and fat with high accuracy¹⁴⁷.

The algorithm translates the raw carcass measurement data into carcass composition data. The algorithm has been developed using assembly of a large data set of carcasses that represent the range of weight and fat composition evident within the industry. These carcasses are initially scanned using CT and the DEXA system to enable the generation of DEXA algorithms that can predict the percentage of CT LMY¹⁴⁸.

CT lean is a preferred method of calibration as it gives highly accurate and repeatable data which can be used to measure, and therefore predict, carcass composition with high accuracy. Alternative, and less accurate technologies, such as VIA currently uses SMY to train and predict carcass yield. The way in which processors determine saleable meat criteria and the variability in cutting specifications leads to unstandardised data which limits the ability for it to be used for predictive purposes¹⁴⁹.

As previously mentioned, Program 1 of ALMTech is looking at the 'Development of LMY technology'. This program is developing technologies for measuring LMY in live animal's on-farm, and of carcass in abattoirs, enabling the prediction of specific cut weights (specifically DEXA). The outcome of KPI 2.12.5, design a prototype DEXA for commercial installation at beef abattoirs is due 30 June 2017.

¹⁴⁴ Gardner, Starling, Brumby et al, 2016

¹⁴⁵ ALMTech Operational Plan, 2016, pg.25

¹⁴⁶ ALMTech Operational Plan, 2016, pg.25

¹⁴⁷ Gardner, Starling, Brumby et al, 2016

¹⁴⁸ Gardner, Starling, Brumby et al, 2016

¹⁴⁹ Johnson 1987, Perry et al 1993, and Thompson et al 2012

Under this is a sub-program 1.2: Design prototype technology for the direct measurement of LMY in an abattoir', which specifically relates to The Proposal by MLA to install DEXA in processing plants. Figure 6 outlines the relevant KPIs and status of completion for Sub-Program 1.2.

Figure 6: ALMTech sub-program 1.2 KPIs and completion status

KPI	KPI description	Status of completion	Expected completion
2.1.2 Provide a brief account of the design and testing of technologies for direct/indirect measurement of LMY in abattoirs			
2.12.1	Report on the outcome of an experiment to assess the impact of processing factors on DEXA measurement of lamb carcase composition, and analysis of detector stability	10%	30 Aug 17
2.12.2	Report on experiment to assess the ability of DEXA to determine lamb age based on bone mineral content	80%	30 Jun 17
2.12.3	Report on improvements in DEXA precision based on more sophisticated image analysis techniques	75%	30 Jun 17
2.12.4	Report on the outcome of an experiment to assess the impact of processing factors on DEXA measurement of beef carcase	100%	Completed
2.12.5	Report on the outcome of the pre-engineering experimental work to design a prototype DEXA for commercial installation at beef abattoir	20%	30 Jun 17

Source: EY analysis based on ALMTech Operating Plan Quarterly status report

Based on R&D to date, the advantage of DEXA is that it has a higher level of accuracy in predicting LMY in comparison to other OCM technologies. The results of DEXA for prediction of LMY in beef have not been published, however based on reported testing of DEXA's accuracy in lamb, 'a precise and accurate prediction of carcase composition enabling more accurate valuation of carcasses up on the basis of lean meat yield'¹⁵⁰. The accuracy of current carcase yield measurement has previously been evaluated, with an R2 (or coefficient of determination) typically between 30-40%¹⁵¹.

ALMTech have also assessed the impact of processing factors such as spray chilling, carcase weight and carcase orientation during DEXA imaging. This analysis is related specifically to KPI 2.12.4 and is 100% complete. This work has resulted in a prototype algorithm predicting carcase composition that, as stated by ALMTech, is ready for deployment when the first Beef DEXA system has been installed¹⁵².

There are more sophisticated image analysis methodologies to investigate the potential for bias across predictions, and this work is stated to be progressing well. However, the results have not yet been published. This relates specifically to KPI 2.12.3 in which a number of different approaches have been undertaken to increase the precision of DEXA prediction of body composition. This KPI is 75% complete, with the final paper being submitted on this work before 30 Jun 17¹⁵³.

Currently, the 'proof of concept' DEXA system has provided valuable insight into the hardware specification that will be required to develop a production capable (in line) DEXA grading prototype for beef.

¹⁵⁰ DEXA lamb eating quality and supply chain grading, 2016, pg.2

¹⁵¹ Johnson 1987, Perry et al 1993, and Thompson et al 2012

¹⁵² ALMTech Operation Plan - Program Quarterly Report 2: Updated March 2017, pg.16

¹⁵³ ALMTech Operation Plan - Program Quarterly Report 2: Updated March 2017, pg.16

However, due to cattle being a larger carcass size than previous applications in lamb, the work of ALMTech Operational Plan aims to complete an additional experimental engineering phase to establish the optimal hardware arrangement and product handling design of the final commercial prototype.

“This ‘pre-engineering phase’ will focus on a dual hardware DEXA arrangement that will utilise two x-ray sources detected by a ‘sandwich’ dual energy detector.

The dual hardware arrangement is required to achieve the desired hardware separation, power output, and machine footprint for the required length of scan at production line speeds”¹⁵⁴.

This work relates to ALMTech KPI 2.12.5 in which it is currently reported to be 20% complete, with the final report due to be before 30 Jun 17¹⁵⁵. Based on understanding to date, DEXA is able to operate at a capacity to scan 30 carcasses per minute¹⁵⁶. As it is understood by The Review, the first beef DEXA grading system for the measurement of LMY is planned to be installed in a large processing facility in July 2017. Therefore, no further calibration work will be completed on this device before this time¹⁵⁷.

The Review notes from recent media articles, a number of beef carcasses have been put through a DEXA grading prototype for the measurement of LMY, with initial results showing ‘the technology does work’. The processor involved has indicated that a commercial unit able to process 200 carcasses per hour is expected to be operational in August 2017.¹⁵⁸

Furthermore, on 22nd May 2017, MLA announced that they would invest up to \$10m to co-fund the installation of DEXA objective measurement systems in four red meat processing facilities (3 of which are focused on lamb).

¹⁵⁴ ALMTech Operational Plan, 2016, pg.25

¹⁵⁵ ALMTech Operation Plan - Program Quarterly Report 2: Updated March 2017, pg. 16

¹⁵⁶ Gardner, Starling, Brumby et al, 2016

¹⁵⁷ ALMTech Operation Plan - Program Quarterly Report 2: Updated March 2017, pg.25

¹⁵⁸ Reported on ABC News Rural website on 1 May 2017 at 2:08pm



4. The Proposal

4. The Proposal

This section aims to provide an outline of The Proposal which includes: objective carcass measurement; the proposed DEXA technology solution; the rationale for an expedited rollout; the proposed financing arrangement; the expected benefits, costs and funding options; and ownership and use of data; as well as the indicative technology installation schedule. The Review's analysis of these issues is contained in Section 7 of this report.

4.1. Proposed use of OCM

MLA stated their Proposal to be a potential first step towards addressing producer concerns in the current grading process¹⁵⁹ through the usage of OCM technology. The related producer concerns are outlined in more detail in the following sections.

As noted in the Section 3 above, OCM is not a universally defined term. However, MLA have made a concerted effort to adhere to a definition with the aim to provide a common industry understanding of what OCM is:

"OCM refers to the processes and technologies that have the potential to be used to better measure carcass attributes to predict eating quality, disease or contamination, precise boning cutting lines, and lean meat yield" - MLA¹⁶⁰

4.1.1. Proposed industry need for OCM

MLA have stated that, in their view, the use of objective measures and removal of human involvement as part of the grading process, is anticipated to immediately address the concerns of producers¹⁶¹.

As outlined in the funding proposal put forward by MLA, red meat producers and feedlot operators who sell livestock directly to processors have expressed concern towards the validity and accuracy of carcass measurements that determine the payment they receive¹⁶².

MLA have stated that this has led to a specific distrust towards the objectivity of the carcass grading process¹⁶³ where the majority of carcass graders are employed by processors. The Review understands this may be a factor that contributes to perceptions of bias.

¹⁵⁹ MLA Funding Proposal, accessed April 2017, pg.2

¹⁶⁰ MLA website - Objective Carcass Measurement, accessed April 2017

¹⁶¹ MLA Funding Proposal, accessed April 2017, pg.4

¹⁶² MLA Funding Proposal, accessed April 2017, pg.7

¹⁶³ MLA Funding Proposal, accessed April 2017, pg.7

4.1.2. Summary of current OCM R&D

MLA, along with other supply chain participants including AMPC and processors, have invested significantly in OCM research and technology for a number of years. This has included investment in the use of DEXA in lamb abattoirs for the purposes of driving automated boning. Additionally, the MLA Donor Company (MDC)¹⁶⁴ has also worked to secure private investment to progress the technology's development. Since 2012, MDC has been working with a technology solutions provider and a large processor to develop technologies to measure carcass traits to predict bone cutting lines, lean meat yield and eating quality.

Furthermore, in 2015, MLA and AMPC successfully received funding under the Commonwealth Government's Rural R&D for Profit program to further progress the technologies towards commercialisation¹⁶⁵. In 2016, this funding saw the establishment of the ALMTech project. For further details on the ALMTech programs see Table 1 above.

4.2. Proposed applications of DEXA as one part of OCM

The Proposal to install DEXA addresses one specific aspect of MLA's OCM definition. Specifically, DEXA technology is aimed at the OM of a carcass's composition through the output of LMY. The application of an OM of LMY in the context of The Proposal is outlined below.

4.2.1. Addressing carcass grading complexities

The prices received by producers for livestock that are sold 'over the hooks' (a form of direct selling) are most often determined through a carcass grading process at the abattoir. 'Direct selling' refers to the sale of livestock via bilateral agreements directly to meat processing facilities.

In 2016, the ACCC cattle and beef market study report received submissions by major beef processors and supermarkets in Australia that approximately 90 per cent of the cattle they purchase are acquired directly from producers and using OTH. 'Making this the most important channel for information about prices and quality requirements of end customers to flow between processors and producers'¹⁶⁶. The livestock are delivered to the abattoir, where the transfer of ownership takes place at the abattoir scales.

Once ownership of livestock is transferred and standard carcass trims undertaken, the carcasses are graded against a 'price grid'¹⁶⁷. These 'price grids' outline the various quality factors that the carcass must satisfy in order to achieve a certain price range. At present the grading occurs manually, whereby graders use a variety of measurements and observations to assess carcasses.

¹⁶⁴ The MLA Donor Company is a fully-owned subsidiary of Meat & Livestock Australia. The MDC facilitates voluntary investments in R&D innovations across the red meat supply chain.

¹⁶⁵ Department of Agriculture and Water Resources - Rural R&D for Profit program: approved round 2 projects, accessed April 2017

¹⁶⁶ ACCC Cattle and beef market study – Final report, 2017, pg.70

¹⁶⁷ 'Price grids' are specific to each processor and in many cases each processing facility. Their composition is set by the processors, and will usually reflect the market specifications they require to meet customer requirements and prevailing market conditions.

The grading specifications fit into one of three categories:

1. Specifications based on the AUS-MEAT language (a requirement for export beef)
2. MSA- defined specifications; or
3. Processor-defined specifications

Processors are able to determine the parameters they will use to grade a carcasses, however usually this is dictated by their customers who require the use of AUS-MEAT or MSA grading¹⁶⁸. MLA states that beef grading measurements are subjective and use rudimentary manual techniques and weighted averaging to grade and price carcase. After grading, producers are provided with the price grid, outlining the measurements and associated prices received for the livestock.

As outlined in MLA's funding proposal, producers feel they have few alternative sale options if they believe the grading process at one processor is not accurate. Furthermore, with a growing number of livestock being sold via the direct sales method, these concerns on the part of producers are expected to increase.

It is planned that the output of LMY data from a DEXA scan, which will include measurements for meat, fat and bone composition, will be used in addition to AUS-MEAT feedback.

As part of the grading process, there are additional measures which are collected including MSA and other processor specified measures. As part of the ongoing ALMTech research, technologies which provide additional measures to LMY are being investigated that could supplement DEXA in providing other objective measures such as EQ.

4.2.2. Standardising data feedback to livestock production

MLA have stated that installing DEXA technology throughout Australia's red meat industry has the potential to create a single scientific measurement of carcase meat, fat and bone (lean meat yield) and the opportunity to pass this information back along the value chain¹⁶⁹.

The March 2017 release of the Cattle and beef market study by the Australian Competition and Consumer Commission recommended that data produced from OCM should be shared for the benefit of the industry. It notes that the data produced as a result of objective carcase grading will be of wider benefit to the industry if aggregated and shared¹⁷⁰.

Furthermore, the Review understands that MLA believe that standardisation of LMY across the industry is the best way to provide producer confidence in the grading system. This standardisation concept was further described in a media release by the MLA on 2 May 2017. MLA have also indicated that standardisation is also required to enable the proper auditing and assurance of the grading system.

¹⁶⁸ ACCC Cattle and beef market study – Final report, 2017, pg.71

¹⁶⁹ MLA Industry News 08 December 2016

¹⁷⁰ ACCC Cattle and beef market study – Final report, 2017, pg.12

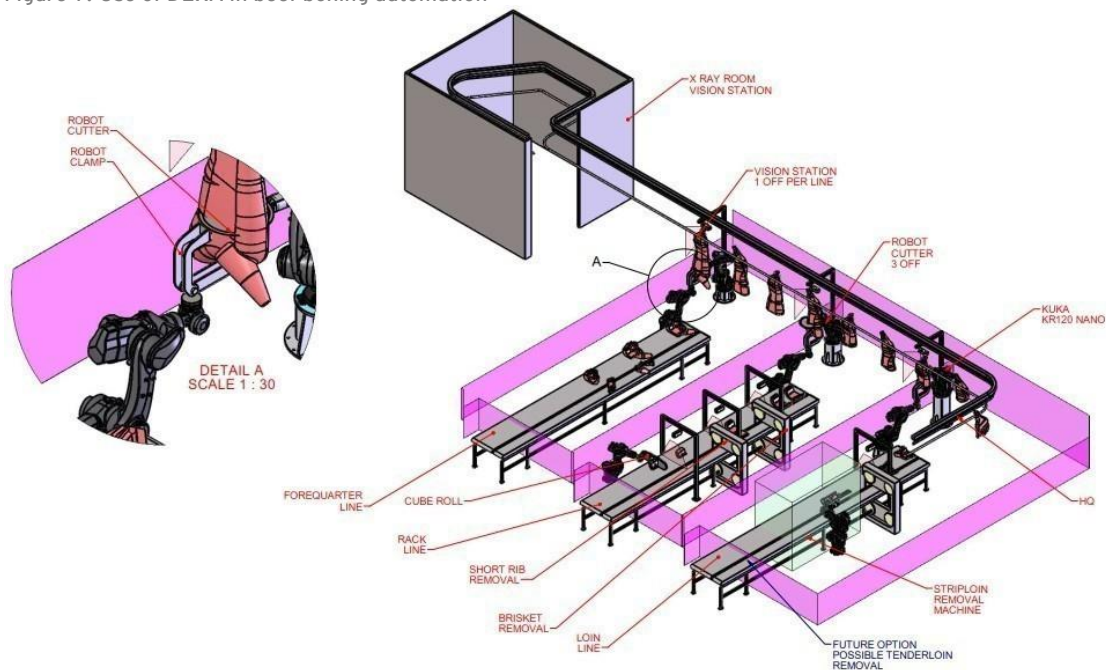
4.2.3. Enabling processing automation

MLA anticipates the installation of DEXA will reduce the barriers to adoption for OCM and other automation technology solutions in the future. The use of OCM and other automation technology will attribute to 'better processing plant management of boning-room labour, improved prediction of future product volume for different markets and the ability to market products with greater accuracy of specifications'¹⁷¹.

MLA documents indicate that the objective measure of LMY without automation is specifically able to benefit improved carcass sortation¹⁷² to customer specifications using objective carcass measures. When combined with automation, this information can also be used to direct advanced robotics for automated boning¹⁷³.

Currently, x-ray technology such as SEXA and DEXA are being deployed by major Australian red meat processors as part of their automated cutting and boning procedures for lamb. Figure 7 below highlights an example of how DEXA can be applied to enable full beef automation in cutting and boning. An example of this can be seen in Figure 7 below.

Figure 7: Use of DEXA in beef boning automation



Source: A technology solutions provider

¹⁷¹ MLA Funding Proposal, accessed April 2017, pg.8

¹⁷² Sortation is to the process of sorting items into categories or into a set order, especially when done by machine or computer

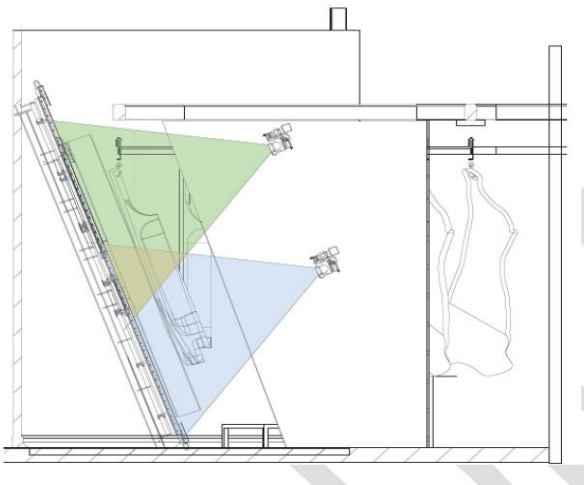
¹⁷³ Development of supply chain OM strategy & value proposition to stakeholders, MLA, 2016, pg.5

4.3. Proposed use of Dual Energy X-ray Absorptiometry (DEXA)

As noted above, the specific technology MLA is proposing be purchased and installed is DEXA, a bone density measurement technology, which can also measure fat and muscle definition. MLA have proposed that the DEXA units be installed in a purpose-built lead-walled section within each processing facility, post slaughter either prior to, or after, chilling of the animal in the production line. The choice of the installation location has been left to processors to determine.

The DEXA technology utilises two X-ray beams with different energy levels that are projected onto the carcass to provide an accurate indication of LMY¹⁷⁴. The data captured include x-ray images (illustrated in Figure 8 below), carcass weight and carcass ID which are then subsequently fed into the software algorithm for the calculation of LMY in the animal carcass¹⁷⁵. This algorithm is proposed to be programmed into software as part of MLA's proposed installation and used to analyse DEXA scan data, carcass weight and carcass ID to arrive at a prediction of percentage of lean meat, fat and bone for individual carcasses.

Figure 8: Example of a DEXA beef carcass x-ray scan



Source: MLA Funding Proposal, accessed April 2017, pg.18)

The information characterising LMY will be linked to an in-plant Radio Frequency Identification (RFID) systems, where available, and live animal tracking systems, using NLIS¹⁷⁶ numbers specific to each animal and shared back to producers. The LMY data is proposed to be collectively stored by MLA (or a suitable independent body) in a suitable and secure location, and used for collective R&D and marketing, or to create solutions for providers more generally.

The Proposal has recognised that calibration of each DEXA unit is required at installation and periodically, to maintain accuracy and consistency across the industry; vital to underpinning objective lean meat yield data and carcass pricing. As a consequence of funding the technology purchase and installation, The Proposal also suggests that this auditing function be carried out by AUS-MEAT, similar to current randomised auditing of manual grading. Funding of AUS-MEAT DEXA audits is expected to be redirected from current funding of the manual grading audit function. AUS-MEAT, being jointly owned by processors and producers, is deemed to be best placed to carry out the audit function.

¹⁷⁴ MLA Funding Proposal, accessed April 2017, pg.9

¹⁷⁵ Meeting with a technology solutions provider, March 2017

¹⁷⁶ The National Livestock Identification System (NLIS) is Australia's system for the identification and traceability of cattle, sheep and goats.

4.4. The Proposal's rationale for an expedited rollout of DEXA

The following section articulates the expected benefits that MLA believe would accrue if there were to be the proposed accelerated industry-driven DEXA installation, and the resulting issues that would impede producers if it was market-led by the processing sector¹⁷⁷. The specific issues MLA anticipates from a market-led installation include further industry consolidation in the processing sector; challenges in defining audit processes and standardisation of DEXA installations; and an overall delay in shifting the industry to value-based operations that would improve productivity and better meet consumer needs.

4.4.1. Expected benefits of an expedited DEXA roll-out

The proposed installation of DEXA is stated by MLA to address the continued concerns by red meat producers and feedlotter, towards the validity of carcase measurements and thus payments for livestock. MLA states that the accelerated, centrally driven installation, is required to achieve wide adoption and standardisation of OM¹⁷⁸.

In addition, The Proposal states that an accelerated industry-wide application of the technology will deliver other key benefits to red meat producers and the wider industry value chain¹⁷⁹, including:

- ▶ Transforming the industry towards livestock production and marketing through objective data and value measurements which is anticipated to return \$220m to the value chain per annum by 2020
- ▶ Providing the industry with a valuable database of objective measures, critical to supporting individual farm and whole-of-industry scale productivity improvements
- ▶ The installation of DEXA will reduce the barriers to adoption for OCM and other automation technology solutions in the future

4.4.2. Implications of a market-led outcome

MLA indicates in The Proposal that market-led adoption of OCM technology is likely to be, at best, ineffectual and is likely to have an adverse impact on producers¹⁸⁰.

The Review understands that MLA believes:

- ▶ That smaller processors may find it more difficult to fund capital investments and that as a result industry-wide adoption is anticipated to take longer under a market-led approach
- ▶ This inability to invest may put pressure on smaller processors to the extent that further industry consolidation may take place, and that this may in turn may result in negative impacts to producers
- ▶ Market-led adoption is likely to mean that processors have less incentive to broadly share their operational data

¹⁷⁷ MLA Project 150 Funding Proposal, accessed April 2017, pg.8

¹⁷⁸ MLA Project 150 Funding Proposal, accessed April 2017, pg.7

¹⁷⁹ MLA Project 150 Funding Proposal, accessed April 2017, pg.8

¹⁸⁰ MLA Project 150 Funding Proposal, accessed April 2017, pg.2

4.5. Proposed costs and financing overview

This section outlines the cost inclusions and exclusions and proposed funding structure specified in The Proposal, and lists key inputs and assumptions within the proposed funding model.

Further to the information provided in this document, MLA has advised the Review that they are exploring alternative funding models to that originally proposed. In addition, as noted elsewhere, on 22nd May 2017, MLA announced that they would invest up to \$10m to co-fund the installation of DEXA objective measurement systems in four red meat processing facilities.

AMIC and AMPC have advised the Review that they are supportive of the development and advancement of OCM technology and specifically of research as to whether DEXA represents the appropriate technology platform to support this. They note that early signs are encouraging, and have advised that they stand ready to support their members and the wider industry into providing research on that technology. They have advised that they are awaiting the outcomes of this Review to assist them in considering these matters¹⁸¹.

4.5.1. Proposed cost

Based upon the documentation received by The Review from MLA, The Proposal includes the purchase and installation of DEXA units in up to 90 AUS-MEAT accredited meat processing facilities in which the total cost is estimated to be \$150m¹⁸². The proposed average cost per unit for purchase and installation is \$1.45m per unit¹⁸³. The Review acknowledges that this is a voluntary opportunity and the proposed cost is for up to 90 AUS-MEAT processing facilities.

These individual unit costs include the cost of purchasing the DEXA unit, its installation at a processing plant and additional program administration costs. The individual unit cost however, does not include plant modification costs which may be required to accommodate the DEXA unit. Nor does it appear to include the on-going operating and maintenance costs¹⁸⁴. Further details of The Proposal cost inclusions and exclusions are outlined in Table 2 below¹⁸⁵.

Table 2: The Proposal cost inclusions and exclusions

#	Cost Areas	Included/Excluded	Cost borne by
1	Initial purchase of DEXA unit	Included	The Funding Proposal
2	Installation of DEXA unit	Included	The Funding Proposal
3	Program governance costs	Included	Not specified
4	Plant modification costs	Excluded	Processor
5	Operating costs (hardware and software)	Excluded	Processor
6	Maintenance costs (hardware and software)	Excluded	Processor
7	Audit of DEXA unit accuracy and calibration consistency	Excluded	AUS-MEAT ¹⁸⁶
8	Training and knowledge management	Excluded	Not specified
9	Integration costs with internal systems (e.g. ERP, other tools)	Excluded	Not specified
10	Decommissioning costs	Excluded	Not specified

¹⁸¹ MLA approves \$10m for DEXA installations, Beef Central, dated 22 May 2017

¹⁸² MLA announcement, 10 November 2016

¹⁸³ MLA Funding Proposal, accessed April 2017, pg.9

¹⁸⁴ MLA Funding Proposal, accessed April 2017, pg.13

¹⁸⁵ Cost inclusions and exclusions sourced from the MLA Funding Proposal, accessed April 2017, pg. 13

¹⁸⁶ MLA announcement, 10 November 2016

Based on information outlined in The Proposal¹⁸⁷ and subsequent discussions with MLA¹⁸⁸, The Review understands that, while processors will operate and maintain the DEXA unit, the ownership is to be retained by MLA. The Review understands that if the proposed roll out occurs, MLA and processors will periodically assess whether the unit is being used in accordance with the intended purpose. The details of this arrangement will need to be agreed upon between MLA and processors.

4.5.2. Proposed financing structure

The Proposal notes that the original proposed funding structure comprises of a government concessional loan through the Commonwealth Regional Investment Corporation. The proposed loan would have been structured over a negotiated period of 10 years against a reduced borrowing rate. It was proposed that the loan would have been underwritten by MLA and serviced through the apportionment of producer levies over the loan repayment period¹⁸⁹.

The Review notes that the financing structure outlined above was proposed in documentation dated in 2016 and we understand, through discussion with MLA, that this has evolved.

Based upon the government concessional loan outlined above, The Proposal outlines plans to drawdown on this loan during the rollout period between FY17 to FY20, with gradual increases in the repayment of capital and interest over the life of the loan. The total cost of funding is \$183.4m which includes cumulative interest of \$32.1m¹⁹⁰. The interest rate proposed in the funding model is based on 10 year Government bond rates as at 28 November 2016 of 4.75%¹⁹¹.

The proposed funding model was prepared based upon a 'worst case' view should the initiative not be eligible for the Government 'matching dollar' contribution¹⁹².

The producer levies in FY17 to FY20 are modelled on current market trends, while years FY21 to FY26 are based on long term historical averages. The use of new levies or levy price increases have not been factored into this model to fund the new asset¹⁹³. Levy expenditure is predicted to exceed levy income as built up reserves are utilised between FY17 to FY20. Thereafter, levy expenditure is anticipated to normalise at \$91.5m per annum¹⁹⁴. This is illustrated in Figure 9 below.

¹⁸⁷ MLA Funding Proposal, accessed April 2017, pg.13

¹⁸⁸ interview conducted on 31 March 2017

¹⁸⁹ MLA Funding Proposal, accessed April 2017, pg.11

¹⁹⁰ MLA Funding Proposal, accessed April 2017, pg.11

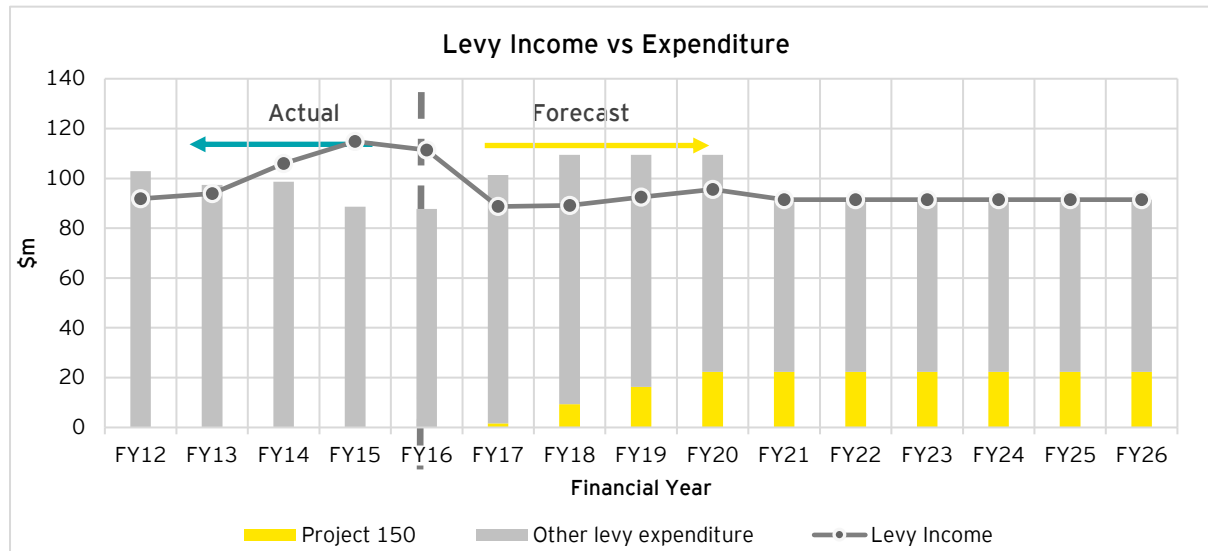
¹⁹¹ MLA Funding Proposal, accessed April 2017, pg.13

¹⁹² MLA Funding Proposal, accessed April 2017, pg.13

¹⁹³ MLA Funding Proposal, accessed April 2017, pg. 13

¹⁹⁴ MLA Funding Proposal, accessed April 2017, pg.12

Figure 9: Projected levy income vs planned expenditure



Source: MLA Funding Proposal, accessed April 2017, pg. 12

4.6. Proposed expected benefits

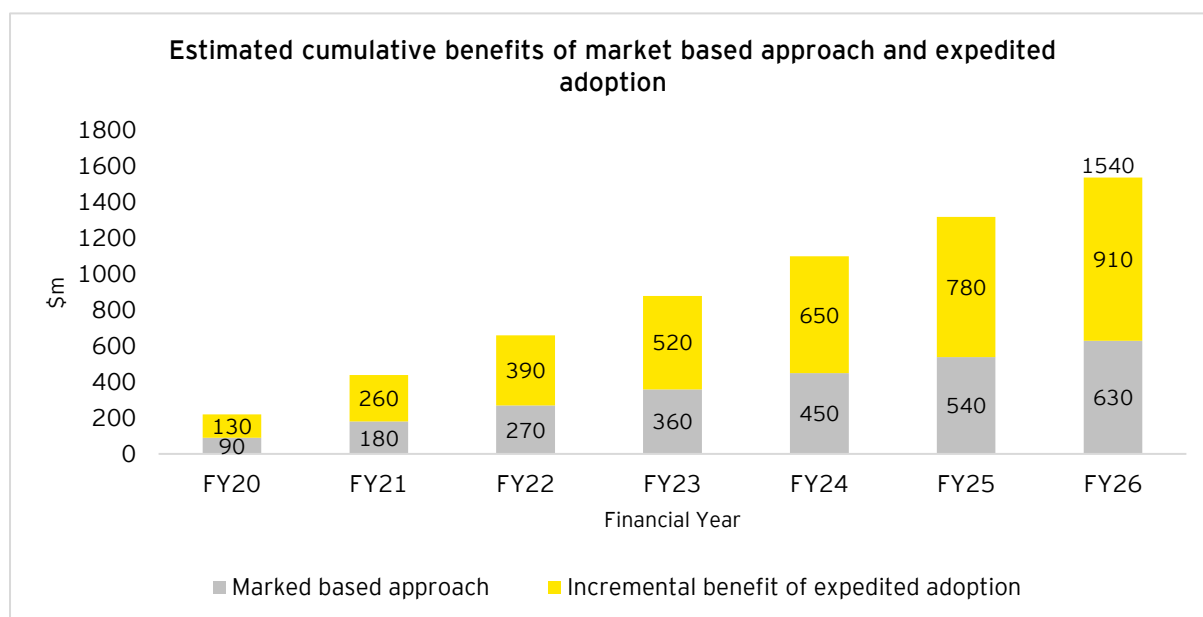
This section outlines the proposed benefits of the DEXA implementation to producers, the Government, the taxpayer and the broader industry as per MLA's Funding Proposal.

4.6.1. Proposed industry wide benefits

The Proposal estimates a cumulative industry wide benefit of \$1,540m by 2026 based on the expedited adoption of DEXA. This benefit is the aggregate of the total estimated gross annual benefits of \$220m between 2020 and 2026¹⁹⁵.

The incremental benefit of expedited adoption and the market based adoption rate is \$910m by 2026. This is based on incremental annual, gross benefits of \$130m between 2020 and 2026¹⁹⁶. The difference between a market based approach and expedited adoption of DEXA is outlined in Figure 10 below.

Figure 10: Estimated cumulative benefits of market based approach and expedited adoption



Source: MLA Funding Proposal, accessed April 2017, pg. 8

These benefits are categorised into four groups¹⁹⁷:

1. Increasing lean meat yield of the Australian flock and herd
2. Optimising purchasing of livestock to better suit end markets
3. Optimising boning room fabrication to best enable available livestock purchased to meet end customer needs
4. Increasing boning room cutting accuracies

¹⁹⁵ MLA Funding Proposal, accessed April 2017, pg.8

¹⁹⁶ MLA Funding Proposal, accessed April 2017, pg.8

¹⁹⁷ MLA Funding Proposal, accessed April 2017, pg.9

It is important to note that The Proposal includes estimated benefits at an industry wide level, while the proposed costs only address the installation of DEXA units (as illustrated in **Table 2** above) and do not include the other areas which would facilitate the realisation of the broader benefits; processing automation for example.

The 'Development of supply chain OM strategy and value proposition to stakeholders' report, 2017 (OM Strategy Report) prepared by Greenleaf, Miracle Dog Consulting and S. Williams Consulting¹⁹⁸, estimates benefits separately to The Proposal. The value proposition benefits are based on six scenarios where benefits may be generated. These scenarios are broadly consistent with the four benefit groups identified above:

1. Increasing lean meat yield but maintaining eating quality
2. Increasing lean meat yield but maintaining pH
3. Increasing feedlot quality but maintaining turn off times
4. Improving animal health
5. Optimise livestock purchased to market specifications
6. Fabrication of purchased livestock to optimise value

The potential upside benefit based on 100% adoption is estimated \$417m annually by 2030, of which \$334m is attributable to the beef industry. The likely estimated benefit based on expected adoption rates is \$247m annually by 2030, of which \$196m is attributable to the beef industry¹⁹⁹.

Analysis of these issues is contained in Section 7 of this report.

¹⁹⁸ Greenleaf, Miracle Dog Consulting and S. Williams Consulting, 2017 as cited in 'Development of supply chain OM strategy and value proposition to stakeholders', 2017, pg.2).

¹⁹⁹ Development of supply chain objective measurement (OM) and value proposition to stakeholders', 2017, pg.3

4.7. Proposed DEXA roll-out

The documentation provided to The Review included a proposed installation program for the installation of DEXA in processing plants. This included the appointment of a program manager to work with third parties to commence procurement and installation of DEXA technology²⁰⁰. The proposed installation program consists of four steps:

Step 1	Step 2	Step 3	Step 4
<p>After successfully receiving the required loan from the Commonwealth*, a tender process would be undertaken to determine OCM technology suppliers and installation partners.</p> <p>(*The Review notes recent advise that the funding proposal is evolving)</p>	<p>In 2017, MLA would commence the program with the appointment of a project manager to administer the project, work with processors and partners to purchase and install OCM technology at AUS-MEAT accredited processing facilities.</p>	<p>Set up supporting systems and processes, including technology auditing and data storage.</p>	<p>MLA will service the debt obligation through apportioning producer levies, developing an exit strategy - where appropriate - from day to day administration of OCM technology in processing facilities.</p>

4.7.1. Proposed technology installation schedule

Based upon the documentation received by The Review from MLA, it is understood that the installation of small DEXA units would commence across a number of plants in FY17, and the roll-out continuing to FY20²⁰¹. This is subject to the initiative receiving formal approval from the necessary stakeholders and confirmation of acceptable installation timeframes with the individual processors. Indeed, on 22nd May 2017, the MLA announced that they would invest up to \$10m to co-fund the installation of DEXA objective measurement systems in four red meat processing facilities.

Prototyping of large DEXA units is in final stages of development and testing, and it is proposed that the installation of these units may commence during the first half of FY18, with roll-out continuing through to FY20²⁰². A summary of an indicative installation schedule proposed by MLA is set out in Table 3 below:

Table 3: Indicative technology installation schedule and cost

Year ended	Large Facilities		Small Facilities		Total	
	Number	Cost (\$m)	Number	Cost (\$m)	Facilities	Cost (\$m)
2017	0	0.0	9	12.5	9	12.5
2018	23	35.6	16	18.7	39	54.3
2019	17	26.7	14	9.4	31	36.0
2020	17	26.7	7	21.8	24	48.5
Total	57	88.9	46	62.4	103	151.3

²⁰⁰ MLA Funding Proposal, accessed April 2017, pg.9

²⁰¹ MLA Funding Proposal, accessed April 2017, pg.9

²⁰² MLA Funding Proposal, accessed April 2017, pg.10



5. The views of industry bodies and experts

5. The views of industry bodies and experts

As noted above, The Review contacted relevant industry bodies and several experts to seek their views on a range of aspects of The Proposal. These views have been used as inputs into The Review's insights and observations relating to the strategic, financial, technical, commercial, operational, governance and implementation aspects associated with The Proposal.

This section provides an overview of what these industry stakeholders have told us. We have also noted a number of media releases and media articles about this issue.

Section 6 of this Report provides information relating to the specific discussions with producers and processors to gain their views on The Proposal and related matters for consideration

5.1. Industry stakeholders

The Review engaged with industry bodies, specialists and independent parties in a consultative and transparent manner, whereby their viewpoints about The Proposal were captured and analysed.

The details of the specific groups engaged are identified in Section 1, above.

5.2. Methodology and key areas explored

The Review followed a structured approach, using interview questions that were consistent across the stakeholder groups, with additional areas of specificity based on the bodies' or individual's area of expertise. These interviews also allowed a degree of flexibility to explore new areas and any concerns raised by interviewees.

Across the stakeholder groups the following key areas were explored:

Views on the viability of The Proposal (Project 150)	Views on relevance and utility of OCM on the Australia Red Meat Industry	Views on DEXA as preferred OCM technology	Views on data ownership and Intellectual Property (IP)
<ul style="list-style-type: none"> ▶ Rationale for the introduction of OCM, the funding options, perceived benefits and return on investment, risks and issues, impact on other industry investments 	<ul style="list-style-type: none"> ▶ Value of OCM as a grading mechanism, impact on LMY and EQ, alternative technologies for OCM (non DEXA) and their maturity 	<ul style="list-style-type: none"> ▶ Maturity of DEXA by meat category, perceived utility to producers (e.g., to benchmark against others to improve livestock quality in line with market needs) and processors (e.g., automated boning, consistent grading capability, grading throughput implications), implementation timeline, adoption methodology (industry-wide vs. market-led), operationalisation, safety and social health considerations 	<ul style="list-style-type: none"> ▶ Use and ownership of data generated from DEXA, access rights of data within the industry

Interviews were conducted by telephone between 8 March and 19 May 2017, each lasting approximately 60 minutes. Table 4 below captures the count of the total number of interviews conducted by category.

Table 4: List of interviews

Interview respondent profile	Total # of interviews conducted*
Peak industry councils	5
Research and Development Corporations	6
Academic and independent experts	11
Providers of OCM technology	3
Total # of interviews conducted	25

*Total number of interviews conducted includes all interactions, including with interviewees who were engaged with on multiple occasions

5.3. Observations

The following sub-sections capture the opinions that emerged from interviews with industry bodies and interested parties on each of the aforementioned themes.

5.3.1. Views on The Proposal

The majority of stakeholders advised The Review that they believed that benefits would accrue from implementation of The Proposal, particularly for *over the hooks* grading of animals and value based transactions. Further to this, the majority of stakeholders also believe that The Proposal is likely to improve confidence within the producer community with increased transparency in pricing based on OCM.

The Review has been advised by AMPC and AMIC that they are awaiting further information relating to the details of The Proposal, and see this independent review as a way to address the need for evidenced-based information prior to making any decisions.

The Review has noted that the SCA, CCA and the Victorian state farmers' association have expressed their support for The Proposal.

SCA have expressed²⁰³ their active support for implementation of Project 150 contingent upon the following conditions being fulfilled:

- ▶ Match funding from government R&D dollars
- ▶ No diversion of funds from other programs
- ▶ Fast tracking of lamb EQ measurements by MLA that are proposed to be incorporated into Project 150
- ▶ Data exchange done through Livestock Data Link
- ▶ Exploring potential co-funding of hook tracking systems with processors
- ▶ SCA board sign-off on finalised funding arrangements.

²⁰³ SCA March 2017 Board Meeting Outcomes - SCA (15th March, 2017)

SCA noted that the introduction of objective measures would guarantee the product quality of MSA Lamb and assist in the development of an Australian “Yearling” product.

Similarly, CCA²⁰⁴ noted their support of the implementation of DEXA and its introduction on a voluntary basis into the Australian livestock processing sector, provided MLA investigate funding opportunities and partnerships to ensure long term sustainability of the project.

CCA have expressed that there are ‘market advantages to be gained through this technology and we are committed to ongoing collaboration within the red meat industry’.²⁰⁵ On 30 May 2017, the CCA wrote to The Review reaffirming their support of The Proposal and seeking to ensure that this view is reflected in our report.

As mentioned in a media report on 4 April 2017, the Secretary of the Department of Agriculture and Water Resources²⁰⁶, Daryl Quinlivan, has said that he supported the implementation of DEXA and suggests that “industry inertia” is preventing adoption of the technology. Additionally, feedback received by producers on the quality of carcass will help the industry build the genetic quality of Australian sheep and cattle over time that could improve farm-gate returns and industry competitiveness.

Some stakeholders, particularly from peak industry councils, have voiced concerns on the funding mechanisms suggested in The Proposal (producers to finance the procurement of DEXA technology in exchange for ownership of the data thus generated). In their opinion, processors should be paying a part of the costs incurred in the procurement and installation of DEXA machinery. This, they believe, will incentivise processor facility management teams to drive the initiative commercially; that would be beneficial in the sustainability of the initiative post implementation.

A risk cited by various stakeholder groups is the potential loss of capital invested if the benefits made in The Proposal are not realised post installation. Our interviews indicated that a number of groups are seeking a thorough relook of the assumptions made in The Proposal to mitigate this risk.

There have also been concerns that investments in Project 150 may divert cash from other industry programs (e.g., feedstock research, Live Export Program (LEP)).

5.3.2. Views on relevance and utility of OCM

There was broad consensus among stakeholders that the introduction of OCM is a positive move in the industry that would help reduce subjectivity of manual grading procedures currently prevalent across most processors, thereby improving the confidence of producers by increasing transparency in pricing.

Among the benefits outlined in using OCM, accuracy of LMY calculations has been cited by most stakeholders. However, some stakeholders have raised concerns that overemphasis on LMY may lead to a compromise on meat quality (EQ) in the long run. They suggest adoption of MSA to guard against such imbalances while implementing OCM.

In terms of alternative technologies to DEXA, some stakeholders believe that CT scan, MRI, Comb bean (flat panel), tissue depth probes, VIAscan® (previously used in New Zealand) and 3D imaging may be evaluated. However, they believe that while these technologies have shown promise, they are either too expensive, are low on throughput or are unreliable in their current form, to be commercially implemented.

²⁰⁴ Letter to MLA, (Cattle Council Board Meeting - 22-24 February), dated March 20th, 2017

²⁰⁵ Cattle council backs voluntary DEXA roll-out, Queensland Country Life, February 27th 2017

²⁰⁶ Quinlivan: perfect could be enemy of common good for DEXA, FarmOnline National, April 4th, 2017

5.3.3. Views on DEXA as preferred OCM technology

There is consensus that DEXA technology has shown promise in the sheep industry, particularly to enable automation, but some stakeholders, especially from the specialist community, believe that there needs to be more trials done on beef before a decision is taken around commercialisation. Some have cautioned against extrapolating results derived from lamb on beef, as the results can vary substantially.

One State farmers association advocated, in their media release²⁰⁷, the use of DEXA in beef would, in their opinion, lead to efficiency benefits for both producers and processors. They noted that abattoirs that have used DEXA thus far, have realised a 20-30% improvement in efficiency and that it provided greater transparency to producers by helping them alter breeding objectives to meet market demand. However, they acknowledged that some processors may not be in a position to install DEXA in the immediate future.

Similarly, another State farming association²⁰⁸ have lent their support to the implementation of DEXA. They believe that it would be a more efficient and cost effective solution to address the independence issue around carcass grading.

In terms of technical capabilities, the stakeholders, especially within the specialist community, agree that DEXA can provide data on lean meat and fat content but it does not provide adequate information on moisture and protein content or other characteristics used to determine the quality of meat. This may, in their opinion, hinder DEXA's adoption if alternative technologies can provide such capabilities at a competitive price point. Other technical limitations that have been raised around commercial use of DEXA, including its limited throughput while analysing a carcass based on computational constraints and variation in grading results based on carcass presentation.

On the operationalisation of DEXA, most stakeholders believe that there wouldn't be any Occupational Health & Safety issues as the processing plants would have rooms lined with lead to prevent any health issue. From a social health standpoint, there were no concerns raised by the stakeholders because they expect DEXA to be safe for use on meat²⁰⁹.

The consultations with peak industry councils and specialist stakeholders indicate that some believe it would be prudent to go with a market-led voluntary approach, where processors take a decision on installing DEXA depending on business case alignment. However, some other stakeholders believe that mandatory industry-wide adoption would be appropriate as it would prevent consolidation of pricing power with large processors, help in standardisation of the grading protocols and with industry-wide consistent auditing mechanisms.

²⁰⁷ DEXA beneficial for beef industry - May 23rd, 2017, WA Farmers

²⁰⁸ Industry investment lifts integrity in livestock supply chain, Victorian Farmers Federation, November 10, 2016

²⁰⁹ Occupational Health & Safety and other health and social health issues that may arise in connection with DEXA do not fall within the scope of this report. EY makes no representation in relation to any Occupational Health & Safety, health and social health issues that could arise in connection with or arising out of the use of DEXA.

5.3.4. Views on data ownership and Intellectual Property (IP)

A number of stakeholders interviewed were of the view that there was a need for further clarification on the ownership and use of data that will be generated via the use of DEXA. They also emphasised the need to educate and train industry participants (producers and processors) on deciphering the data, so that they are well placed to utilise the data to make business decisions.

A few stakeholders advocated the need for the key industry stakeholders to own the data and make it available to all participants. It would, in their opinion, reduce the possibility of cartelisation in the future. They support using the data for both R&D and commercial purposes, if made open to the industry.

Many stakeholders suggest the need to link data generated through OCM across the value chain. They expect the industry to work towards advancing the current MSA grading system in conjunction with using OCM, thereby finding a balance between LMY and EQ in the future.

Summary – Producers and processors stakeholder interviews - mixed and varied views

The responses provided to The Review suggest that there is confidence in OCM creating a positive impact on the industry by enabling value based transactions and improving confidence of the producer community. It is also expected to provide capabilities to maintain a better balance between LMY and EQ by providing data to producers to alter their herd composition.

The deployment of DEXA as the preferred OCM technique at this point in time receives mixed levels of support from within the industry bodies and experts interviewed. While some specialists believe that technology needs to be proven for beef, some industry bodies have come out in support of the implementation of the DEXA technology in its current form. For lamb, the mandate is positive with most stakeholders being confident of successful use of DEXA for OCM.

A few stakeholders have a view that the processors should have a say in terms of when to adopt OCM based on their business case viability, while others believe an accelerated, industry led adoption is the way forward to prevent consolidation within the processors, and mitigate the potential issues with standardisation of grading and auditing requirements.

On the use and ownership of data generated, the interviews suggest that there needs to be greater clarity in the proposed arrangements of its use.

Similarly, a number of stakeholders interviewed by The Review suggest The Proposal explore alternative funding opportunities to help make the project sustainable in the long run.

The Review believes these responses need to be considered in the light of Section 6, which details the unfiltered and direct views of a number of producers and processors.

A golden-hour photograph of a farm. In the foreground, a large, dark brown, textured area, possibly a field or a close-up of soil, is visible. In the middle ground, a group of cows is grazing in a field. The background shows a line of trees and a bright, hazy sky, suggesting a sunrise or sunset. A semi-transparent grey text box is overlaid on the left side of the image.

**6. What we were told
by producers and
processors**

6. What we were told by producers and processors

This section provides the areas of investigation, methodology and findings of the 'voice-of-the-industry' research (the study) that was conducted by EY Sweeney, a major full service market research firm. It was designed to directly bring the vital perspectives of producers and processors to The Review. It recognises that these informed industry operators provide a range of practical insights, perceptions and expectations which represent critical considerations for the industry.

Ultimately, any application of new technologies, operating models or business relationships, will require decisions by many boards and companies. The Review therefore believes that direct and unfiltered views of boards and companies are an important input for considerations of these issues.

6.1. About EY Sweeney

EY Sweeney (formerly Sweeney Research) was founded in 1972 has grown to become one of the most prolific research firms in Australia. EY Sweeney is a full service research provider performing all forms of research including consumer usage and attitude studies, segmentation, new product development research and industry wide Business-to-Business research.

EY Sweeney has worked across all sectors and for a diverse range of and government clients, and been recognised for a range of Research Effectiveness and other global awards. In addition, it also regularly produces a series of prescient evidence-led Thought Leadership reports. Some of its more recent and high profile studies include smart cities, global consumer banking, Digital Australia and FinTech.

Since joining EY, EY Sweeney has conducted research in over 30 countries around the world. EY Sweeney research projects have covered diverse sectors including consumer preference studies across chicken, pork and red meat, rural finance and farm work practices.

EY Sweeney has also played a leading role in the development of 'stakeholder research', a methodology which gathers the insights and strategic perspectives of key stakeholders within specific sectors, by means of one-on-one, in-depth interviews. These dialogues identify then explore important issues, perceptions and expectations of stakeholders, leaving no stone unturned in order to articulate, explain and evidence their points of view.

EY Sweeney has performed over 40 senior stakeholder research projects in Australia and overseas for state and federal government, public and private companies, industry bodies and State owned enterprises, involving more than 1250 in-depth interviews with key stakeholders, including 250 interviews with CEOs.

The conclusions developed by these stakeholder research studies benefit from a carefully constructed and representative sample of informed, senior stakeholders and are evidenced by verbatim comments drawn from the conversations themselves. Unlike quantitative surveys which rely on asking large sample sizes quite simple questions, these interviews involve penetrating and detailed explorations of a representative group of stakeholders' points of view. Where quantitative research provides the 'weight of numbers', this qualitative research uses in-depth interviews, to unlock the meaning that sits behind the attitudes and behaviour of people. Deep insight and understanding which expresses stakeholders' perspectives, using their own words.

6.2. Areas of investigation

The study explored producer and processor perspectives on: OCM technology for use in beef (in particular), the proposed use of DEXA technology, confidence in DEXA to meet suggested benefits, proposed project funding and capital expenditure.

The overall areas of investigation for this study was to gather producer and processor perspectives on the following areas:

Perceptions and perspectives of OCM	Funding of the projects	Perceived suitability of DEXA technology for OCM	Industry appetite for DEXA technology in processing plants	Expected returns on investment
<ul style="list-style-type: none"> ▶ Perceived benefits of OCM technologies ▶ Relative perceptions of producers and processors 	<ul style="list-style-type: none"> ▶ Perspectives on funding options for the project 	<ul style="list-style-type: none"> ▶ Establish the level of industry need, for OCM ▶ Identify perceived effectiveness of the DEXA option ▶ Identify perceived match with the needs of the industry of the DEXA option 	<ul style="list-style-type: none"> ▶ Gauge industry's perceived benefits of and concerns with DEXA, ▶ Gauge industry's willingness to invest or pay for DEXA 	<ul style="list-style-type: none"> ▶ Establish the relative 'strategic priority' of DEXA as a capital project

6.3. Methodology

This study made use of qualitative research in the form of in-depth interviews with producers and processors. By design, qualitative research is used to gather rich insights and perspectives of respondents, the purpose of which is to speak with a cross section of industry participants to gather diverse points of view and to then summarise emerging themes.

As part of The Review, the interviews were conducted by telephone between March 8th and April 20th 2017, each lasted between 30 and 60 minutes. The details of which are illustrated in Table 5 below.

Table 5: List of producer and processor interviews

Interview respondent profile	# of interviews conducted
Producers Large (sell 50k+) p.a.	7
Producers Medium and small	4
Seedstock producers	6
Total # of Producers Interviewed	17
Processors Top 4	2
Processors 5 to 15	5
Processors 16 to 30	3
Processors 31 to 45	7
Processors 46 and smaller	3
Total # of Processors Interviewed	20
Total # of Interviews Conducted	37

Interviews were conducted with both producers and processors until it reached a point at which no new perspectives were being introduced in additional conversations. Overall, this concluded with a sample size of 17 producers (including several of the very largest) and 20 processors (representing over 80% of the industry's processing capacity). Of these groups, 5 producers and 5 processors were focused on sheep meat, while the remainder were focused on beef.

Industry bodies were invited to provide a list of members as candidates to be recruited for interview, however only AMPC provided a list of suggested interviewees. The rest were sourced by The Review team.

The findings presented in this section are substantiated by a range of direct quotes gathered during the extensive interview process.

6.4. Introduction to our findings from stakeholder interviews

The following six initial findings emerged from producers and processors that were interviewed as part of this study:

1. Almost all producers and processors of those interviewed are calling for pilot programs, generating reliable data, to take place before significant industry expenditure is undertaken. These pilot programs will demonstrate the technical and commercial impacts of DEXA and inform individual operator capital decisions
2. Confidence in DEXA to deliver suggested industry developments is only moderate among both producers and processors. The absence of a reliable knowledge base of trials, studies or data from the use of DEXA on cattle, has left confidence at moderate levels among both groups
3. Producers and processors view capital investment as a means to deliver their own business strategy and to activate their business model. Processors consider that industry investment programs of this type assume all operators need the same capital equipment, and share similar views about industry priorities, when in reality each processor is pursuing their own business model
4. Carcase grading and pricing has been an ongoing source of frustration to producers. This history has undermined their level of trust in processors and OCM technologies are often viewed as the solution to this frustration. This mistrust in manual grading is too widespread to be ignored, the industry cannot dismiss the problem, and it needs to address the problem
5. OCM technologies generally, are seen by producers as much-needed tools to increase the objectivity and transparency of carcase measurement. The benefits include accurate grading and valuation, enabling processors to optimise boning, helping producers to identify inefficient stock, informing breeding strategies and supporting the producers' pursuit of a value based marketing approach
6. While processors are concerned that DEXA technology will lead to producers pursuing yield over quality, producers are well trained in the importance of meat quality factors. They intend to use the accurate yield measurement from DEXA to complement their decision-making, not to redirect it. Producers expect DEXA will enable processors to optimise boning, potentially lifting the revenue from saleable meat to producers, and reducing the cost of processing

In summary

In summary, the initial findings of our engagement with the industry suggests there is a desire from producers and processors to see further evidence of DEXA technology being proven for beef in commercial operations. In addition to this, there is a call for greater visibility as to the proposed investment and associated benefits.

6.4.1. Finding #1: Industry-wide calls for a DEXA pilot program

Based on our consultations with both producers and processors there was a clear desire to see pilot programs using DEXA conducted before any significant capital is invested. They expect any investment, proposal or business case to be well supported by pilots, trials and data. The experience of both groups is that in their previous dealings with industry R&D bodies, proposals are invariably well-supported with detailed results and data outlining the actual performance of prototype equipment or new developments.

Both processors and producers acknowledge they have limited knowledge of the operational and commercial impact of DEXA technology, they consider a range of pilot programs would serve to fill this knowledge gap. In particular, producer confidence that DEXA will deliver on the many promises of OCM technology for beef, will likely be grown through successful trials and results. It was suggested that pilots would enable producers and processors to consider a DEXA investment based on reliable data, and to assess the extent to which DEXA technology will support their own business model.

"I think it could be a good program and I sort of like the idea, but not sure it is worth that sort of investment. Might be good to see it trialled small scale to see how it goes." – **Top 50 processor**

"We need trials, to run over 2 years, installed in larger plants and doing high volume numbers." – **Top 4 processor**

"Once we know what DEXA can do, a business can determine if DEXA supports their business model, and they may have a reason to invest." – **Top 35 processor**

"Perhaps four pilots as a priority: a pilot in each of the northern and southern regions focused on domestic markets and eating quality. Then two more focused on export markets and yield in each of the north and the south regions." – **Large producer and processor**

"We certainly need to see some evidence presented far more clearly, we need to see some results that show it will perform as indicated." – **Sheep producer**

"This is all new to me, we were supposed to see a presentation about this at recent MINTRAC conference for QA managers but it didn't happen for some reason." – **Top 30 processor**

These pilot trials would not only demonstrate the technical merits of DEXA to the industry, they would also address commercial concerns that the technology may not result in prices paid by processors to producers, accurately reflecting the 'value' of the meat and the carcass. A number of producers expressed a specific concern that while the DEXA technology may reveal the saleable red meat with greater accuracy, that information may be used to discount the price paid for their carcass. For this reason, the pilot programmes should also monitor the commercial impacts of DEXA in the real market place.

"If the processors do the right thing, premiums will be paid for higher yielding carcasses. What will more likely happen is they will use it to benchmark prices for the best and discount underperforming carcasses. The processors now pay the base rate for the best cattle and less for everything else." – **Seedstock producer**

"I have been to all our processors' plants but there are too many factors in the grids, between 10 and 20 measures. DEXA based 'saleable red meat yields' could become yet another tool or criteria for processors to discount the value of a carcass." – **Small producer**

"If OCM just measures yield characteristics and replaces graders we will not get a better outcome, it won't identify top quality carcasses by itself - it needs to be used in conjunction with current carcass measurements including quality measurements e.g. marbling, colour, fat depth etc....." – **Seedstock producer**

In summary

Both producers and processors want to see pilot programs using DEXA conducted before any significant capital is invested. They want to see if the technology actually works for the industry, on many fronts, including both operational and commercial. They expect any business case to be well supported by pilots, trials and data. Two processors of the 20 interviewed, indicated a willingness to conduct pilot programs at their facilities, as they anticipated that DEXA may be well suited to their respective business models.

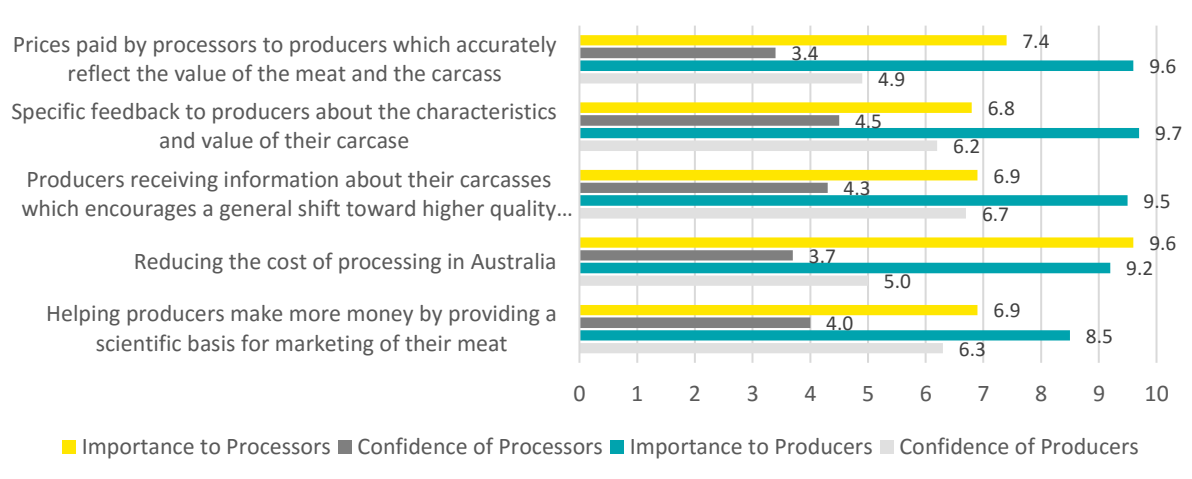
6.4.2. Finding #2: Moderate confidence in DEXA to deliver

Based on documentation provided to The Review and subsequent interviews, we understand that during the announcement of The Proposal, five 'industry developments' were foreshadowed to flow from the introduction of DEXA. The Review sought to understand producer and processor views on the importance of each of these industry developments, and to gauge their confidence that DEXA would actually deliver these industry developments.

To achieve this respondents were firstly asked to rate the importance of each industry development out of 10. Figure 11 below demonstrates that producers on average rated the importance of all five industry developments highly, between 8.5 and 9.7 out of 10. Processors on average rated the importance of the industry developments between 6.8 and 9.6 out of 10. Respondents were then asked to rate their confidence that DEXA would actually deliver these industry developments. Producers, on average rated their confidence that DEXA would actually deliver the industry developments, between 4.9 and 6.7 out of 10. Processors on average rated their confidence between 3.4 and 4.5 out of 10.

The responses from producers and processors were somewhat consistent, they scored the importance of the suggested 'Industry developments' highly, but scored their own confidence that DEXA would deliver these, significantly lower. Figure 11 identifies the industry developments with respective the level of importance and confidence demonstrated below.

Figure 11: DEXA related industry developments are important, but confidence significantly lower



Source: EY voice of the Industry

Both producers and processors indicated their knowledge of the performance of DEXA was low because they had no basis at this stage to be sufficiently confident of the technology.

"I haven't seen any studies, the industry is littered with failures, the cost of a mistake is great but I haven't seen any workings." – **Large producer**

"I have no confidence at all in DEXA until it is trialled in at least 2 abattoirs, it's got a long way to go." – **Top 4 processor**

In summary

Producers and processors currently seem to lack clarity in understanding how DEXA may meet industry needs.

6.4.3. Finding #3: Capital invested to deliver own business strategy

Producers and processors view capital investment as a very selective means to deliver their own business strategy and to activate their business model. Both producers and processors are actively scanning the industry for relevant technology solutions which work for their business. Ultimately their capital decisions are made based on robust business cases, consisting of reliable data about a project's value to their company and its customers.

"We compete in our business for capital based on payback and ROI." – **Top 4 processor**

"I have to put proposals to management, it's not likely to proceed unless it was a request from our customers." – **Top 30 processor**

"We are monitoring different systems around the world, we look at plants and visit trade shows, but at this point in time none of them meet the criteria for us." – **Top 5 processor**

As at the time the interviews were conducted, investment in DEXA technology was a capital priority for just two of the 20 processors interviewed. In the first case, it was a lamb processor that believed DEXA would enable them to get the most out of rack and loin yields, but that same processor also suggested that each processor should decide for themselves if it made sense to invest. The second processor intending to invest in DEXA was also a producer, they advocated a wide ranging pilot programme and intended to be part of early trials of DEXA.

"Only those that really want DEXA should do it. For us it will be for lambs." – **Top 35 processor**

"I am going to do it anyway, we are intending to invest at one site, we are happy to be a trial site."
– **Large producer and processor**

The remaining 18 processors interviewed expressed three common reasons they were not focused on spending capital on DEXA technology at this point in time: suitability to their business model and customers, industry priorities and more research required explaining DEXA capability and performance.

6.4.3.1. Business model and customers

A number processors did not perceive DEXA to match with their own business model, facilities or the demands of their target customers at this point in time.

"Each business is pursuing a particular business model, the idea that DEXA meets everyone's business model doesn't stack-up." - Top 4 processor

"I am not knocking the technology, I just think it needs more thought, grading things is one thing but you've got to have other facilities in place to fully utilise the technology." - Top 25 processor

"We have a grading system and MLA LDL data bases provide this insight for cents, not \$150m. Getting cost out is the priority." - Top 4 processor

"I don't really know exactly what it does but I don't think I've got customers at the moment that really want this. We already provide feedback and not many of them even look at the data we give them." - Top 40 processor

6.4.3.2. Industry priorities

A further group of processors including some producer/processors were not convinced that the DEXA investment proposed was the highest priority for the industry at this point in time. They considered other industry priorities to be more pressing.

"I think we can invest \$150m in many better things to improve returns for farmers and consumer end products e.g. working out better feeding regimes, finding better farm management techniques, manufacturing to provide greater range of products to consumers and enhance returns for both producers and processors." - Top 15 producer and processor

"Industry in general needs to find improvements, but I don't know if this is the right one." - Top 30 processor

"From an investment point of view what concerns me is that this could be a waste of money if we are not growing flock numbers. How can we encourage farmers to produce more stock (which declines every year) rather than this large investment in grading technology?" - Top 45 processor

"MLA is telling people that producers are demanding DEXA, but the MLA should take the same caution with capital that individual producers do. The beef industry backs some losers, if something is imposed it's doomed to failure." - Large producer

6.4.3.3. More research required

And, finally, a group waiting for available research and pilot results to be presented to the industry as a foundation to make fully informed decisions based on demonstrated operational and commercial performance of DEXA.

"I am not against the idea of using technology, just against the fact that there has not been enough thought put into this." - Top 5 processor

"I would like them to show us some research that shows why the DEXA system was chosen." - **Top 30 processor**

"No, we need hard data otherwise we will repeat the Future tech model." - **Top 4 processor**

"The industry is littered with investment failures, the cost of mistakes is very great. I haven't seen any workings on the returns so I have my reservations." - **Large producer**

In summary

Based on The Proposal inclusions both producers and processors are seeking clarity on; how this investment may impact (and be implemented) based upon business model, how it aligns with industry priorities and what evidence based research is available for consideration.

6.4.4. Finding #4: Carcase grading a source of producer frustration

Producers expressed a low level of confidence and trust in the manual grading of carcasses by processors. Many producers interviewed shared stories of how manual grading was leading to variable carcase valuations; how 'split mobs' of cattle were graded differently by different processors; and how processor grids were applied inconsistently depending on cattle supply.

"We have split 'mobs' and got vastly different results at different processors. At times there has been \$100 per head difference between processors." - **Large producer**

"Grids are the greatest rort of all time, when they are short of cattle they don't even use the grids, but when there is plenty around they will use the grids to knock down prices." - **Small to medium producer**

"Yes, it's a major concern that every processor has a different grading system - it's ridiculous because there is no uniform standard, they can grade however they want and the producer just has to cop that, we need industry wide conformity. Everything needs to be graded under the same system, quality is the most important consideration." - **Seedstock producer**

"We've had situations in the past when we had to challenge the grading and they were found to have been incorrectly graded and underpaid. I'm bloody sure that these mistakes are sometimes made deliberately, the processors underpaying producers to take more profit for themselves - a lot of that going on, we should have more independent graders in the processors." - **Seedstock producer**

This history has undermined the level of trust between many producers and processors with producers feeling financially exposed, particularly in drought conditions.

"Northern producers developed a hatred for processors during the drought, they believed that processors took advantage of the producer being forced to sell." - **Top 10 processor**

While a complete suite of OCM technologies to measure all attributes is considered ideal, some producers and processors do share relationships based on trust. They have established a basis for trading with greater confidence in carcase valuation.

"We don't deal with the Processors we don't trust, over time we now trust the abattoir we deal with, so we trust the system." - **Large Producer**

"We already operate another grading system to value a carcase, we operate an open door with producers, and they can come in and see how we grade their carcase. We conduct open days when producers come in and see how the system operates." - **Top 5 processor**

In summary

The historical mistrust of manual grading appears to remain widespread and a continued source of deep frustration for producers.

6.4.5. Finding #5: OCM tools increase objectivity and transparency

Producers seek OCM technologies which remove subjective human factors from carcass grading, valuation and feedback. Producer interviews identified five main benefits of OCM technologies:

1. In the short-term, OCM tools potentially enable processors to accurately value both the quality and quantity of saleable red meat in a carcass.

“OCM will take out subjective analysis of carcass.” - Seedstock producer

2. OCM tools should also ensure that the processor is sufficiently informed by images to optimise either automated or manual boning, for the greatest yield or value from the carcass.
3. In the medium term, some advanced OCM technologies may inform a producer about which of their herd is likely to be ‘inefficient’ and not worthy of an investment in continued feeding.

“I need to identify the inferior animals because the cost of feeding them when they have a poor conversion of energy to meat, is not worthwhile.” - Large producer

4. In the longer term, the factual insights emerging from the broad range of OCM tools will inform producers how to fine-tune their breeding strategies to increasingly improve the overall quality of their herd, based on what truly makes a carcass valuable.

“OCM will enable us to more accurately monitor and track back to parents, aiding genetic evaluations.” - Seedstock franchise

“It will help our breeding program to ensure we are producing the right product. We would be able to trace back to sires to ensure we are breeding for the market demands.” - Large seedstock producer

5. The progressive accumulation of sufficient insight to support the industry progressively transforming to a value based marketing approach.

“At the moment there is no value based marketing system in place, I am all for that happening and we have to get to a value based marketing approach in order to change the emphasis from commodity based, to reward for effort.” - Seedstock franchise

In summary

OCM technologies represent a range of benefits which are expected to increase the objectivity and transparency of carcass measurement and support producers' evolution to a value based marketing approach.

6.4.6. Finding #6: Concern DEXA will lead to producer pursuit of yield

Processors anticipate that the DEXA project will provide them with an accurate measure of meat yields and fat content, a smaller number would expect to use the DEXA imagery of the carcass for cutting and boning optimisation. However, processors expressed great concern that DEXA will lead to paying for yield over quality, and this is not a better outcome for consumers.

“Encouraging yield over quality does not necessarily mean better outcomes for producers or consumers.” - Large sheep producer and processor

“My concern is that using DEXA for robotic technology might be OK but using it as a measurement for payment has the potential to commoditise beef and lower the overall value of beef over time. It has the potential to move producers in the wrong direction e.g. towards yield and away from quality.” - Top 5 processor

“This may be a good approach for producers in northern areas where the focus is already on yield but is not the right approach for the southern industry as we are going for quality. It’s very dangerous to spend so much money on one trait across the whole country.” - Top 5 processor

The Review’s consultations explored processors’ concerns that DEXA will result in a race to ‘yield’ by producers. These concerns were not confirmed during interviews with producers themselves. While producers expect DEXA will provide much more accurate estimates of saleable red meat yield, they also recognise that the value of their carcass is determined by the ‘grids’ provided by processors. MSA attributes such as colour, marbling, pH, and bruising are all of great importance to the price they ultimately receive from the processor today. Producers considered this would not change.

Producers therefore consider that, in the medium to long-term, using this additional information wisely should lead to them conducting a more profitable producer business.

“Hopefully we might get paid a little more if we produce the right article” - Large producer

“The data would support making better on-farm decisions, it should mean we’d be able to make more money.” - Large producer

While producers expect OCM technologies generally offer promise to increase objectivity and transparency of carcass measurement, overcome carcass grading and pricing frustrations, potentially contribute to the fine tuning of breeding strategies and identify inefficient stock, they are not convinced DEXA delivers these benefits with beef. They welcome pilot programs to demonstrate any of these benefits. Producers do expect DEXA will enable processors to optimise boning, potentially lifting the revenue from saleable meat to producers, and reducing the cost of processing

In summary

Processors themselves will play an important role in maintaining the correct balance between meat quality and yield factors in the value grid for a carcass, in the event that DEXA technology plays a future role in OCM.

6.5. Working together and moving forward

Producers and processors have the potential to either work together or unilaterally. They share many common interests but also have the potential to disrupt one another. Industry members are calling for greater collaboration and consultation, to build the cohesiveness of the 'industry'. They are looking to their industry bodies to support consultative, informed and constructive progress.

"It's about time that processors and producers start working together. I pay a lot of levies and there seems to be a lot of money just wallowing around rather than being applied to industry improvements." - Top 15 processor and producer

"I don't understand it at all, I imagine there's a reasonable amount of resistance from processors. I only know it is an industry directive from industry body MLA." - Seedstock Franchise

"The announcement was made without consultation with industry and sounded like a mandate. I really don't know how it is supposed to be rolled out, it has not been properly researched or explained." - Top 5 processor

"I would suggest some sort of seminar to provide better understanding of this. I would also suggest a small scale trial before going ahead." - Top 30 Processor

Producers and processors consider pilots or trials are a more constructive approach to progress, and both are eager to collaborate to implement pilot programs. If industry trial programs have already yielded valuable and relevant insights, the careful communication of these outcomes will benefit the knowledge and confidence of the industry.

"We need to conduct the trials using an educational approach, which explains to all producers and processors how the technology is performing. It will get everyone on board sooner." - Large Producer

"We all need to be very open minded about this, there is generally not enough cooperation through our industry. Information needs to be more readily sharable and transferable." - Seedstock Franchise

"I'd like to be much better informed about this proposal & technology. Very surprised I have not heard about it before now. It's nice to be contacted and to be part of something like this for a change." - Seedstock Producer

"It's a disjointed industry reluctant to share, the parties need to discuss the potential benefits, then to volunteer collaboration. Then spending a small percentage of \$150m to prove the investment would be far better." - Large producer

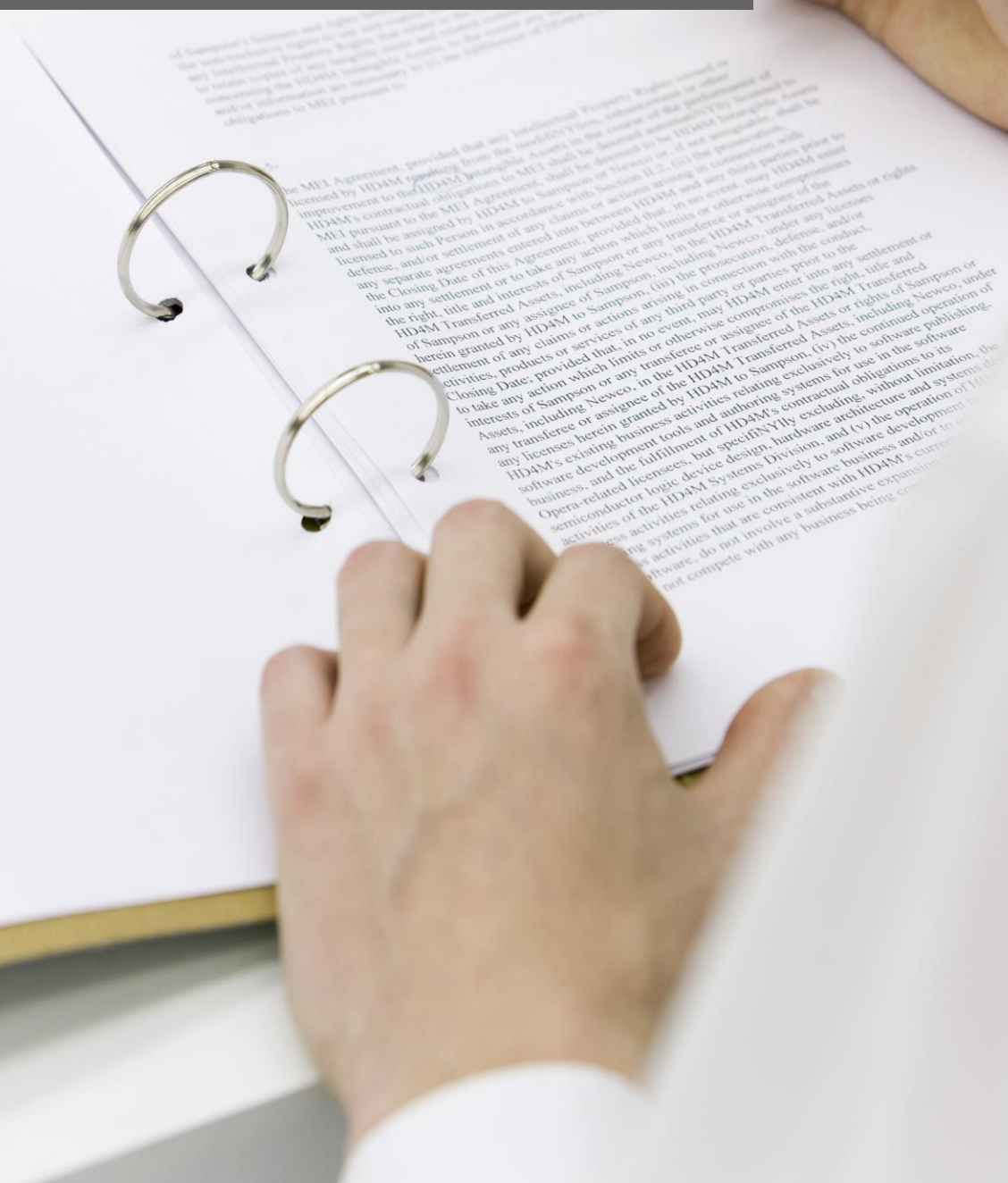
Conclusion - EY Sweeney stakeholder consultations

Producers and processors participating in The Review recognise the need for the industry to pursue a progressive approach. Many also consider cooperation a critical component of growth and success for the broader industry.

Producers and processors consider that trials would provide both parties with informed and credible insights into the merits and relevance of DEXA technology to individual businesses.

While many are scanning the international market for relevant technology, and a handful have decided DEXA is relevant to their business model, most considered a thorough assessment of DEXA technology, including DEXA pilot installations, would represent a constructive step forward for all involved.

7. The Review's insights and observations relating to the Terms of Reference



7. The Review’s insights and observations relating to the Terms of Reference

This section provides The Review’s insights and observations that have resulted from its industry consultation, documentation assessment and further independent research.

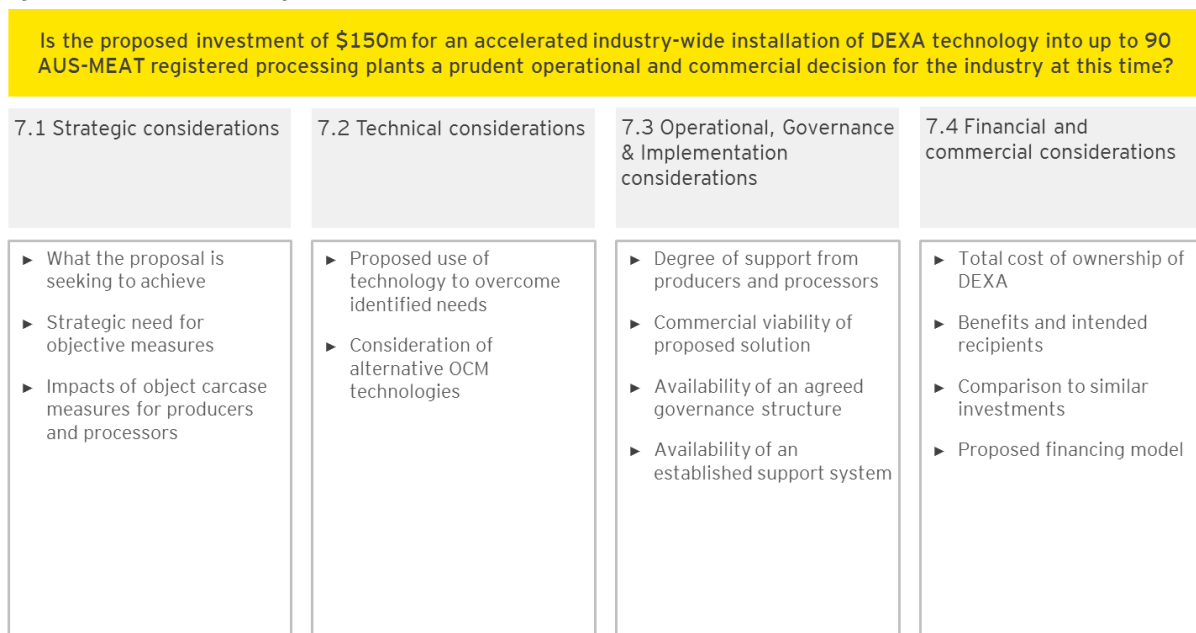
Since the 10 November 2016 announcement there has been further development of aspects contained within The Proposal, such as initial trials of DEXA for beef in one processing plant, key research being published, exploration of alternate funding arrangements, and announcements about funding the deployment of the technology to a number of processing plants. These developments have been examined and reflected in this report (where appropriate).

Pursuant to its Terms of Reference, this section sets out the key insights and observations relevant to the strategic, financial, technical, commercial, operational, governance and implementation aspects of what has been proposed. Please note that this section needs to be read as a whole, as some issues fall across or relate to more than one of the Terms of Reference.

The Review has structured its insights and observations on the key question of; *“Is the proposed investment of \$150m for an accelerated industry-wide installation of DEXA technology in up to 90 AUS-MEAT registered processing plants a prudent operational and commercial decision for the industry at this time”*.

Further details as to the overall structure of this section and subsections included within can be seen in Figure 12 below.

Figure 12: The Review’s insights and observations structure



Source: EY analysis

7.1. Strategic considerations

Pursuant to the Terms of Reference this section explores strategic considerations in relation to The Proposal. This includes an exploration of the key industry challenges of the Australian red meat and livestock industry and the relationship with those identified by The Proposal. In an effort to provide a holistic view of the strategic priorities of the industry The Review has leveraged the MISP 2020, strategic plans of key industry bodies, and industry consultations.

As noted previously, the industry is one of great importance to the Australian economy. With increasing global competition it must address productivity efficiencies to remain viable. The industry is also moving towards a value based approach to performance, attributing payment and pricing to value characteristics, with data playing an increasingly important role in the objectivity and transparency of these measures.

The need for greater objectivity in the industry has been openly expressed and is well documented. The importance of greater objectivity and accuracy in carcase grading is reflected in considerable investments in technology and solutions across the supply chain. It is also evident that objective measures are a priority for the industry.

7.1.1. What The Proposal is seeking to achieve

The Proposal that has been put forward is seeking to address the key issue of a lack of accuracy, objectivity and integrity of the carcase grading system. Additional benefits sought by The Proposal relate to industry-wide data that could potentially provide a benchmark for carcase characteristics and the enablement of automation. There is also the implication as to whether it could act to prevent or limit industry consolidation. A detailed overview of what is included within The Proposal can be seen in Section 5 of this Report.

The Review understands that the determinants of payments made to producers are a key driver of the lack of trust experienced by the industry. This has been explored in detail by the recent ACCC report²¹⁰ and reinforced through consultations undertaken as part of The Review.

In approaching an industry-wide investment, such as that contained within The Proposal, there is merit in clearly articulating what the initiative is seeking to achieve; which is typically achieved via a “problem statement”. A problem statement is a clear concise description of the issue(s) that need(s) to be addressed by a problem solving team. Although not described as such, The Review understands that the problem statement being advanced by The Proposal relates to:

- ▶ The accuracy and objectivity of carcase grading process (and subsequent pricing)
- ▶ Increased data sharing between producer and processor to better meet the needs of the market
- ▶ Processing efficiencies (and enabling of automation)

Consultations conducted across the industry have underlined that there is a broad level of support for objective measures. Despite industry agreement of the needs and benefits of objective measures, our consultations indicate that there is some confusion in the industry as to how, and indeed why, a specific technology has been proposed as the solution. A peak industry council noted that there is support to move an objective measures solution forward, however the question is whether DEXA is that solution. Further to this, it was also noted that while objective measures makes sense, The Proposal is lacking in a number of areas and has raised further questions that were explored throughout The Review²¹¹.

²¹⁰ ACCC Cattle and beef market study – Final report, 2017

²¹¹ Anecdotal comments provided to The Review via an Interview on 24 March 2017

The MISP 2020 has identified cultural change as a key challenge for the industry, which is a consideration as to how the industry could respond to the trust concerns identified within the industry.

7.1.2. Strategic needs for objective measures in the industry

The Proposal presents identified concerns of the industry regarding the objectivity and integrity of the current carcass grading process²¹²; specifically noting the 'distrust of the subjective approach that that determines the payment producers receive from the processors'²¹³.

In this context, The Review has explored these concerns in greater detail to understand the potential implications for the industry, and key drivers of the identified concerns and distrust from a strategic perspective.

As outlined in Section 2.5 of the Report, the industry is a complex one that is experiencing a number of global opportunities and trends that have resulted in the identification of six industry strategic risks²¹⁴. Critical to the future sustainability of the industry is its ability to respond to competition and market access, changing consumption patterns, climate change, social license to operate, regulatory environment and value chain integration²¹⁵. These risks lend themselves to vulnerabilities within the industry and have the potential to exacerbate the productivity challenge both on-farm and post farm-gate.

In support of progressing the industry, RMAC (with the support of major red meat and livestock co-investors including levy payers; Commonwealth, State and Territory Departments of Agriculture; CSIRO; the University sector and agribusiness) developed the *MISP 2020*²¹⁶; being the whole of industry strategy.

Looking towards 2030, the *MISP 2020* identified an industry challenge as 'driving efficiencies and integrity through the value chain'²¹⁷. As a market, the Australian red meat and livestock industry has built a reputation as a high-quality, safe, ethical and sustainable producer²¹⁸; a desirable position to which the industry is committed to retaining. The *MISP 2020* is the industry approach to achieve this. And, like all strategies, is looking to mitigate risks and capitalise on opportunities.

Key messages²¹⁹ of note from the *MISP 2020*, in the context of The Proposal, for the future of the industry include:

- ▶ Alignment of industry practices with consumer and community expectations (on-going commitment to objectivity and transparency in communication)
- ▶ Improvement of quality and integrity of industry products and systems
- ▶ Objective measures to transfer and drive product value and integrity
- ▶ Systems and policies to underpin pricing according to performance (value-based marketing as assessed by objective carcass measurement and assurance systems)

²¹² MLA Funding Proposal, accessed April 2017, pg.7

²¹³ MLA Funding Proposal, accessed April 2017, pg.7

²¹⁴ AMPC Strategic risks facing the Australian red meat industry, 2016, pg.9

²¹⁵ AMPC Strategic risks facing the Australian red meat industry, 2016, pg.9

²¹⁶ MISP 2020, 2015, pg.3

²¹⁷ MISP 2020, 2015, pg. 9

²¹⁸ MISP 2020, 2015, pg. 9

²¹⁹ MISP 2020, 2015, pg. 11

- ▶ Biggest non-economic challenge is cultural change (collaboration and transparency)

By examining the objectives contained within the *MISP 2020* pillars, and the associated priorities and imperatives, The Review recognises the importance of 'supply chain efficiency and integration across the industry'²²⁰. Key to this is the identification and development of industry systems that objectively measure key qualities and integrity specifications across the supply chain.

To monitor the achievement of this, there are key performance indicators (KPIs) contained within the 'supply chain efficiency and integrity' pillar. Upon evaluation, The Review notes that the KPIs appear to speak to the needs identified within The Proposal. These KPIs include²²¹:

- ▶ Tools to provide objective and accurate measurement of all key attributes included in the meat language
- ▶ Performance against key quality, yield and integrity attributes
- ▶ Accurate and timely industry wide statistical information, analysis and forecasts to facilitate optimal decision making

By way of satisfying The Review's assessment of industry wide strategic needs, an evaluation of RDC strategic plans was undertaken. Based upon this there were a number of similarities identified, including: clear alignment of pillars/objectives and priorities to *MISP 2020*; and strong presence of product quality, cost efficiency and system integrity within the pillar 'supply chain efficiency and integrity'.

The clear visibility of these priorities and the consistency represented across the industry is a positive sign for strategic alignment of key industry bodies. The Review commends the industry on formal strategic alignment on these key industry issues. Such strategic alignment will be critical in the industry moving forward in a collaborative and transparent manner. This is a goal that is supported by the industry as a whole and core to the *MISP 2020* and RDC strategic plans.

Conversely, there appears to be less representation in the *MISP 2020* and RDC strategic plans of dedicated priorities to address 'cultural change in the industry'. Identified in the *MISP 2020* as the biggest non-economic challenge facing the industry²²² the support in which to address it is less prominent. This may be an opportunity for the industry to explore alternate solutions to the issue of trust within the industry.

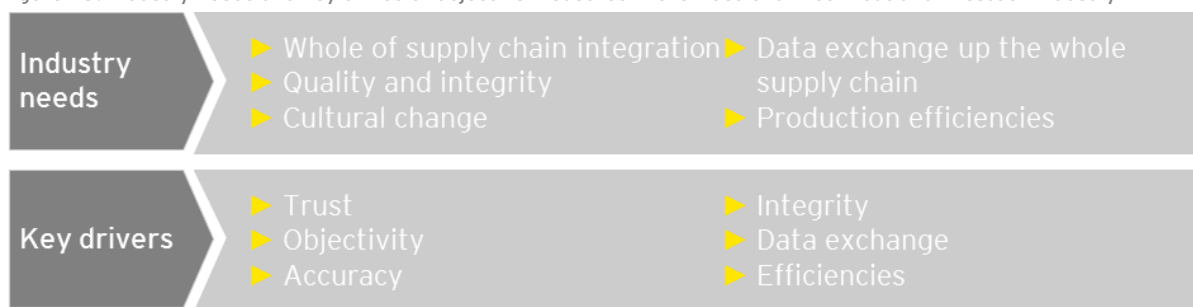
It is clear that the industry as a whole recognises and has prioritised industry needs within the respective strategic plans. The specific industry needs and drivers are depicted in Figure 13 below.

²²⁰ *MISP 2020*, 2015, pg. 22

²²¹ *MISP 2020*, 2015, pg. 23

²²² *MISP 2020*, 2015, pg. 12

Figure 13: Industry needs and key drives of objective measures in the Australian red meat and livestock industry



Source: EY analysis of MISP 2020 and industry strategic plans

In response to the needs and drivers of the industry as a whole, there is a clear direction for improvements in the grading of carcasses. There are a number of ways in which this may be achieved, including (but not limited to):

- ▶ Independent graders
- ▶ Improved training of existing manual processes
- ▶ New carcass grading techniques through technological advancements
- ▶ Cultural change in the industry
- ▶ Increase audit frequency
- ▶ Publication of audit results

As part of a decision as to how best to respond to industry needs, The Review notes the value in considering these alternatives to improve the current grading process. Our Review has highlighted the need to engage and provide transparency on the relative merits of these options to key stakeholders before committing to a major investment.

As The Proposal has focused its proposition towards 'new carcass grading techniques through technical advancements' The Review has explored these areas in greater detail, as outlined in the remainder of the Report.

Observation

There is recognition of the identified industry needs and support for objective measures, following trialling in a number of processing plants. However, greater clarity based on trialling on how DEXA performs as a solution, particularly for beef, is required.

Further consideration of cultural change solutions would likely drive increased trust between supply chain participants as an alternative to, or in addition to, investment in large technology solutions.

7.1.2.1. Long term sustainability and integrity of the Australian red meat and livestock industry

In support of identified industry issues and priorities, as outlined in Section 3.5, there are further long term sustainability considerations. This includes the integrity of systems, value based pricing and data sharing up and down the value chain.

The *MISP 2020*²²³ states:

“We must develop systems and policies to underpin the industry’s need to differentiate prices according to defined performance against key quality, yield and integrity attributes (value-based marketing), as assessed by objective measurement and assurance systems. These endeavours will support the industry to transition from price-averaging systems, and will require the support of whole-of-supply-chain electronic data exchange capability, with open and transparent access by all relevant parties.”

Based on documentation evaluated by The Review, it appears that, for the long term sustainability of the Australian red meat and livestock industry to be realised, the coordination of a number of aspects would be beneficial.

- ▶ **Integrity of systems** - By instilling rigor and objectivity into a systemised approach the industry there can improved product assurance and optimise cost efficiencies
- ▶ **Value based marketing** - Differentiation of pricing based on performance to key quality and integrity specifications²²⁴ will bring additional transparency
- ▶ **Data sharing up and down the value chain** - Enabling electronic data sharing across the whole of supply chain to better meet the needs of end markets

OCM and The Proposal would appear to be a reasonable proposition to explore, with some diligence and caution; seeking agreement amongst key industry stakeholders to have confidence in the commercial returns and there distribution. However, industry consultations conducted as part of The Review indicate that demand for this solution is mixed.

Evidence that alternative options and technologies have been adequately considered is low.

Observation

In consideration of the needs of the industry, the strategic alignment and the long term sustainability of the industry, The Review believes that OM is a valid means of addressing these, to the advancement of the industry as a whole. Further consideration should be given to alternative options.

²²³ MISP 2020, 2015, pg. 11

²²⁴ MISP 2020, 2015, pg. 24

7.1.3. Objective measures for industry participants

As discussed in Section 7.1.1, there is a clear need and industry support for the increased accuracy and transparency of the grading process. This is reinforced by the recent *ACCC Cattle and beef market study* that looked to examine the dynamics of the industry in greater detail; in response to concerns of anti-competitive conduct and market structures²²⁵.

The ACCC analysis revealed a number of matters relating to the issues that were at risk of damaging the transparency, competition and efficiency of the cattle and beef industry. Specifically, the ACCC noted shortcomings in the transparency of price reporting and carcass grading. Subsequent recommendations from the final report can be seen in Figure 14 below.

Figure 14: ACCC Cattle and beef market study - Final report recommendations



Source: ACCC Cattle and beef market study - Final report, 2017

The Review recognises the industry's need for objective measures, to which The Proposal is looking to implement one specific measure (LMY). Of specific note from the ACCC recommendations are; OCM should be prioritised, OCM data should be shared and carcass feedback and producer education should be clearer. LMY as a measure provides the industry with an objective and repeatable measure in which to understand the carcass composition (of meat, fat and bone) and ability to lift produce to meet market needs. Based on industry consultations undertaken within The Review, this appears to not be fully understood.

There is also consideration of a case for standardisation of the attributes of objective measures, to enable consistent sharing of data across the industry supply chain.

²²⁵ ACCC Cattle and beef market study - Final report, 2017, pg. 3

It is understood by The Review that objective measures include a variety of measures that can be grouped into three categories that reflect:

- ▶ Carcase composition e.g. LMY, SMY
- ▶ Consumer measures e.g. EQ, shelf life, human nutrition
- ▶ Animal health e.g. animal welfare, environmental factors

Based on a combination of these measures a carcase is derived to have a certain 'value'. Noting that this value is influenced by external factors, such as end market demand, and can influence the price paid for a carcase.

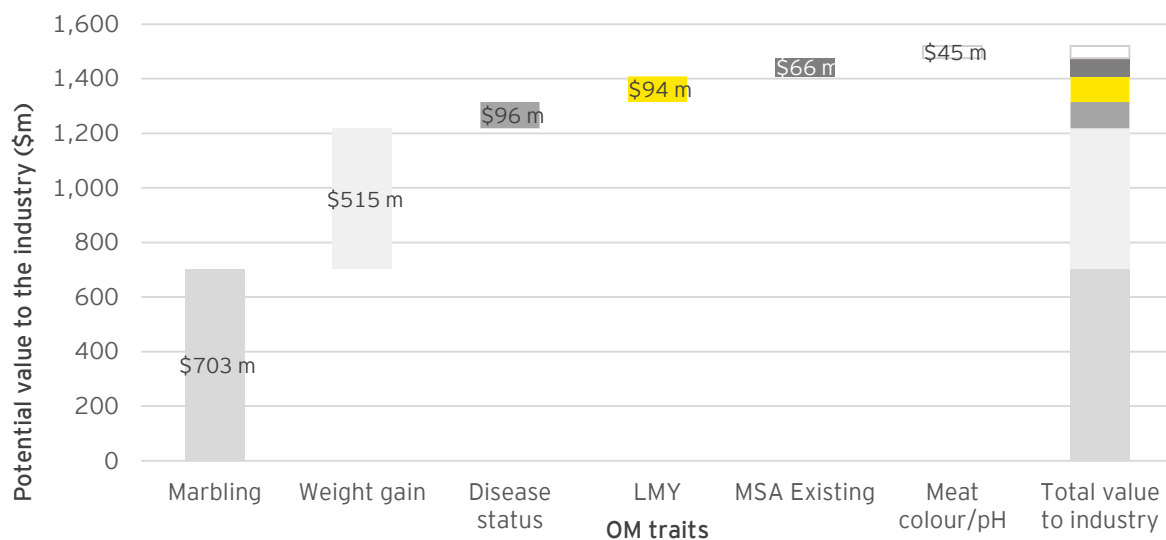
The 'value'²²⁶ placed on the various characteristics of a carcase is strongly influenced by the end market in which processors are providing products to. As such there are differing importance to industry stakeholders based on where they reside in the supply chain. The two primary stakeholders who are impacted by The Proposal are producers and processors.

Advice to The Review indicates that the value of OCM, particularly in relation to beef, includes:

- ▶ Improving transparency in cattle markets by publicly available and more simplified processor pricing grids. This will help producers with pricing signals in order to make more informed decisions about who to sell cattle to
- ▶ Improving over the hook transactions and grading

Based on research conducted into OCM²²⁷ for example, the value of OCM to the industry and improving accuracy of OCM, it is the understanding of The Review that, while there are a number of measurement improvements being explored (as illustrated in Figure 15), The Proposal has focused on LMY to meet the industry needs of increased accuracy of grading.

Figure 15: Potential maximum industry value of OM traits based on application of technology



Source: EY analysis of OM Strategy report²²⁸

²²⁶ Note that 'value' in this context is not the price paid for a carcase

²²⁷ Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders, Greenleaf, Miracle Dog and Scott Williams Consulting, 2017

²²⁸ EY contacted the authors of the OM Strategy report to seek their views on this analysis however no response had been received at the time of finalising this report.

As part of its assessment of the various objective measures for beef, The OM Strategy Report has noted that not every trait can currently be measured or predicted at the optimum or at all points in the supply chain. They have however, noted the inclusion of a list of traits that are known to be of most financial value as their selection of objective measures (as illustrated in Figure 16 below). However, The Review has not been able to ascertain the considerations that were involved in the selection of this particular list.

Figure 156: List of selected OM based of known value (dollar) importance



Source: EY analysis of OM Strategy Report²²⁹

Further to this, The Review undertook consultations in an effort to understand the broader priorities of the industry and why LMY has become the focus of The Proposal to improve carcase grading (further details on LMY has been articulated in Section 4.3 of the Report). Based on these consultations, and advice we received, it appears there are differing views on what measures would be the most benefit to the industry. There is agreement that carcase composition measures are the highest priority. Additionally, there appears to be a debate as to whether one measure or multiple measures should be improved; and, if multiple measures are to be applied, which ones?

With such a valuable dialogue occurring within and across the industry, this presents an opportunity to maintain the engagement in reaching an industry agreed way forward for objective measures. While the OM Strategy Report has identified a range of measures that will generate value to the industry, and indeed quantified the said value based on the use of technology, the case for investment in LMY as a priority over other measures has not been addressed: particularly in relation to the application of a specific technology as is the case with the proposed DEXA solution.

Observations

The level of understanding of OCM across the Australian red meat and livestock industry varies, with research bodies and key industry bodies engaged in seeking to advance this understanding, including the value of individual objective measures and the ways in which they can be prioritised based on their differing importance to supply chain participants.

Additional understanding on the impacts of The Proposal based on the various business models operating in the industry could be explored.

In consideration of the possible level of change for the industry, support for the 'industry as a whole' through this change will be an important contributor to any success, or failure.

²²⁹ EY contacted the authors of the OM Strategy report to seek their views on this analysis however no response had been received at the time of finalising this report.

7.1.4. Impacts of OCM for producers and processors

The Review has explored the areas of impact that OCM may have on stakeholders and the industry as a whole. These are discussed in further detail below.

7.1.4.1. Impacts to current grading process (trust)

As has been discussed throughout this Report, industry concerns pertaining to a lack of trust in the current grading process has been the cause of contention for many years, with a key driver of this being the prices being paid to producers for their products. This is primarily experienced by some producers who indicate that, with current methods, they lack visibility over the grading process and determinants of price.

The proposed installation of OCM technology would provide a mechanism in which to conduct standardised and repeatable grading with increased accuracy than the manual methods used today.

Based on The Proposal, OCM is positioned to provide a greater level of transparency that will be visible through data output (LMY) for producers and processors based on the product being received. Early research is showing that the proposed technology will increase the accuracy of carcass grading than current subjective methods. See Section 4.4 for more information on current research into LMY and the proposed technology solution.

The integrity of data and how it is maintained is required to support improvements in the grading process and trust in the industry. This will include the integrity of the supporting algorithm by any party who uses the technology solution posed.

7.1.4.2. Impacts to pricing

It is understood by The Review that, as the industry moves to greater transparency and accuracy, there is a market need to move towards a value based approach to performance. The recently published report *Development of supply chain objective measurement strategy & value proposition to stakeholders*²³⁰ outlined the contributing aspects to value based performance:

- ▶ Value Based Trading (VBT) - Transfer of ownership based on a set of measures that estimate the value of the product and are used to establish the transfer price
- ▶ Value Based Marketing (VBM) - Specifies the 'value' characteristics of the live animal prior to sale commitment and using these measures to offer the animal to prospective purchasers. The accuracy of live animal measurements in describing post-slaughter value will need to be accurate enough for VBM to substitute for VBP
- ▶ Value Based Pricing (VBP) - Process by which a buyer (e.g. processor) will pay a seller (e.g. producer) based on the specific 'value' characteristics of the carcass (or potentially the live animal in the future) after the commitment to sell has been made. Although price for different values is usually agreed prior to sale, the actual value of the product is unknown until after the commitment to sell/buy

With LMY being but one input into the overall value of a carcass, it is understood by The Review that there is little correlation of the impact of OCM installation on the direct uplift in prices paid for carcasses. The strategic intent of greater accuracy and objectivity is to develop the industry towards a value based performance approach to the industry.

It is important to note that pricing of a carcass is bespoke to each processor. Based on what has been communicated to The Review, processors have not determined how they will use LMY in the price in which they 'value' a carcass, as it is only one input measure. The most common view is that

²³⁰ Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders, Greenleaf, Miracle Dog and Scott Williams Consulting, 2017, pg. 13

LMY would be an incentive. Value, however, is crucial. There needs to be sufficient incentive to encourage investment by producers to modify herds. Further considerations relate to the seasonality of the industry i.e. limitation or excess of capacity and competition influences on prices.

Throughout the consultations undertaken by The Review, it became apparent that there is an opportunity to provide clarity as to the impact in which the proposed technology will have on carcass prices. One peak industry council²³¹ noted 'the technology, OCM and LMY is going to allow better alignment of performance to reward. It does not necessarily mean that producers will get paid more overall', however, another noted that the 'reality is that not all carcasses make profit. There will be some winners and some losers. Therefore, it is really a redistribution of payment'.

7.1.4.3. Impacts to herd development and long term modification

As identified in Section 4.3, the impact of increased accuracy of carcass grading will provide data on the characteristics of a carcass, which may be used for herd development. With the industry looking to maintain its position of quality and integrity in the global marketplace, there is the proposed intention to pursue long term herd modifications that can be applied based on the OCM data feedback.

While data feedback is noted within The Proposal to support the transparency of carcass grading, it also enables herds to be altered based on end market needs. It is anticipated that producers would be provided with data output specific to their herd to which decisions can be made relating to genetic make-up, feed and other management activities to better meet the specifications of processors.

This data output, and ability to make evidenced based decisions, could be a valuable asset to the industry. While herd development is a long term strategy, it is an enabler for the Australian red meat and livestock industry to continue to compete and drive quality on a global scale.

Although a subjectively attractive proposition, based on the information made available to The Review, it is unclear that there is a business case for herd development to support long term quality focused approach.

The OM Strategy Report notes there appears to be a high degree of diversity across producers with the assumption of maximum annual rate of genetic gain of 2% per generation²³². Through The Proposal, it has not been made clear as to whether it will focus on the largest producers to gain adoption needed.

7.1.4.4. Impacts to processing productivity

Processing efficiencies as a result of OCM has been explored in detail in Section 4.3.3 of this report. As The Proposal seeks to address industry concerns resulting to carcass grading, the impacts on processing productivity may result if investment in automation technology accompanies an installation.

The Review has assessed The Proposal (and the OM Strategy Report) in detail and it appears that, in order for a processor to fully realise the benefits posed, it is highly recommended that OCM be installed with accompanying automation. While it is not the primary purpose of The Proposal, it is certainly a consideration for processors based on their business model. The operational considerations are fully explored in Section 7.3, while a more detailed analysis of the benefits is provided in Section 7.4 of this Report.

²³¹ Anecdotal comments provided to The Review via an Interview on 27 March 2017

²³² Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders - Final report, May 2017, pg.69

7.1.4.5. Potential uses of industry data for R&D

OCM data can be used, as outlined within this Report, as an accurate and objective carcass grading measure. It potentially could also be used at an industry level for the betterment of the industry as a whole. As noted in the previous section, the industry is experiencing increasing pressures from global processors. As such, exploration of applications of OCM data for industry R&D may be a means in which Australia's red meat industry can continue to differentiate itself from international markets.

The Review has been advised that The Proposal would generate a globally unique data set for the Australian industry. However, the case for the creation of a R&D dataset has not yet been made beyond 'we don't know what we don't know'.²³³ The manner in which benefits from the commercialisation of the IP would be shared have not been resolved. There are potentially a range of claims to IP from producers, processors and peak representative bodies. The Review believes these are critical matters that should be resolved as a collective.

In The Review's discussions with international meat scientist specialists it was noted that the availability of a large industry database of objective measures would be a highly valuable asset to the industry. The question remains, however, as to whether there are any circumstances in which individual processors would be prepared to make available such data: as it will also be valuable to them in terms of their competitive positioning.

Further considerations to this include:

- ▶ Level of take up in the industry for this to be beneficial to the industry as a whole
- ▶ Standardisation of data - industry wide alignment required

7.1.4.6. Consumer benefits

As noted previously, the Australian red meat and livestock industry exports over 70% to international markets²³⁴. Known for its high quality produce, the industry faces increasing pressure to become more cost efficient. The OCM data output could potentially enable products to better match consumer preferences in domestic and international markets.

The Review has not been provided with evidence that The Proposal has considered consumer benefits. This may include:

- ▶ Potential improvements to cost through efficiency gains
- ▶ Potential consumer risk (as a result of being uninformed of the technology and safety measures)

Observations

The critical issue remains as to who should own any data derived from OCM technology, how it is utilised in commercial relationships between processors and producers, and whether industry-wide benchmarks can be established.

The use of, and needs for, industry data appear to be in the infancy of possibility. Industry wide collaboration will be essential to taking the issue forward, noting the competitive or commercial factors that will influence individual processors' decision-making on these issues.

²³³ Interview with MLA on 31 March 2017

²³⁴ ACCC Cattle and beef market study - Final report, 2017 pg. 7

7.2. Technical considerations

Pursuant to The Review's Terms of Reference, the purpose of this section is to outline the technical considerations relating to The Proposal, including the analyses of possible solutions to address the industry challenges/needs and opportunities (which have been outlined in Section 7.1).

Based on the experience of those involved in The Review, and when considering major proposals for the industry, the proposed investment bears many similarities to that of a government, infrastructure or technology investment. These similarities include (though not limited to); a staged rollout approach, large commitment of capital and far reaching impacts if the investment is to proceed.

For the purposes of this review, we have examined factors which could potentially be considered by these types of programs.

7.2.1. Proposed use of technology to overcome identified needs

As would be the case with a government, infrastructure or technology investment, there would likely be considerations made to a range of potential solutions in order to overcome the identified needs/challenges and opportunities. In the context of The Proposal, the process of considering possible solutions would likely identify whether an industry-wide technology solution is the most appropriate solution, or if other non-technology solutions such as improvements to the existing industry processes and methods could be considered.

Commonly used methodologies when considering investment opportunities firstly identify key strategic needs, with solutions (technological and non-technological) being identified last. For example, one of the objectives of The Proposal was to address concerns of producers where there is a specific distrust towards the accuracy and fairness of the carcass grading process. A possible alternate solution to the one posed may be to increase the frequency of grading audits and the publication of audit results (as recommended by the ACCC), or the possibility of auditors being employed by a third party. The Review is unable to determine whether these alternative options have been evaluated.

Further analysis of the results of research included in the Senate Inquiry²³⁵ found that those who raised the issues associated with grading systems and regulation, OCM as a solution was only raised three times in submissions by producers. Other solutions such as need for greater transparency, objective yield standards, a yield reporting website and mandatory price reporting could be considered related to OCM, but in other cases no solutions were identified.²³⁶

The following examples illustrate where the use of technology and data has been successfully applied to meet an identified need, to benefit an industry as a whole.

²³⁵ The Senate Inquiry was commenced in 2016 into the effect of market consolidation on the red meat processing sector.

²³⁶ Subjective Measurement as a Concern for Producers in Submissions to the Senate Inquiry on Consolidation in Beef Processing, SG Heilbron Economic & Policy Consulting, January 2017

Illustrative example #1: Smart Imaging Technology to improve food quality and safety

The global food industry is facing relentless pressure to drive production volumes ever higher, with improved quality and safety of food. While automation in food handling has driven significant production gains, costly recalls are all too frequent and waste is endemic. Food safety issues released to the public can be very damaging to a company's reputation and brand.

A Canadian imaging technology provider, is using in-line Smart Imaging technology with data analytics in a novel way to help ensure the food is safer, of higher quality and is produced with less waste. With the companies' **patented automated hyperspectral imaging systems**, food producers would be able to mitigate issues with subjective, error-prone visual inspection and time-consuming laboratory testing with an in-line, real-time solution.

The system scans the entire width of a conveyor belt at the same time. This leads to the collection of data regarding chemical signatures both of food and non-food product that in turn allows an analytical engine to differentiate types of foreign materials from types of food, as well as things related to food product quality.

This addresses limitations of X-ray, metal detectors and classic vision systems by combining knowledge of chemical signatures using optical and data analysis techniques.

Illustrative example #2: Impacts of technology on food processing industry

The development and adoption of new food processing technologies is a crucial factor for boosting the competitiveness of the food and beverage sector. With increase in demand, fragmentation of the industry and associated cost pressures, health concerns and limited produce shelf-life, the need for technology intervention is a necessity.

Food contamination

Problem: Food contamination calls for the need to innovate food preservation to guarantee an advanced level of consumer protection

Solution: Development of a new food processing technology based on High Pressure Processing (HPP) was initiated by a Spanish company called *Hiperbaric*. HPP allows the effective destruction of pathogens, whilst keeping key nutrients intact. It can be used to treat a wide range of substrates, from fruit juices to meat and dairy products. The effectiveness of this technology has resulted in the installation of over 100 *Hiperbaric* machines across 25 countries worldwide.

The data that is collected from the substrates is analysed to improve decontamination processes for different kinds of products.

Consumer health and sustainability awareness

Problem: Consumer health and sustainability awareness is pushing for alternative pasteurisation methods, which are able to extend food shelf life, while at the same time preserving the integrity of nutrients.-

Solution: The need for extension of product life while preserving nutrients has led to industry research on technology that uses non-thermal ways to pasteurise drinks and dairy products. *Elea*, a German company, manufactures and markets Pulsed Electric Field (PEF) technology for the food and beverage sectors.

PEF destroys pathogens by making their membranes permeable, a process known as electroporation. Exposure of the microorganism to a pulsed electric field punctures its membrane and killing the pathogen. This ensures the targeted and effective inactivation of bacteria, thus achieving pasteurisation of food products.

PEF achieves a significant increase in shelf life (up to 240%), as well as greater yields, energy savings and lower operational costs. In addition, since the process does not involve significant heating, pigments, vitamins and antioxidants are not damaged, and the food retains its sensorial and functional value. This technology has improved retailer margins by increasing shelf-life and reducing logistics (cold storage) costs. Data on changes to shelf-life based on product category has helped optimise the use of the technology to maximise returns.

The Proposal includes other solution components in addition to OCM technology, including proposed funding models and the optional application of DEXA within processing plants. These, along with other key elements of The Proposal are outlined in Section 4.

For an industry investment of this size, consideration of the various elements of The Proposal is recommended to understand the benefits and trade-offs for the different scenarios. For example, processors can elect where to install DEXA technology as part of The Proposal, offering the flexibility for individual processors to place the DEXA unit based on a business decision.

The Review supports The Proposal in enabling this business decision for processors, however the impacts of the location of DEXA installation within a processing plant, and the implications this may have on its use for the purposes of grading or automation requires broader consideration.

As part of the industry research outlined in Section 6, producers and processors raised concerns in relation to DEXA being an appropriate solution, and identified the need for analysis of alternative solutions to take place. In particular, a large processor agreed with the need to find improvements in the industry, but raised doubts as to whether DEXA is the right solution. Others had only moderate confidence that a large investment in grading technology is the most feasible option given the priority for driving cost out of the industry, and believe that the existing grading system and databases can be improved at a much smaller cost.

Additionally, producers and processors raised views that a capital investment is a selective means to deliver their own business strategy and to activate their business model. Both producers and processors are actively scanning the industry for relevant technology solutions which work for their business. The Proposal seeks to install an industry-wide technology solution, however in doing so, the benefits and trade-offs of a market-led adoption by processors versus an industry-led approach, would benefit from further consideration by the industry.

The Review notes that the establishment of the ALMTech project, outlined in Section 3.1, indicates a clear commitment from key industry bodies and the Australian government to invest in OCM and support in the benefits it can achieve. The ALMTech program established a clear timetable for these issues to be progressed.

The Review understands that, prior to the announcement of The Proposal, there was active engagement with a number of producers and processors, and a number of media articles were published communicating the potential investment of OCM technology in the industry. Additionally, industry workshops were held in which OCM technology was one of the key agenda items.

Despite The Review not having seen evidence of consideration of other possible solutions, this may have occurred prior to the development of The Proposal. Whilst there appears to be a strategic rationale for OCM in meeting various industry needs and opportunities, there are other possible solutions for consideration, including those which relate the use of technology, how it is introduced to the industry, and its subsequent application in processing plants, highlighting the benefits and trade-offs of each.

Furthermore, consultations with producers and processors suggest that (based on the information that they have available to them) a portion of the industry still remains unconvinced that a technology investment of this size is the right solution to meet the needs of the industry at this time.

In moving forward, more should be done to improve the industry's understanding of the alternatives available and their relative attractiveness.

Observation

The industry would benefit from better understanding the benefits and trade-offs for other possible solutions, including those which relate to the use of technology, how it is introduced to the industry and how it could be used in processing plants.

7.2.2. Consideration of alternative OCM technologies

The Proposal focuses on the 'installation of an industry-wide OCM technology' which is proposed to provide an accurate indication of LMY. Based on the understanding of The Review, MLA along with other supply chain participants including AMPC and processors, have invested significantly in OCM research and technology development for a number of years.

This has included developing technologies to measure carcass traits to predict bone cutting lines, LMY and EQ. Additionally, The Review has been provided with a considerable amount of documentation on OCM technologies, has consulted with various technology specialists, vendors, and processors who have deployed OCM technology, in order to understand the technology being proposed and applicable alternatives.

Figure 16 highlights the range of OCM technologies which can measure carcass composition and EQ based on the information which has been made available to The Review. These technologies are further outlined in Section 3.4, where the merits of each technology option are also discussed.

Figure 16: Technologies which measure carcass composition and eating quality

Carcass Composition technologies	Eating Quality technologies
1. Point measurements and yield equations	1. MSA Grading system
2. Ultrasound	2. Tendertec probe
3. Video Imaging Analysis (VIA)	3. Colorimeters and beef cam
4. DEXA	4. Slice shear force
5. Computer Axial Tomography (CT)	5. Near-infrared reflectance (NIR)
6. RGBD cameras	6. Imaging cut surface
	7. Other 'blue sky' technologies

Source: EY analysis consolidation from documentation and consultations with technical and industry specialists

In discussions with international researchers and meat specialists²³⁷, The Review notes there is support in the potential benefits of DEXA being introduced on the scale that is currently being proposed in Australia. R&D of DEXA has been occurring for a number of years in Canada, with researchers supportive of a similar proposal being introduced, believing it would improve overall Canadian meat industry by maximising LMY and minimising fat production for wastage.

²³⁷ Anecdotal comments provided to The Review via an Interview on 28 April 2017

Currently, there are whole of carcass camera systems and visual scanners such as those endorsed by the United States Department of Agriculture (USDA), which give a sound prediction of carcass yield, however they do not enable dual application for the purposes of robotic cutting. Furthermore, Video Imaging Analysis (VIA), which was prevalent in the Australia Red Meat Industry in the 1980's, was raised in discussions as a cost-effective although less-accurate alternative to DEXA²³⁸. However, The Review notes there is a lack of appetite in re-introducing this technology into the Australian industry. There have also been suggestions to integrate VIA with DEXA to provide more holistic view of a carcass with the ability to measure elements of eating quality²³⁹.

Based on the industry research outlined in Section 3.1, producers expect DEXA will provide much more accurate estimates of LMY, whilst also recognising that the value of their carcass is determined by the 'grids' provided by processors.

MSA attributes such as colour, marbling, pH and bruising are all of great importance to the price that producers ultimately receive from processors, and thus technologies which can also measure EQ are desired. These technologies have been outlined in detail in section 3.4.

In the prioritisation of technologies which measure EQ versus carcass composition, The Review notes that differing needs for accuracy exist. For example, the criteria for success of a new technology to predict EQ would likely need to exceed the current accuracy of the MSA grading system of 50-70%²⁴⁰. The accuracy of current measurement for carcass composition is approximately 30-40%²⁴¹ and thus there may exist a more pertinent need for technologies which have increased measurement accuracy of carcass yield.

The Review also understands that, based on the ALMTech project, technologies for the measurement of EQ are less advanced in R&D and suitable technology options are still being identified. Additionally, there is a view that one technology is unlikely to measure all aspects of EQ, and thus a mix of technology options are being considered.

Observations

To prioritise the range of OCM technologies for the Australian red meat and livestock industry, The Review believes that a clearly defined and robust criteria including performance, cost and ability, be deployed.

Should this criteria be developed, it will evidence how DEXA has come to be the preferred alternative based on its ability to meet the agreed criteria.

Throughout its consultations with specialists of OCM technologies, The Review has gained a broad understanding of the type of criteria which are relevant in assessing technology options. Specifically, these would likely include:

- ▶ **Software criteria:** which includes the requirements relating to the technology's ability to capture data and subsequently use it to predict objective carcass measures
- ▶ **Hardware criteria:** which includes the requirements relating to the technology's ability to operate in an abattoir environment and the associated costs

²³⁸ Anecdotal comments to The Review via an Interview on 4 April 2017

²³⁹ Anecdotal comments to The Review via submission on 12 May 2017

²⁴⁰ J.M. Thompson, 2016, Appendix C: Innovation in Carcass Yield and Eating Quality Measurement

²⁴¹ Johnson 1987, Perry et al 1993, and Thompson et al 2012 as cited by J.M. Thompson, 2016, Appendix C: Innovation in Carcass Yield and Eating Quality Measurement

Table 6 outlines example elements of the criteria in which to form a basis for OCM technology assessment relating to carcass composition and EQ. This is illustrative criteria and based on analysis and consolidation by The Review from documentation and consultations with technical and industry specialists. A more robust criteria based on requirements as prioritised by the industry is recommended to be developed. This may leverage the work being completed as part of the ALMTech project.

Table 6: Example criteria for evaluation of carcass composition and EQ technologies

Software criteria	
Measurement	The type of measure the technology solution can provide including carcass composition and eating quality measures (e.g. LMY, SMY, chemical lean, pH, meat tenderness) and how this integrates with other technologies and measures
Calibration data	The data the prediction equations uses for the purposes of training and assessment to predict objective carcass measures
Accuracy	The accuracy and precision of the prediction equations using statistical measures such as R2 and RMSE
Transportability	Prediction equations need to be transportable across a diverse range of genotypes, weights and compositions to support having a single standard across the industry
Hardware criteria	
Abattoir ready	The extent to which the technology is commercially developed and able to be implemented into an abattoir for use on smallstock and beef carcasses
Chain speed	The extent to which the technology solution can support existing processing chain speed. The average chain speed in the Australian beef industry is 12 carcasses per minute
Cost	The cost of the technology to implement in an abattoir inclusive of the technical unit and installation costs

Based on the example criteria in Table 6, The Review understands the proposed solution of DEXA to be one of the most advanced in meeting the technology requirements of the industry. Based on R&D results to date, the current known performance of DEXA is not only more accurate than current systems and calibrated using the 'gold standard' CT scanning, but is also proving to be transportable across datasets. A prototype is still being developed to test in a beef abattoir environment as further discussed in Section 4.4.2. These are early encouraging developments for the technology and its potential application in real life beef processing situations. However, as noted elsewhere, many industry participants are calling for more trialling to occur.

Observations

The development of a processor-defined criteria which prioritises requirements for, and allows for evaluation of, existing OCM technologies, would assist in providing evidence for the implementation of any technology investment, including DEXA.

7.3. Operational, governance and implementation considerations

Pursuant to The Review's Terms of Reference, this section outlines the operational, governance and implementation considerations relating to The Proposal. In particular, these considerations seek to explore the relative merits of The Proposal's advocacy for an accelerated industry-wide installation of DEXA technology into AUS-MEAT accredited meat processing facilities, which has been articulated in more detail in Section 4 above.

The Review has identified four key areas that we believe are necessary for the successful roll out of an industry-wide implementation of a new technology solution; and especially so when an accelerated roll-out is proposed. Specifically, these areas are the:

1. Transformational change; support from producers and processors
2. Commercial viability of the proposed solution
3. Availability of an agreed governance structure
4. Availability of an established support system

7.3.1. Transformational change; support from producers and processors

As mentioned in a media report on 4 April 2017, the Secretary of the Department of Agriculture and Water Resources, Daryl Quinlivan, has said that "the MLA deserved full credit for working up the DEXA proposal and putting it out there for the rest of the red meat industry to consider and work on". Mr Quinlivan is quoted as saying that The Proposal has aimed at proposing a solution that has the potential to build increased trust between red meat producers and processors through the provision of automated objective measures and independent data feedback on carcass quality and commercial yields. It is understood that the information standard will also help to stimulate and build the genetic quality of Australian sheep and cattle over time to significantly increase farm-gate returns and industry competitiveness.²⁴²

If fully adopted, The Proposal would represent a major transformation to the way the Australian red meat and livestock industry has conducted business for many decades. This would mean changes to the way data is utilised and communicated along the supply chain, transition to value based pricing in the long term as well as possible structural adjustments. As such, the level of change required within the industry is significant.

While it is widely agreed that managing major change in any industry or organisation can be challenging, there is little agreement on what factors most influence transformation initiatives. Accordingly to a study by the Harvard Business Review, it is understood that many change management renowned experts have focused on soft issues, such as; culture, leadership and motivation.

While they found that such elements are important for success, managing these aspects alone was not deemed sufficient to implement successful transformation projects. The study believed that there also needs to be an equal focus on hard factors, which bear three distinct characteristics; namely that organisations are able to measure them in direct or indirect ways, can easily communicate their importance, both within and outside their organisations and that they are capable of influencing those elements quickly.

²⁴² "Quinlivan: perfect could be enemy of common good for DEXA", Farm Online (April 4th, 2017)

Some of the 'hard' factors that affect a transformation initiative are the time necessary to complete it, the number of people required to execute it, and the financial results that intended actions are expected to achieve. Research shows that change projects fail to get off the ground when organisations neglect the hard factors. This does not mean that executives can ignore the soft elements; however, if organisations do not pay attention to the hard issues first, transformation programs will break down before the soft elements come into play.²⁴³

As illustrated in detail in Sections 5 and 6, the feedback from our engagement with the various industry bodies, producers and processors has demonstrated that while there is a some acceptance of some aspects of The Proposal, there is only a moderate level of confidence at this point in the specific technology solution being able to deliver the suggested industry developments due to the absence of a reliable knowledge base of trials. Almost all of the producers and processors that we directly interviewed have called for pilot programs, generating reliable data, to take place before significant industry expenditure is undertaken. These pilot programs are expected to provide evidence about the technical and commercial impacts of DEXA and inform the capital decisions of individual operators.

On 22 May 2017, the MLA announced that they would invest up to \$10m to co-fund the installation of DEXA objective measurement systems in four red meat processing facilities. Under the project, the MLA is expected to work with willing partners to develop a single scientific measurement of LMY - and systems to collect and use data across supply chains for future R&D in genetics, animal health and husbandry, processing automation and other productivity improvements on and off farm.

In response to this, AMIC has welcomed the commercial investment with three²⁴⁴ of its members; all of which are sheepmeat processors. One of which, a fee-for-service processor with a longstanding contract with a major supermarket, noted that their DEXA implementation is part of a \$4m upgrade, including robotics. This was said to be part of their plan to provide the best feedback to livestock producers and better quality meat to the customer.²⁴⁵ This investment appears to exceed the estimated \$1.45m contained in The Proposal but appears to be more reflective of the total cost required for processors when automation is included; a necessary requirement to improve overall efficiency and reduce processing costs.

AMIC has been stated to endorse the undertaking of this process through commercial arrangements between interested processing companies and the MDC. Its Chairman also noted that the funding of the system is 'actually individual processor company investments, matched by the Australian Government, through the MDC, and not via producer levy funding through the MLA. This shows the processing sector is committed to technology in this sector'²⁴⁶.

Observations

The Proposal is bold and ambitious. However, all the necessary inputs and its specific impacts to the producers, processors and wider industry have yet to be fully considered. The Review believes that a significant amount of industry wide change management and stakeholder engagement is necessary such that all stakeholders are clear on the potential implications, not only for the broader industry but for their specific businesses as well.

²⁴³ The Hard Side of Change Management, HBR (October 2005)

²⁴⁴ The fourth processor identified as part of the project is not a member of AMIC

²⁴⁵ Installation of new x-ray technology in abattoirs replaced with smaller trial in face of industry rejection, ABC Rural (May 22, 2017)

²⁴⁶ MLA approves \$10m for DEXA installations, Beef Central (May 22, 2017)

7.3.2. The viability of the proposed solution; and the ALMTech initiative

As detailed in Section 3 above, there have been a range of OCM technology solutions that have been invested in and researched by the industry over the last decade; the ALMTech project providing the most current governance arrangements for this. These various technologies each have their relative merits and are at varying degrees of maturity and commercial viability for use in the red meat industry for both lamb and beef.

The ALMTech project was established in 2016 under the Commonwealth Government's Rural R&D for Profit program to enable beef, sheep and pig farmers to have access to more accurate descriptions of the key attributes that influence the value of their livestock including: carcass lean meat yield; eating quality; and compliance to market specifications.

The project consists of a number of programs and sub-programs which are articulated in greater detail in Section 4.1. Of particular relevance, is sub-program 1.2: 'Design prototype technology for the direct measurement of LMY in an abattoir', that specifically relates to The Proposal to install DEXA in processing facilities, the installation costs and timelines of DEXA is noted to rely heavily on the synergy with existing automation, especially in the case of lamb. For beef processing however, where the degree of automation is currently low, this would not be as simple as that of lamb where there is currently greater automation, including the use of x-ray technology.

In the case of beef, it is understood that there would be a need to build a prototype DEXA system to calibrate and test processing factors that includes carcass temperature, spray chilling, and carcass orientation during scanning etc. A "pre-engineering" phase would also be necessary to test dual hardware DEXA arrangement that will utilise two X-ray sources detected by a "sandwich" dual energy detector. The dual hardware design presents a number of challenges - particularly with respect to image analysis and acquisition from two potentially "over-lapping" images.

The MLA Donor Company's 2015-16 annual report noted several achievements in the ongoing proof of concept of using DEXA to measure LMY, including:

- ▶ The validation of DEXA to provide high-accuracy prediction (85% relative to CT) of LMY for sheep. 3D-camera imaging has been developed to positive proof-of-concept to predict LMY in sheep and beef carcasses
- ▶ DEXA lamb carcass LMY prediction was demonstrated at a processing facility improving measurement accuracy to 85%, compared to CT scanning²⁴⁷

It is generally known that DEXA technology has been used to measure LMY in sheep carcasses in New Zealand for a number of years before being implemented in Australia. This has primarily been led by a New Zealand based engineering company specialising in designing and making automated production lines, and which has developed a DEXA system, which uses x-ray technology to measure meat, fat and bone in sheep carcasses.

Their version of the technology emerged from a project to develop robots to work in meat cutting rooms. There was a need to identify the correct and optimum place for the robots to cut the carcass and about 12 years ago they investigated ultra sound and CT scanners but found x-ray technology to be the best. Initially, the system revealed only weight apportion but following further work they refined DEXA to differentiate meat from fat and bone and made it applicable for use on lambs.

²⁴⁷ MLA Donor Company 2015-16 annual report

However, it was also noted that its use in beef was less advanced than in lamb (which has required 12 years of research, trials and testing). The first full system would be installed in an Australian plant later this year as part of a long-term strategy to increase automation in beef processing plants.²⁴⁸

On 1 May 2017, it was reported that a major Australian processor unveiled a DEXA system designed to lift returns to the producers at one of their feedlots. The technology was developed during the past three years by the same New Zealand engineering company, in association with Meat and Livestock Australia, industry and research institutes.²⁴⁹ As noted above, the processor also noted that they plan to install a commercial DEXA unit at one of their facilities in August this year that is expected to scan every side of beef processed, at a chain speed of about 160 carcasses per hour.²⁵⁰

Observations

It has yet to be proven that DEXA as an objective measurement technology is currently a viable solution for beef; specifically in its ability to objectively measure carcasses of all characteristics at line speeds.

Given this, and given the transformative implications of this technology, The Review believes that it would be prudent for the wider industry to delay final decision making until all the current research activities and trials have been completed and the resulting data analysed and publicly communicated and explained, (including through expert peer-review techniques).

²⁴⁸ Bag scanner to help meat grading, Farmers Weekly (February 8th 2017)

²⁴⁹ Producer workshop a 'must do', The Land (May 2nd 2017)

²⁵⁰ DEXA demystified beef producer day, Farm Online (May 1st 2017)

7.3.3. The availability of an agreed governance structure

As described in detail in Section 4 above, The Proposal envisages for the voluntary installation of DEXA technology in up to 90 AUS-MEAT registered processing facilities. The Proposal thereafter, recognised that calibration of each DEXA unit is required at installation and periodically, to maintain accuracy and consistency across the industry; vital to underpinning objective lean meat yield data and carcase pricing.

The Proposal also suggests that this auditing function be carried out by AUS-MEAT, similar to current randomised auditing of manual grading. Funding of AUS-MEAT DEXA audits is expected to be redirected from current funding of the manual grading audit function. AUS-MEAT was deemed to be best placed to carry out the audit function as it is jointly owned by processors and producers; thereby being able to establish a sense of trust between the two groups.

The recent ACCC Cattle and Beef Market study noted concerns about aspects of the grading system: specifically stating that although there is a detailed training and oversight system administered by AUS-MEAT, a conflict of interest remains during the process of grading carcasses at abattoirs. Existing audit systems do not appear to give many producers faith in the integrity of the process, and there is no industry wide standard for dispute resolution.²⁵¹

The study also acknowledges that the quality assurance process for grading carcasses to AUS-MEAT and MSA standards is rigorous, and AUS-MEAT's audits and training of chiller assessors (graders) lessen the risks of unfair grading. However, it ultimately notes that there is still potential for conflicts of interest in the trimming and grading process, because AUS-MEAT's audits of grading in individual plants are infrequent.²⁵² Amongst the series of recommendations put forward by ACCC Cattle and Beef Market study, it specifically recommended that:

1. RMAC should develop a uniform and independent complaints and dispute resolution process
2. Carcase grading audits should be strengthened by:
 - ▶ Increased communication and education about the process by AUS-MEAT and processors
 - ▶ Increasing the number of random AUS-MEAT audits of grading results and standard trim
 - ▶ Publication of audit results relating to grading and standard trim

The Review notes that greater clarity is required on aspects pertaining to the data that would be generated from the use of DEXA technology including but not limited to the following:

- ▶ Development and calibration of data sets suitable for industry-wide use for all red meat types
- ▶ Its use for commercial R&D which would require collective negotiation of data ownership and IP
- ▶ Transmission protocols across various participants (producers and processors) across the value chain in terms of format, encryption standards etc.

²⁵¹ ACCC Cattle and beef market study - Final report, 2017, pg. 4

²⁵² ACCC Cattle and beef market study - Final report, 2017, pg. 9

While The Proposal does note that the producers will have ‘uncontested claims’ to the data that will be collected through the DEXA system²⁵³, further clarification is required about whom would be the sole owners of the data from an IP standpoint, and how the monetary returns from the commercialisation of the data would benefit the various industry stakeholders.

The level of complexity and management surrounding both the use of the proposed DEXA technology in processing facilities and the ownership and use of the accompanying data produced, necessitates a significant level of structured oversight and governance. Hence, the need for a governance structure to manage and guide major projects cannot be overemphasised. Many instances have been witnessed where lack of a governance structure has delayed successful implementation of new initiatives.

One example is the importance of industry level governance in the water industry of OECD countries²⁵⁴, where a high degree of complexity, given the multiplicity of actors, motivations and stakes raises crucial considerations for effective governance²⁵⁵. This has resulted in misaligned objectives and poor management of interactions between stakeholders. Specifically, the lack of industry governance at multiple levels (including basin, municipal, regional, national and international levels). This has resulted in institutional and territorial fragmentation, unclear roles and responsibilities and a misalignment in resource allocation.

An example from the Australian public sector (as illustrated below), highlights where the perceived lack of effective governance mechanism was seen to be a contributing factor in realisation of results that were below expectations. A result the Integrated Healthcare System worked on reforming its governance model to improve its efficiency.

Illustrative Example: Integrated Healthcare System

In 2009, Australia's National Health and Hospitals Reform Commission laid the blueprint for Australia's health care future. It observed that *“each level of government formulates policy in relation to its own responsibilities, not necessarily taking account of the health system as a whole”, and that “current governance arrangements are contributing directly to weaknesses in the quality, effectiveness and efficiency of the Australian health system.”*

As a result, by 2012, Australia's first National Primary Health Care Strategy established a network of 61 primary health care organisations, Medicare Locals (MLs), across Australia. While the strategy stated that MLs “will be an integral component of the National Health and Hospitals Network” and “have some common governance membership with the Local Hospital Networks [LHNs] in their region”, an **integrated governance model was never developed**.

In 2013, there were attempts to correct this deviation from what was originally proposed through the establishment of an integrated oversight committee of federal, state, ML and LHNs. While there have been improvements, **the fundamental issues regarding the lack of industry-wide integration still persists**. This indicates the sheer scale and complexity that is inherent in an interconnected industry; nevertheless there **should be continued efforts to move towards greater industry-wide collaboration and integration**.

As is the case with any industry, a dedicated industry-based group is required to align resources, prioritise actions to achieve goals and meet challenges as and when they arise. This holds true in the situation of OCM deployment as well.

²⁵³ MLA Funding Proposal, accessed April 2017, pg.7

²⁵⁴ Water Governance in OECD Countries - a multi-level approach

²⁵⁵ Organisation for Economic Co-operation and Development, 2011

The Review acknowledges the proposed governance structure framework discussed in the recently released, OM Strategy Report. It articulates the need for various leadership and OCM technology committees necessary to provide the anticipated structure and governance required for the application of OCM technology.

One of the key recommendations from this report was the formation of an OCM Adoption Group (OMAG) that is expected to “focus industry activities on outcomes that enable adoption of OM and related value-based transactions for increased value across the red meat supply chain”.²⁵⁶

The OMAG is noted to be constituted of three sub-groups as described in Table 7 below.

Table 7: OMAG constituent sub-groups

Sub-Group	Constituent Members	Proposed Responsibilities
Leadership	Industry leaders representing all sectors of the value chain across the Australia Red Meat Industry	Focus on adoption of OCM and related value-based transactions and decision support with a view to maintaining industry adoption momentum.
Industry Think Tank	Commercial sector participants, researchers and solution providers	Focus on commercial adoption of solutions and mitigations of obstacles, if any
Standards Technical Group	Independent group of individuals with no specific material interest in the Australia Red Meat Industry	Focus on building and maintaining standards and registers for application of OCM technology measurements, and providing advice, information and guidance on a range of technical measurements and technology development activities to encourage industry adoption and confidence.

As a part of its proposed role, the OMAG would work towards:

- ▶ Prioritising research and development of objective technologies and enabling capabilities for commercial use by certain timeframes
- ▶ Crafting ongoing integration of aforementioned activities along with Value Based Trading (VBT) to bring about strategic alignment
- ▶ Providing strategic leadership around emerging issues as they relate to OCMs and VBT that could impact industry competitiveness and profitability

While the report articulates a high level a plan to govern the commercialisation of OCM technologies (described above), it is yet to be established, have its membership agreed or terms of references confirmed.

In addition and as previously described in Sections 3.1 and 7.3.2 above, the ALMTech project has established a governance structure, to ensure activities are executed in a timely manner within the guidelines of the ALMTech operational plan²⁵⁷. The structure is comprised of the three committees:

- ▶ Steering Committee - provides strategic directions and monitors the project and it is expected to ensure that the project is on-track to achieve its outcomes²⁵⁸
- ▶ Executive Committee - responsible for delivering outputs as specified in the annual Operational Plan²⁵⁹

²⁵⁶ Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders, pg. 52

²⁵⁷ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.6

²⁵⁸ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.9

²⁵⁹ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.7

- ▶ Progress Review and Intellectual Property and Commercialisation Committee - acts an independent committee to review and provide input into the project. It also operates as a stakeholder/reference group²⁶⁰

In these three separate initiatives (i.e. The Proposal, OM Strategy Report and the ALMTech project), the importance of having clear governance structures are well stated. However, The Review notes that there has yet to be a single agreed governance structure or framework to govern the requirements set out in The Proposal. Furthermore, the existing ALMTech and proposed OMAG governance structures, if leveraged, would need to be bolstered to support large scale implementation of objective technologies. This would include, though no limited to, an established tendering process for suppliers, and transparency and industry involvement in vendor selection.

Hence, The Review believes that for a successful acceleration of the installation of DEXA technology in processing facilities as proposed in The Proposal, a functional and robust governance structure is needed to be agreed and established with transparent protocols governing ownership of data and its use before the adoption process is initiated.

Observations

The level of complexity and management surrounding both the use of the proposed DEXA technology, and the ownership and use of the accompanying data produced, necessitates a significant level of structured oversight and governance. This would require the additional capability to support not just research and development of technologies, but their subsequent roll out to the industry, including ensuring that value for money is achieved.

²⁶⁰ Advanced measurement technologies for globally competitive Australian meat - Project Governance, 2016, pg.8

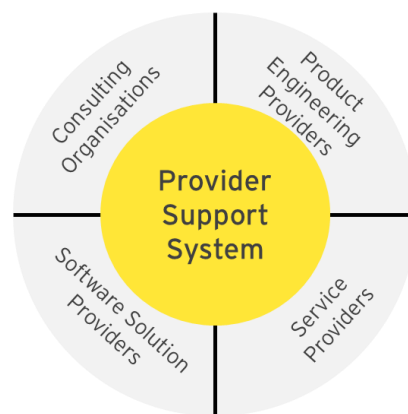
7.3.4. The availability of an established provider support system

The Proposal anticipates that an accelerated deployment of DEXA technology within the AUS-MEAT processing facilities (in the short term) would reduce the manual and subjective process related to grading and form part of the facilities' internal process flow. For the adoption of the proposed solution to be successful, an established provider support system is critical.

7.3.4.1. The importance of a provider support system

A provider support system is a network of companies that collectively has the necessary technical and operational experience required to support an organisation to deliver its services, enable better efficiencies as well as enable business critical actionable insight. This can be accomplished via the provision of a mix of tools, technology solutions and consulting services. A typical provider ecosystem is illustrated in Figure 17 below.

Figure 17: Illustrative provider support system



Source: EY analysis

A possible provider support system would typically constitute:

1. **Consulting organisations** - support producers and processors, in particular to provide insights into the trends and disruptions within an industry and providing actionable insights on markets, customers, regulations and competition
2. **Product engineering providers** - conduct research, development and fabrication of technologies that would form the crux of solution innovation
3. **Software solution providers** - management of the IT infrastructure to help seamlessly deliver and support the solution
4. **Service providers** - involved in supporting the product or service through its lifecycle (e.g. manufacturing, sub-contracting, maintenance and repair)

Collectively, this provider support system would bring in industry experts who can provide business critical actionable insights to cater to the needs of the core industry they serve.

7.3.4.2. The availability of a provider network for the proposed DEXA solution

The Review has been unable to evidence from either The Proposal or associated documentation provided that demonstrates either the existence of, or the plans for, a provider support system to support installation, maintenance and ongoing operations of the proposed solution.

As previously noted in Section 4, The Proposal states that a tender process would be undertaken to determine OCM technology suppliers and installation partners should The Proposal be successfully funded. The Review understands that currently, however, there is just one service provider in Australia which has been involved in various trials and installations with several processor organisations; and thus is deemed the most equipped to deliver the required solution.

The Review believes that this presents several challenges, namely:

- ▶ Possible lack of scale by the supplier to meet the needs of the industry (i.e. the proposal to install DEXA technology in up to 90 AUS-MEAT registered processing facilities) and with limited capable suppliers, creates a potential risk to The Proposal if the supplier faces difficulties to deliver at scale
- ▶ Is there IT infrastructure support (both hardware, and software) to manage, encrypt, transmit and analyse (calibrate and gather insights for industry wide use) the data that would be produced as a result of running DEXA the processing plants?

In light of the current position, The Review believes that it would be prudent to work towards establishing a provider support system to support both producers and processors that choose to adopt the proposed solution as articulated in The Proposal. For industry-wide technology vendors and providers, a tendering process would need to be established and governed under relevant committees, to ensure the selection of vendors is in line with key criteria, (including the ability to deliver at scale as well as support the use of Australian suppliers where this is mandated (such as when purchasing with the use of Government funds)).

The role of a provider support system has been historically demonstrated as critical to any new technology introduction across industries. The illustration below discusses one such support system that has supported the automotive industry adapt to changes in regulations (need to lower emissions and look for greener transportation solutions) as well as to successfully adopt new technologies.

Illustration: Impact of Provider Ecosystem on the Automotive Sector

Provider ecosystem and its impact in new technology adoption is aptly demonstrated in the introduction of **electric vehicles** in the automotive sector -

- ▶ *Consulting organisations* specialising in the automotive sector analysed trends in the industry around regulations (emission reduction standards), state of the market (alternative greener transport mechanisms like hybrids and potential business case for switching to new technologies, market acceptance of disruptive technologies) etc.
- ▶ The battery manufacturers (*product engineering providers*) invested in R&D and engineered power systems that are lightweight and powerful enough to drive vehicles. Similarly, propulsion sub-system manufacturers devised techniques to move from traditional combustion engines to battery led power trains
- ▶ *Software solution providers* updated software used on vehicles to meet new requirements mandated by change in power train, regulatory mandates on security of electric vehicles etc.
- ▶ *Service providers* such as spare parts manufacturers and maintenance personnel re-aligned their production and support capabilities to meet the new product's introduction across its lifecycle

Observations

The availability of a provider support system or network is necessary to provide business critical insights to support DEXA implementation (e.g., IT hardware infrastructure, DEXA equipment suppliers, installers and maintenance personnel). A tendering process would need to be established under governance committees.

7.4. Financial and commercial considerations

Pursuant to The Review's Terms of Reference, this section outlines financial and commercial considerations relating to The Proposal. In particular, these considerations include an assessment of the proposed financial performance and funding options when compared to similar capital investments. The Review has analysed the potential total lifecycle costs and benefits associated with The Proposal in order to arrive at a Benefits-Cost Ratio (BCR), which is a consistently applied metric throughout the Australian red meat and livestock industry for capital investments.

7.4.1. Total cost of ownership of DEXA

The purpose of this section is to substantiate the potential BCR cost inputs relating to, and contained within, The Proposal. The Review has explored the nature and, where possible, validated the volume and magnitude of the identified cost. Where The Review has been unable to validate costs, or further clarification is required, we have outlined a number of possible next steps for AMPC and AMIC should they wish to take this forward.

The Review has been provided with an outline of The Proposal's cost estimates, as specified in the 10 November 2016 announcement. Interviews conducted with MLA confirmed that these cost estimates only relate to the purchase and installation of the DEXA units for up to 90 processing plants. The Review also notes that this cost is based on an initial estimate only and a full cost scoping will occur if The Proposal is accepted, in principle, by willing processing participants.

In the experience of The Review, the proposed investment bears many similarities to that of an infrastructure or government investment. For example, these include (though not limited to), a staged rollout approach, large commitment of capital and far reaching impacts if the investment is to proceed. As such, we would anticipate the criteria for assessing The Proposal's costs and benefits to be consistent with that of an infrastructure or government investment assessment framework.

For the purpose of The Review we have examined The Proposal's cost completeness and accuracy with reference to accepted practices²⁶¹.

Based on the principles within these frameworks, The Review would anticipate seeing capital expenditure and operating expenditure estimates using robust and consistent methods²⁶². A base cost would incorporate all capital and ongoing expenditure, including maintenance and decommissioning costs. Any residual asset values and asset disposal values would also be included in this calculation²⁶³.

The base case will provide a clear distinction between fixed, variable, semi-variable and step costs for the purpose of providing categorised expense types and aid sensitivity analysis as outlined in Table 8 below.

The application of sensitivity analysis is a key element of the risk assessment process. Sensitivity analyses are used to predict the cost or benefit outcome given a certain range of variables. The purpose of the sensitivity analysis is to acknowledge that there is always a degree of uncertainty, and ultimately risk, surrounding an initiative and to test the impact of changes in the assumption on the measures of economic worth²⁶⁴. Furthermore, costs needs to be calculated in 'present value'

²⁶¹ In particular the review has used the Infrastructure Australia (IA) investment assessment framework and The United Kingdom (UK) Treasury Department's 'Green Book' for Appraisal and Evaluation of planned investments by Central Government agencies. Both frameworks include a comprehensive list of cost and benefit considerations when appraising potential infrastructure investments, which provide a robust and objective basis for assessing The Proposal's costs.

²⁶² Infrastructure Australia Assessment Framework, 2016, page 36

²⁶³ Infrastructure Australia Assessment Framework, 2016, pg. 31

²⁶⁴ Infrastructure Australia Assessment Framework, 2016, page 44

terms, allowing comparison of initiatives with costs and benefits that vary over time²⁶⁵.

Table 8: Cost categories

Cost category	Description
Fixed	Fixed costs remain constant over wide ranges of activity for a specified time period
Variable	Variable costs vary according to the volume of activity (for example, external training costs)
Semi-variable	Semi-variable costs include both a fixed and variable component (maintenance is an example, where there is usually a set planned program, and a responsive regime whose costs vary in proportion to activity, i.e. the number of call-outs)
Step	Semi-fixed, or step costs, are fixed for a given level of activity but they eventually increase by a given amount at some critical point

Based on interviews conducted with MLA and in conjunction with information provided in The Proposal, The Review has only been able to validate some of the expected capital and operating costs. However, The Review is appreciative of the transparency that was able to be provided. In consideration of this, we encourage AMPC, AMIC and the industry to engage in further discussions around what are the probable cost impacts of accepting The Proposal and include these considerations in a full benefits-cost analysis.

Partial verification of unit and installation costs was possible as a result of consultation with a technology vendor. The vendor noted the cost estimate for the purchase and installation of the carcass unit was approximately \$1m for the small DEXA units for sheep and goats, and approximately \$2m for the large DEXA to be used for beef. This is broadly consistent with The Proposal's average cost of purchase and installation of the DEXA unit. However The Review notes that these cost estimates are based on advice from only one provider.

Further clarification as to whether the small and large DEXA unit costs are based on individually negotiated costs or a discounted rate based on adoption rates included in The Proposal. Due to the unique nature of the technology there is insufficient comparable market prices to accurately benchmark the purchase and installation costs. We recommend that AMPC and AMIC, in conjunction with the industry, engage with a variety of OM technology vendors to understand whether the proposed price per DEXA unit is deemed to be fair and reasonable.

Furthermore, there are a number of costs not considered by the Proposal when assessed against either of the investment frameworks. These costs have been specified in Table 9 as cost exclusions or noted as 'not specified'. The Review was provided with cost estimates and therefore have been unable to validate the reasonableness of the volume or magnitude. We recommend that AMPC and AMIC, in conjunction with other peak industry councils, investigate the magnitude and volume of these potential costs discussed below.

The cost of plant modification and integration costs will vary depending on a processors' intended application of DEXA for either automation or grading. The Review has not assessed the magnitude of the cost, though, based on interviews conducted with a number of large processors, we believe the industry needs to consider the potential material impact on the planned BCR. For example, processors will need to integrate the DEXA unit with cutting systems in order to realise increased processing efficiency and benefits in where there are associated costs. Based on interviews conducted with MLA the estimated cost of the automated cutting equipment is \$4-5m²⁶⁶. It is important to note that The Proposal is focused on applying DEXA for the purposes of improved

²⁶⁵ Infrastructure Australia Assessment Framework, 2016, pg. 18

²⁶⁶ Interview conducted on 24 March 2017

grading only.

Interviews conducted with MLA on 31 March 2017 indicated that operating costs (hardware and software) and maintenance costs could be divided into three broad categories as illustrated in Table 9 below. The Review has not been able to validate these cost estimates with processors.

Table 9: Operating and maintenance costs

Cost type	Cost category	Description
Maintenance	Long term replacement costs	Relates to the cost of replacing the x-ray light bulb. MLA have stated their estimated cost is \$10,000- \$30,000 and expect that the failure rate will be lower than that of x-ray machines in the medical industry given that the DEXA machine will not have to be turned on and off for each scanning procedure, increasing the longevity of the machine. MLA have also noted that there have been no failures in the SEXA sheep industry machines in the last 8 years.
Maintenance	Carcase conveyer belt costs	Relates to the additional impact on the carcass conveyer belt in the DEXA scanning room. MLA have estimated the cost to be approximately 0.5% additional cost on top of existing conveyer belt maintenance costs.
Operating (hardware)	Electricity costs	MLA estimates that the additional cost of operating the DEXA unit will be \$100 weekly cost for large processing plants.

During consultation with processors it became apparent that individual plants were unable to accurately estimate the cost given their limited knowledge on DEXA and how it would be applied. The Review believes that AMPC should work with key industry players to confirm the full extent of these operating and maintenance costs and ensure they are factored into the benefit-cost analysis.

As noted in The Proposal, The Review understands that processors will operate and maintain the DEXA unit, while the ownership is retained by MLA. Under such an arrangement individual terms and conditions may be applied, in which The Review cannot attribute any additional costs associated with the proposed ownership structure. The Review also notes that these terms are considered carefully by processors choosing to partake in The Proposal, if electing to use DEXA to enable automated boning which will require an additional investment of approximately \$4-5m²⁶⁷. Ultimately, the impact these agreements will have on the sharing of costs and benefits for processors will need to be investigated.

²⁶⁷ Figure estimated for additional lamb automation technology as at Interview conducted with MLA on 24 March 2017

Other costs, where evidence could not be obtained to substantiate costs in The Proposal, include those relating to:

- ▶ Auditing the DEXA units accuracy and calibration by AUS-MEAT²⁶⁸
- ▶ Training staff in using the DEXA machine
- ▶ Overall program governance costs
- ▶ Program management office
- ▶ Employment of program and project managers
- ▶ Decommissioning costs at the end of the DEXA lifecycle

Furthermore, The Review has been unable to obtain evidence to indicate a robust probabilistic risk based analysis or discounting of costs to present value was performed.

For those costs estimated, The Review has been unable to obtain sufficient information to substantiate their accuracy and completeness. To be able to undertake a complete BCR assessment the full set of DEXA lifecycle costs need to be estimated, validated and be subjected to probabilistic risk based analysis performed.

Observation

Further information should be developed in the consideration of cost areas, including, though not limited to the:

- ▶ Range of negotiated prices from OM technology vendors per DEXA unit
- ▶ Considerations on economies of scale for DEXA units if wide-scale adoption
- ▶ Discount costs to present values when performing cost analysis
- ▶ Plant modification and additional costs to integrate DEXA with internal systems
- ▶ Additional costs of AUS-MEAT auditing the DEXA units accuracy and calibration consistency
- ▶ Additional operating costs (hardware and software)
- ▶ Additional maintenance costs in consultation with processors
- ▶ Training and knowledge management, and decommissioning costs

²⁶⁸ MLA Announcement, 10 November 2016

7.4.2. Benefits and intended recipients

The purpose of this section is to assess the accuracy and completeness of the potential BCR benefit inputs relating to and contained within The Proposal. The Review has only focused on assessing the cumulative incremental benefits of the accelerated adoption scenario (herein referred to as 'the benefits', 'benefit' or 'benefits'), as accelerated adoption is a definitive factor of The Proposal. Where sufficient information has been provided to The Review, analysis has been performed to substantiate the volume and magnitude of the benefit. The outcomes of this assessment has enabled The Review to form a view on the accuracy and completeness of estimated benefits and propose next steps for AMPC, AMIC, and the industry to move forward.

The Review has been provided with The Proposal's benefits of \$910m by 2026. MLA have indicated that The Proposal's benefit values have been derived from the benefit calculations included in the OM Strategy Report²⁶⁹. We have had the opportunity to discuss the benefit calculations with one of the authors of this report from Greenleaf Enterprises, which has been of great assistance in helping us to gain a better understanding of the calculations.

Based on this understanding gained and review of the OM Strategy Report, The Review's focus in this section has been to:

- ▶ Reconcile, where possible, the estimated incremental benefits of an accelerated adoption between the OM Strategy Report and The Proposal
- ▶ Assess the completeness of the benefit calculation methodology outlined in the OM Strategy Report against existing investment assessment frameworks
- ▶ Substantiate the key benefit calculation inputs and assumption outlined in the OM Strategy Report

Reconciliation of the OM Strategy and 'The Proposal'

Based on interviews conducted with Greenleaf Enterprises²⁷⁰, The Review understands that The Proposal's estimated benefits have likely been derived from the potential 2020 benefit scenarios 1, 2, 5 and 6 in the OM Strategy. The Review has been unable to reconcile these benefit scenarios to the \$130m in annual benefits outlined in The Proposal. The OM Strategy report and The Proposal benefits do not reconcile, as the OM strategy was commissioned to measure benefits of OM technology more broadly. Based on our understanding the OM Strategy does not focus on a specific technology, rather focuses on the value which can be derived from OM through various methods and technologies. Greenleaf Enterprises have not been able to reconcile the two reports though they have acknowledged it may be possible with MLA assistance.

Completeness of the benefit calculation methodology in the OM Strategy

Based on this acknowledgement and the assumption that benefit values in the two reports can be reconciled, The Review has focused on understanding the calculation methodologies, inputs and assumptions for each relevant benefit scenario and comparing these methodologies for reasonableness against specified investment frameworks. As the OM Strategy was only made publicly available on 8 May 2017, The Review has not had sufficient time to perform a detailed analysis of the benefits between that date and the release date of this report.

The Review has examined The Proposal's benefit valuation and accuracy with reference to The United Kingdom (UK) Treasury Department's 'Green Book' for Appraisal and Evaluation of planned

²⁶⁹ The OM strategy refers to the 'Development of supply chain objective measurement (OM) strategy and value proposition to stakeholders' report prepared by Greenleaf Enterprises, Miracle Dog and Scott Williams consulting.

²⁷⁰ Greenleaf Enterprises is the one of the authors of the 'Development of supply chain objective measurement (OM) strategy & value proposition to stakeholders', 2017 report

investments by Central Government agencies, and the Infrastructure Australia (IA) investment assessment framework. Neither investment framework explicitly recommends a calculation methodology though does specify that any methodologies, used should be supported by compelling evidence and details about the assumptions should be clearly stated²⁷¹.

The IA framework notes that it is likely that a difference between planned and actual benefits will exist, due to biases unwittingly inherent in the appraisal, and risks and uncertainties that materialise. As a result, appraisers need to calculate an expected value of all risks for each option, and consider how exposed each option is to future uncertainty²⁷². In addition, the need for sensitivity analysis should always be considered, and, in practice, dispensed with only in exceptional cases²⁷³. Furthermore, the proponents of a selected investment need to articulate the costs associated with benefits realisation²⁷⁴.

The OM Strategy Report benefit calculation formulas follow a three step process to determine the estimated value for each scenario²⁷⁵:

- ▶ **Step 1: Calculate maximum benefits:** this value represents the absolute total benefits that can be derived for each scenario. For scenario 1 and 2, it assumes that OM technology is 100% accurate and each animal derives the maximum annual genetic gains²⁷⁶. For scenario 5, it assumes 100% of boning labour reductions and 100% of boning room throughput improvement rates are achieved. For scenario 6, it assumes the full uplift in saleable meat yield is achieved
- ▶ **Step 2: Calculate potential benefits:** this value represents the maximum benefits adjusted for a technology accuracy percentage²⁷⁷ and an estimated magnitude of change factor²⁷⁸. The potential benefits assume 100% adoption of the technology. In scenarios 5 and 6, the estimated magnitude of change factor does not apply. Scenario 5 includes a factor that measures the percentage of the supply chain that have the flexibility to make different fabrication options
- ▶ **Step 3: Calculate likely benefits:** this value represents the potential benefits adjusted for expected market adoption rates²⁷⁹ of OM technology

The Review has assessed that the calculation formulas for benefit scenarios 1, 2, 5 and 6 are all clearly stated and calculation inputs meet the minimum expectation of the IA and Greenbook investment frameworks. Though, as noted above, The Review has been unable to assess the accuracy and completeness of the detailed calculations. The Review suggests that AMPC and MLA work together to clarify the reliability and accuracy of the detailed calculations within this economic model.

²⁷¹ Infrastructure Australia Assessment Framework, 2016, pg. 31

²⁷² The Green Book - Appraisal and Evaluation in Central Government, 2016 , pg.29

²⁷³ The Green Book - Appraisal and Evaluation in Central Government, 2016, pg. 30

²⁷⁴ Infrastructure Australia Assessment Framework, 2016, pg. 18

²⁷⁵ Development of supply chain objective measurement (OM) strategy and value proposition to stakeholders, Greenleaf Enterprises, Miracle Dog and Scott Williams consulting, 2016, pg. 19-21, 26-27, 36-39

²⁷⁶ Greenleaf Enterprises have noted that the maximum benefit value is highly unlikely to occur as it is expected that maximum genetic yield and 100% accuracy in OM technology is improbable over both the short and long term

²⁷⁷ Based on the measuring accuracy of currently available OM technologies that are either currently available or expected to be available by 2020.

²⁷⁸ Measures the estimated degree of change possible in the live animals meat composition prior to slaughter based on data feedback from the OM technology

²⁷⁹ Represents expected rates of adoption for OM technology. Based on interviews conducted with Greenleaf Enterprises, these percentages have been formulated from discussions with processors, producers, feedlotter and seedstock farms in the industry

Key benefit calculation inputs and assumption outlined in the OM Strategy

The Review has only analysed the key model inputs²⁸⁰ underpinning the potential and likely benefit scenarios, which include adoption rates, magnitude of change, technology accuracy percentage and supply chain flexibility factors. The Review's analysis of these inputs have been listed in Table 10 .

Table 10: Key inputs applicable to likely and potential benefit scenarios

Input	Description	Applicable scenario ²⁸¹				The Review's assessment of the accuracy and completeness of the input
		S1	S2	S5	S6	
Adoption rates	Represents the estimated percentage of industry that will use the OM technology. Greenleaf Enterprises have estimated the market based adoption rates based on interviews conducted with large processors, seed stock farms and producers that constitute a large proportion ²⁸² of carcass production nationally. The adoption rates used in the potential benefit calculations assumes 100% of industry will uptake the specified OM technology.	Y	Y	Y	Y	Greenleaf Enterprises have indicated that the incremental benefit of the accelerated adoption rate is determined by the difference between a 100% adoption rate and market based adoption rate in steps 2 and 3 of the calculation formulas, respectively. As The Proposal has derived the estimated benefit from the potential benefit calculation scenarios, it implies the accelerated DEXA technology adoption rate is close to, or exactly, 100% of national carcass production capacity. The Review has not been provided with sufficient information to validate that the 90 AUS-MEAT plants constitute close to 100% of carcass processing capacity in Australia. A change in the market based or 100% adoption rate scenarios are likely to materially impact the cumulative benefit associated with accelerated adoption. The Review recommends substantiating the market based adoption rate in further discussions with industry and validating the accuracy of the accelerated DEXA adoption rate.
Magnitude of change	Measures the estimated degree of change possible in the live animal's meat composition prior to slaughter based on data feedback from the OM technology. For example, the magnitude of change is highest in the live animal sector because management can be made to deliver to market specifications before the animal is sold ²⁸³ .	Y	Y	N	N	The Review has not reviewed the magnitude of change percentage. It is recommended that a full review of the accuracy of the magnitude of change percentage is undertaken for the placement of DEXA in the processing plants prior to concluding on the financial performance of The Proposal.

²⁸⁰ The Review's assessment has only analysed the key model inputs that are probable to have a material impact on the estimated benefit values

²⁸¹ S1 is Scenario 1 - Increasing LMY but maintaining EQ, S2 is Scenario 2 - Increasing LMY but maintaining pH, S3 is Scenario 5 - Optimise livestock purchased to market specification and S6 is Scenario 4 - Fabrication of purchased livestock to optimise value

²⁸² Based on interviews conducted with Greenleaf Enterprises, the processors interviewed constitute approximately 60% of the processing capacity nationally

²⁸³ Development of supply chain objective measurement (OM) strategy and value proposition to stakeholders, Greenleaf Enterprises, Miracle Dog and Scott Williams consulting, 2016, pg. 22

Input	Description	Applicable scenario ²⁸¹				The Review's assessment of the accuracy and completeness of the input
		S1	S2	S5	S6	
Technology Accuracy	Represents the measurement accuracy of the of specific meat traits such as LMY and EQ.	Y	Y	Y	Y	The Review has not reviewed the technology accuracy percentage. It has been noted that the 30% accuracy rate ²⁸⁴ applied for DEXA technology is lower than recent test results for lamb, while measurement accuracy in beef is still being tested. A higher accuracy is likely to increase the benefit value for the likely and potential benefit scenarios. The Review recommends a full review of the technology accuracy for beef prior to concluding on the financial performance of The Proposal.
Reliable environment factor	The OM Strategy has noted that the scenario 1 benefits only applies to 60% of beef production. This is because it is estimated that only 60% of beef are derived from areas where reliable environment and access to a range of markets make an optimised mix of quality and yield. This combination is predicted to be the most profitable output for the supply chain ²⁸⁵ .	Y	N	N	N	This Review has not reviewed the accuracy of this assertion, though recommends further analysis to substantiate that 60% of beef production is derived from reliable environments. A high reliable environment percentage for beef will increase the potential benefit estimate.

The Review has noted that the above stated benefit scenario formulas have been modelled using sensitivity and risk analysis in a Monte Carlo simulation. Monte Carlo is a risk modelling technique that presents both the range, as well as the expected value, of the collective impact of various risks. It is useful when there are many variables with significant uncertainties²⁸⁶. The Review has not reviewed the accuracy and completeness of the Monte Carlo calculation methodology due to the above mentioned time limitations. Though The Review has reviewed the risks considered in Monte Carlo simulation and assessed if all risks, that are likely to have a material impact on benefit realisation, have been included.

Potential risks of failure of a DEXA unit in a processing facilities

One of the risks considered by The Review, and not included in the Monte Carlo simulation²⁸⁷, is the risk that a failure of the DEXA unit may result in the temporary shutdown of a processing plant. Regardless of whether the unit is being applied for the purposes of grading or automation, all carcasses will need to pass through DEXA unit and therefore the unit becomes a single point of failure²⁸⁸. As a result, a failure has the capacity to stall the processing chain, temporarily halting carcass output and negatively impacting operating margins. The maximum number of operational downtime hours that allow the minimum BCR to be achieved needs to be considered in understanding of this risk on the estimated benefit.

Processors would need to carefully consider whether they would need to maintain arrangements that would allow their processing chain to continue to operate should the DEXA unit be unavailable.

Another potential cost associated with this risk is the cost of holding DEXA key part replacements. This information was not made available to assess the probability of failure occurring, which may have a potential impact to The Proposal's estimated benefits.

²⁸⁴ The Green Book - Appraisal and Evaluation in Central Government, 2016 , pg.74

²⁸⁵ Development of supply chain objective measurement (OM) strategy and value proposition to stakeholders, Greenleaf Enterprises, Miracle Dog and Scott Williams consulting, 2016, pg. 18

²⁸⁶ The Green Book - Appraisal and Evaluation in Central Government, 2016 , pg.33

²⁸⁷ Based on discussions with Philip Green from Greenleaf Enterprises on 19 May 2017

²⁸⁸ A single point of failure is part of a system that, if it fails, will stop the entire system from working

Possible impact on consumer demand

The Review has also noted that a potential risk of decline in consumer demand for red meat, based on the perception of using x-ray beams. Historically, changes in consumer demand has varied in response to new food production techniques and processing technologies.

For the purposes of demonstrating the elasticity of consumer demand, when Genetically Modified (GM) food was introduced to the Australian market in the early 2000's consumer demand stagnated, regardless of the lower prices offered²⁸⁹. On the contrary, consumer lamb consumption behaviour has remained unchanged after the recent introduction of the SEXA technology units to which employs x-ray technology to drive automation. The impact of changing consumer demands may possibly have potential material impact to The Proposal's estimated benefits. This is an area where research, and communication strategies, will be essential.

In addition, any impact that a focus on LMY as opposed to EQ would have on consumer demand needs to be carefully examined.

Other possible risks

Furthermore, The Review has considered the following risks associated with The Proposal which may have potential material and negative impact to their on BCR:

- ▶ Lack of adoption by processors due to the cost and/or logistics of in-plant implementation. For example smaller processors may be limited by the cost to modify their plant and therefore restricting their ability access the full range of benefits
- ▶ Data not being shared across value chain participants
- ▶ Lack of adoption of new data feedback by commercial producers²⁹⁰ - this would be a result of livestock producers not identifying value in the data feedback
- ▶ Timing delays in the rollout of DEXA due to factors such as difficulty in accessing regional processing plants
- ▶ Processor resistance resulting in lower than expected adoption and consequently delaying forecast benefit realisation
- ▶ Obsolescence of technology within the timeframe outlined in The Proposal
- ▶ Slower than expected uptake of the Value Based Trading (VBT) model by the industry

The OM Strategy assumes benefits are equally shared between producers and off-farm sectors of the value chain. In our experience with investments of this size and nature, there is a risk of benefits flowing disproportionately to select areas of the value chain at the expense of others. For example, producers who sell livestock through one or two sales channels may be limited in their ability to negotiate a higher share in the premiums derived from a Value Based Trading (VBT) system. The Review notes that consideration should be made to the way benefits are shared across the value chain.

Based on the above assessment and the information available to us, The Review has been unable to establish a clear link between the DEXA specific benefits in The OM Strategy and The Proposal. Provided with additional time, the accuracy and completeness of the formulas and methodology could be assessed. The accuracy of the risk and sensitivity analysis in the Monte Carlo model has not been evaluated, though The Review has concluded that additional risks need to be factored into the

²⁸⁹ Rural Industries Research and Development Corporation website - Impact of Genetic Engineering on Consumer Demand, 2005, pg. viii

²⁹⁰ Rural Research and Development (R&D) for Profit programme - Round two application form (MLA), 2015, pg. 23

model. Our view is that these risks therefore could decrease the overall benefit value.

Observation

That AMPC work with MLA in the further consideration of benefit areas, including, though not limited to the:

- ▶ Estimated incremental benefits which isolate DEXA benefits based on The Proposal and The OM Strategy Report
- ▶ Detailed review of the Monte Carlo simulation used in The OM Strategy Report and incorporation of a robust risk assessment
- ▶ Accuracy and completeness of the key inputs calculations and the support of reliable and proven evidence
- ▶ Estimated benefits and how they will be shared across the value chain with mitigation for benefits being over allocated to certain industry stakeholders.

7.4.3. Comparison to similar investments

The Proposal does not state a BCR, or an alternative financial performance metric. Furthermore, The Review has been unable to calculate a potential BCR due to the accuracy and completeness of key input calculations in The Proposal. A BCR if calculated, would be a useful comparator for the industry to evaluate the project against others for investment purposes.

The Review understands that no immediate benefits are expected from the project in the initial years as the industry adapts to the new technology. Additionally, benefits of the investment relate to the incremental benefit from adoption resulting from the acceleration of the technology roll-out (rather than the full benefit of the technology). Furthermore, The Proposal's costs do not currently reflect total cost of ownership, including operating costs as well as costs of operational downtime.

In the experience of those involved in The Review, the BCR should incorporate the complete set of costs and benefits, and relevant risk factors included in the estimated benefit calculations. Once these inputs are complete, a BCR can be calculated and used to compare against similar investments.

Specifically, a complete BCR for The Proposal would need to ensure the following are addressed:

- ▶ Total expenses are substantiated, given their likelihood of increasing the cost input in the BCR
- ▶ Identified risks and timing considerations are incorporated into the benefits calculations, given their likelihood of decreasing or delaying the estimated benefits of The Proposal

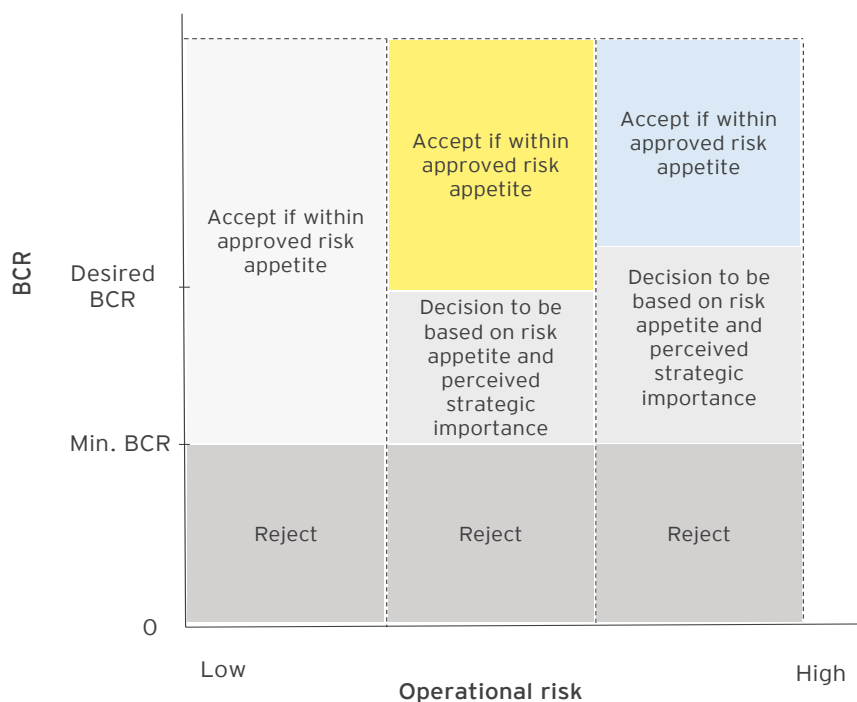
The BCR is typically assessed in relation to the risk of an investment²⁹¹. The most relevant risk to The Proposal is operational risk, which can be defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events²⁹². Specifically, the operational risk for The Proposal is, but not limited to, the DEXA system not adequately meeting the targeted applications for grading and standardised data feedback as outlined in Section 3.3.

Furthermore, with the possibility of various risks outlined above, one aspect of evaluating the merits of the investment is how the level of the BCR varies with the risk appetite. Generally, the higher the risk profile of the investment the higher the expected return as demonstrated in Figure 18 below.

²⁹¹ Where risk is a factor of the probability and impact of the investment not meeting its objectives

²⁹² Basel II Accord, 2016

Figure 18: Comparison of BCR and operational risk



Source: EY

Based on EY’s risk rating, The Proposal’s operational risk profile could be classified as moderate to high²⁹³ based on the following:

- ▶ Technical feasibility not tested and proven in beef
- ▶ A significant number of technology projects fail to meet all stakeholder expectations
- ▶ Large and complex projects have a higher probability of overspend and not meeting specified deadlines
- ▶ Lack of detailed governance frameworks described to ensure rollout and ongoing controls to ensure desired objectives are met

Observation

A BCR would be a useful comparator for the industry to evaluate The Proposal for investment purposes. This would need to include total cost ownership including operating costs, full economic benefits and their associated risks and timing. The Review recommends that expected BCR scenarios should be prepared based on pilot findings and as agreed through industry consultation. Further to this, industry consultation on the expected BCR will better inform the industry’s current risk appetite for an accelerated roll-out of DEXA technology and assist in determining the minimum required BCR for pursuing an investment of this nature.

²⁹³ Risk rating determined using EY risk rating frameworks

7.4.4. Proposed financing model assessment

The purpose of this section is to evaluate the proposed financing models relating to and contained within The Proposal. The Review has compared the proposed financing models to debt financing options for similar investments²⁹⁴.

The Review has been provided with the financing model outlined in The Proposal, and as illustrated in Section 4. Correspondence with MLA has confirmed that the proposed financing model is in draft, with at least two peak industry councils formally expressing interest in shared financing arrangements. Therefore, The Review has based the evaluation of the proposed financing models on the completeness of financing options considered, and where sufficient information has been provided, validation of the inputs and assumptions of the financing model contained within The Proposal.

The Review recommends that a financing options analysis is performed, taking into consideration two key principles when evaluating each option:

1. Understand how the selected financing option impact the borrowers' credit profile and eligibility to borrow additional funds in the future
2. Understand if the borrower will be able to meet the debt servicing requirements

Based on these principles, The Review has outlined a list of potential debt funding options and matters to be considered when assessing financing options in Table below:

Table 11: Potential debt funding options

Funding model	Description	Matters for consideration
Commercial loan relying on the capacity of a single borrower	Fully funded through an external debt raising utilising the funding capacity of the borrower and future cash flows	<ul style="list-style-type: none"> ▶ This approach will require a detailed credit analysis of the borrower ▶ The borrower will need to be able to demonstrate cash flows will be sufficient to meet the servicing obligations ▶ Assuming an approval of the credit assessment, a commercial loan is typically the fastest way to access capital ▶ Without a government guarantee, transaction and borrowing costs will be higher than a commercial loan with a government guarantee
Commercial loan with shared servicing arrangements	The Government or partner shares in the loan servicing arrangements by partially funding interest / principal repayments for the intended loan.	<ul style="list-style-type: none"> ▶ A shared financing arrangement will result in credit enhancement for all parties and will enable the investment to be financed at more competitive interest rates ▶ This model will require The Commonwealth Treasury (The Treasury) or partner support, which may result in increases in timeframes to establish the commercial loan ▶ Provided the sharing servicing arrangement, the collateral security and the consequences of the loan being unable to be serviced need to be agreed upon
Joint government concessional loan and commercial lender	The government provides a concessional loan to the borrower for the purposes of reducing the external borrowings required.	<ul style="list-style-type: none"> ▶ This model reduces the borrowers required borrowings to proceed with which would provide a credit enhancement in obtaining a commercial loan ▶ This option will require The Treasury's support which may impact on timeframes to establish a concessional loan and,

²⁹⁴ Similar investments have been defined as any historical or planned investments that have, or likely to have, an impact on the strategic direction of an industry as a whole. These may include, but not limited to, investments greater than \$5m undertaken by MLA, AMPC or Peak Industry Bodies within agriculture, medical and/or the Research and Development industry

		where applicable terms would be dependent on the level of government support
Government guarantee on 3rd party commercial loan to a single borrower	A Government guarantee provided against a partial / full face value of a 3rd party commercial loan could be used to support the single borrower's ability to borrow	<ul style="list-style-type: none"> ▶ Enhances the borrower's creditworthiness to lenders, and provides significant support in obtaining finance due to the high credit rating of the Commonwealth and State Governments. ▶ As part of the arrangement, the Government typically charges an "insurance fee" from the borrower to remunerate the Government for the risk associated with the contingent liability ▶ Requires Treasury support due to the "downside risk" guarantee which may impact on timeframes to establish the commercial loan, where applicable terms would be dependent on the level of government support ▶ Demonstrated in Europe and US and currently being implemented by the NSW Government in supporting SME job growth

In addition to the above matters, the below impacts should be considered for proposed financing arrangements:

- ▶ Revenue exposure to future livestock sale volume and price volatility
- ▶ The potential impact on borrowers if the levy forecast falls short of the debt servicing requirement in future years
- ▶ The default risk if the estimated DEXA benefits are not completely realised²⁹⁵
- ▶ The opportunity costs of investing in the DEXA rollout at the potential cost of future projects

The Review also notes that two peak industry councils have requested MLA investigate the possibility of a shared financing arrangements. One of the Peak Industry Councils has stated that they will 'actively agree' to a shared financing arrangement conditional on:

1. Matching government research dollars
2. Funding not being diverted from the enhancement of integrity programs
3. Eating quality objective measurements are accelerated
4. All carcase information being available to producers in a standardised language, which is compatible with other on farm data management systems
5. Strongly encouraging information is provided through Livestock Data Link
6. Investigating potential co-funding of hook tracking systems with processors
7. The Peak Industry Council board signing off on the final funding arrangements

Where shared financing arrangements are proposed, the conditions should clearly stipulate how the benefits are to be realised, and shared, amongst peak industry councils and their members.

²⁹⁵ This assumes the estimated benefits will indirectly flow to MLA through increased levies and will be used to service part of the debt

Observation

There should be further work in the consideration of funding models, including, though not limited to:

- ▶ A detailed credit analysis of potential financing partners, to demonstrate potential borrowing capacity
- ▶ Opportunity cost and the limitations on other investments
- ▶ Options analysis in consultation with the Australian red meat and livestock industry alternative funding models
- ▶ Based on funding models, the outcomes for how benefits will be shared

A photograph showing the silhouettes of several business professionals sitting around a table in a meeting room. The scene is backlit by a bright sunset or sunrise, creating a warm, golden glow. The silhouettes are reflected on a polished surface below. The overall mood is professional and forward-looking.

8. A possible way forward for the industry

8. A possible way forward for the industry

As previously mentioned, the Australian red meat and livestock industry is a major component of our national economy; directly contributing \$7bn a year to Australia's Gross Domestic Product (GDP). It is Australia's largest food manufacturer, and a significant employer in rural and regional areas, employing some 200,000 Australians on farms, in meat processing and at wholesale and retail businesses.

In some respects this industry may be seen as simple; in that it grows and then converts animals into food and other products. It is however, a complex ecosystem of interconnected industry stakeholder groups; and with heavily external market-driven needs, value chain contributors, and disparate geographies; with significant competition both locally and internationally.

A customer centric approach should be prioritised in driving the direction of the Australian red meat and livestock industry

In this increasingly global and competitive industry, there has been careful and ongoing consideration about how to best position the Australian industry and Australian producers and processors.

As is the case with any manufacturing industry, the meat processing industry has been working towards driving efficiency into the supply chain to remain competitive; automation has been a key solution towards that goal. However, there are also initiatives to leverage data generated across the supply chain to improve overall productivity and efficiency; including the efforts to improve LMY through OCM as set out in The Proposal.

The following example illustrates the tangible value delivered and implications to an organisation pursuing a customer centric approach to their business.

Illustrative example: Customer centric approach to delivering value

In 2015, Kingsmill, the bread giant were delisted by Tesco from its 3,000 British stores and online. The decision was made after Tesco reviewed its ranges to ensure they met the needs of its customers. This is due to the rapidly evolving grocery industry and the need of food manufacturers to ensure their products meet the needs of retailers and consumers.

The Saucy Fish Co. did just this - and they were relisted by Tesco just months after being dropped by the supermarket. Importantly, it was their data analysis that reportedly triggered the spectacular U-turn.

They were able to show that consumers were choosing to shop at other stores (after Tesco had delisted its products), a move that contributed to a dip in overall protein spend at Tesco. They were also able to provide evidence demonstrating that their brand attracted a lot of younger shoppers that Tesco was missing out on.

In this highly competitive desire for shelf space, food manufacturers need to look at how their brand can add real value to retailers. Focusing on consumer data enables an organisation to justify their value to retailers as well as develop insight-based recommendations.²⁹⁶

We believe, that the driver for any business change should be consumer-led; as consumers drive industry demand, knowing their specific needs and expectations provide the necessary insight that helps an organisation cater to their needs and grow.

²⁹⁶ Cognition, Food delisting: Why the future of food manufacturing is customer-centric

Technology enablement is necessary for a competitive edge

The Proposal has provided the industry with a bold and ambitious plan.

As discussed throughout this Report, the need and desire for an increase in OCM within the industry has been well documented, particularly to increase the accuracy and objectivity of the carcass grading process. In addition, the data generated from the proposed DEXA technology solution could potentially provide both producers and processors the factual and scientific information required to make more informed decisions based on empirical evidence (e.g. altering genetics, feed and herd development as well as altering or developing new products for key market segments) to align with the trends of the industry in a quick and cost competitive manner.

Through the consultations we have conducted, The Review has observed that the specifics of The Proposal has raised several questions.

The desire for more detailed and fully considered information signifies an industry that is eager to embrace new solutions that will improve its current position.

The Review notes that in particular there is a desire from the industry to better understand the:

- ▶ Technical readiness of the proposed solution for commercialisation in beef; supported by robust pilots and trials that assess the applicability for their specific business model, operational requirements and impact of technology failings and support structures. This is especially true for processors that process both sheep and cattle
- ▶ Financial implications across the industry and to the producer and processor groups based on possible funding arrangements for the initiative and the subsequent impact of such arrangements on industry stakeholders. In addition, further clarity is needed regarding the implications to other possible industry investments (i.e. opportunity costs), clarity regarding the anticipated benefits; who receives them; on what basis and to what quantum
- ▶ The ownership of data and governance arrangements to support producers in their ability to modify herd development and feed to suit specifications and market conditions including; processors' ability to clearly communicate and demonstrate carcass LMY measures and end prices paid (based on the full value of the carcass, not only LMY)

While technology enablement is a necessity, it is essential that the right solution be considered. This would help avoid potential failure of the program to meet all expectations in the future that may adversely impact the growth and competitiveness of the industry as a whole. For example, the intended industry-wide standardisation of LMY based processing, may lead the industry to lose out on benefits that accrue currently due to specialised business models which focus on a range of consumer preferences and needs.

Observation

The Review believes that the industry should consider a more staged and collaborative approach to such changes that have potential for significant supply chain disruption. This would allow for consideration of all the issues identified in our Review, and for further evidence to be gathered including how this might affect the range of different business models that exist in the industry.

Industry-wide collaboration is essential for long term sustainability

This level of change being contemplated by the industry is best accomplished through transparent and earnest collaboration amongst all stakeholders across the industry value chain.

The importance and need for collaboration to ensure the long term sustainability of the industry cannot be understated. It has been specifically identified in MISP2020 as essential for its full value to be realised, and again recently in the *ACCC Cattle and beef market study*; which highlights that the majority of their recommendations will require industry leadership and collaboration by multiple stakeholders in order to be implemented.

"[we must acknowledge]... that the biggest non-economic challenge facing our industry is cultural change - this is a far greater task than delivering any related technologies. Our enterprises, supply chains and industry as a whole must engender, support and reward a business and customer focus. Industry organisations must lead by example in promoting collaboration and transparency across our industry. These are essential operating criteria if we are to fully realise the value on offer in MISP 2020, and if we are to cement community and consumer - and levy-payer - confidence in the industry." - MISP2020²⁹⁷

Further to this, This Review has highlighted the need for industry level planning and coordination in order to harness new technologies, by creating a roadmap for the future of the industry. This necessitates an appreciation of the priorities across supply chain participants and focusing their interests to align with evolving consumer priorities.

We encourage the industry to discuss the potential benefits of having an industry wide plan and ways by which these benefits can be shared across the supply chain. This would go a long way in convincing participants, who despite having competing priorities, to work together for a common outcome.

The need for a cultural shift towards a shared industry-wide purpose

The engagement that The Review has had with the industry has led us to conclude that a degree of fragmentation exists. The industry appears to be experiencing changing needs and competing priorities within its supply chain that may not be conducive to its overall success in the long run. All parts of the industry need to have a collective understanding of how they can be collectively successful in the future.

'Purpose' is a key ingredient for a strong, sustainable, scalable organisational culture. It is defined as being an unseen-yet-ever-present element that drives an organisation; and when extrapolated to an industry, it can be a strategic starting point, a differentiator, and an organic attractor of industry participants and customers. In the absence of purpose, an industry's leadership is likely to have greater difficulty in motivating its stakeholders and putting the entire industry on the course to success. With a clear uniting purpose, an industry can create positive value that is far greater than the sum of its parts.

Effective industry leadership would typically have participants from across the supply chain working together to improve benefits provided to their consumers, and as a result, derive growth, increase stakeholder returns and maintain stability among its participants.

The following example illustrates how strong industry leadership and collaboration of various competing organisations around a common purpose can lead to overcoming common challenges.

²⁹⁷ MISP2020, 2015, pg.12

Industry Leadership: Pistoia Alliance

The Pistoia Alliance is a not-for-profit alliance of global life science companies, vendors, publishers, and academics that work together to lower barriers to innovation in R&D. Their projects transform R&D innovation through pre-competitive collaboration. The alliance hosts webinar programs, community workshops, conferences and provides a platform to its members to collaborate and develop industry best practices and technology pilots to overcome common obstacles and improve overall operational efficiency at an industry level.

A successful example of the industry collaboration to tackle common problems is HELM (Hierarchical Editing Language for Macromolecules). HELM is a notation standard, supported by a set of software tools, for describing in a consistent manner a wide range of biomolecules (e.g. proteins, nucleotides, and antibody drug conjugates) where traditional small-molecule or sequence-based approaches would fail to cope with the size and complexity of the structures. The previous lack of a standard for describing these kinds of molecules meant that it was difficult for researchers within the same organisation to clearly communicate their findings with each other, a problem that was compounded when attempting to work with external collaborators who would each be using a completely different standard.

HELM was originally developed as an internal project at Pfizer, but the Pistoia Alliance recognised that the underlying problem of biomolecule description affected the whole research community and that it would benefit everyone involved if a universal solution could be found. Working closely with Pfizer and a selection of Alliance members, the Pistoia Alliance transformed HELM into a truly open collaborative project, supported by a knowledgeable and energetic community of experts, and made it available as an independent tool to be adopted by R&D groups worldwide. In recognition of the importance of its contribution, HELM was awarded the Bio-IT World Best Practices Award in 2014²⁹⁸.

“Through the formation of significant collaborative relationship across its member organisations, Pistoia Alliance enables us to work jointly towards the resolution of common problems in an unprecedented fashion, resulting in a level of efficiency and interoperability that is vital to our increasingly collaborative industry.” - Sergio Rotstein, Director of Research, Business Technology - Pfizer.

In conclusion

Consistent with our terms of reference, this Review has allowed us to examine many aspects of the Australian red meat and livestock industry. We have had the opportunity of engaging with many individuals, businesses, industry bodies and experts.

Key observations

There is a strong desire for the success of the industry, but there are many non-competitive and competitive factors at play. Earlier reviews, reports and plans have called for greater collaboration between the industry players, and we echo that sentiment. That does not mean that the industry should delay progress in the absence of consensus; but rather that leaders seek to cooperate and work towards their common goal of a successful, sustainable, internationally competitive industry; with the consumer of its products at the centre of all it does.

The industry has major opportunities to sustainably grow and prosper, but faces many risks. It is heavily trade exposed, and has very high operating costs compared to international competitors. It faces competition from other sources of protein. Technological advances, high levels of collaboration across the value chain (noting the understandable competitive tensions that will always exist), and a relentless focus on the needs of the customer are preconditions to success.

²⁹⁸ Pharmaphorum: Pre-competitive research: Don't compete - collaborate! (November 2014)

The Proposal is bold and ambitious. It has focused discussion and debate in the industry about several key aspects of technological advances - objective carcass measurement, automation, data ownership, and data-driven improvements to production and processing.

Our consultations indicate that there is general acceptance across the industry about the need for, and benefits of Objective Measurement, including Objective Carcass Measurement; and that the adoption of OCM will, over time, potentially enable greater trust in commercial relationships and potentially lead to an uplift in productivity across the value chain. However, it is clear from our consultations, research and analysis, that questions remain and that there is no alignment of views at this point.

Some key stakeholders have advised that they agree with the specific OCM technology advanced in The Proposal. According to the information available to The Review, it has been and is being used successfully with sheep/lamb processing, and is being used to enable automated processing in beef by a major processor. Also, according to the information available to The Review, it is in the initial stages of being used to determine LMY in beef in a commercial setting.

In addition, some stakeholders believe that an increasing focus on Lean Meat Yield as a key supply chain 'signal' may inhibit industry diversity and specialisation, which may have unintended and detrimental impacts to industry competitiveness, particularly in export markets.

The Review agrees that the potential benefits of the collection and use of data derived from OCM technology appear to be significant, and valuable, both to individual companies and to the industry as a whole. This is consistent with the experience of many other industries and companies. However, there are questions as to whether, and how, this can be achieved on an industry-wide basis.

There have also been questions raised about whether the proposed widespread installation of high cost capital equipment, owned by a RDC, at the post-slaughter stage of processing plants, is an activity that should be undertaken by RDCs. The Review notes that one stated rationale for The Proposal is to enable the collection of datasets to enable further research and development.

It is clear that there are major questions about data collection, ownership and use, and intellectual property. Some stakeholders have commented that uptake of such technology should only be at the request of processors; The Review notes this is consistent with The Proposal's offer of a voluntary roll-out.

Our research concludes that all the potential impacts on producers, processors and the wider industry have yet to be fully identified, explored and considered. The Review believes that a significant amount of industry wide change management activity and stakeholder engagement is necessary: so that all stakeholders are clear on the potential implications of The Proposal, not only for the broader industry but for their specific businesses as well.

Looking forward: consistent with the strategic lens of our Terms of Reference and following our consultations, research and analysis, The Review has also focussed on the future of these issues for the industry.

These potential technological and data-driven advancements represent too important and transformative an opportunity to be missed. However, the necessary level of shared purpose and collaboration for such transformational change is not yet present. More must be done to build those essential preconditions for progress.

The Review has concluded that this area is one which requires overall industry participation and alignment. It impacts on both pre-competitive and competitive areas of the many processor and producer businesses involved. Being a "shared space" it thus needs to involve both key Research and Development Corporations and all industry representative bodies.

The ALMTech program, which involves all RDC key players, and/or the governance arrangements suggested by the OM Strategy Report, would appear to be possible structures well placed to support this strategic alignment.

Strategic recommendations

1. The industry should advance OCM initiatives: (including the technologies to be researched and trialled, and potentially to be voluntarily deployed by processing companies according to their business model when commercially proven) in an open, consultative and collaborative manner and driven by a clear common purpose.
2. As these issues directly relate to the research and development activities of both the processing and production sectors, AMPC and MLA need to work together to achieve alignment, as they both have key roles in taking these initiatives forward.
3. One way to achieve recommendations (1) and (2) would be for industry governance arrangements relating to technological developments to be revitalized.
4. To provide the necessary levels of transparency, there should be a series of conferences or open workshops to allow industry participants to be briefed by experts on progress with OCM to date; enabling a clear and agreed roadmap for the future to be established.
5. ALMTech should consider updating its work plan, timetable, and key performance indicators.
6. AMPC and MLA, either through the ALMTech structure or in some other way, should work with AMIC and individual processing companies to explore how the potential benefits of an industry wide data-base of key objective measures could be achieved; and to consider its implications, including the impact on the intellectual property and commercial operations of individual processing companies.

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