AUSTRALIAN MEAT PROCESSOR CORPORATION

FINAL REPORT – A Feasibility Study and provisional Business Case to assess the scope and potential for establishing and operating a world class Red Meat Processing Innovation Centre of Excellence in Australia

Project code:	2014/1031
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Date submitted:	26 August 2015
Date published:	XXX
Published by:	XXX

The Australian Meat Processor Corporation acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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1.0 Introduction

The innovation process or translation of research into commercial outcomes in order to increase profit is a major challenge in any industry. The goal of this project was to determine the feasibility of establishing a Red Meat Processing Innovation Centre of Excellence within Australia and identify what form and function it might take.

To address the goal a comprehensive understanding of processing companies' perceptions of risk and uncertainty around implementation of new technology and drivers that influence adoption and implementation of new technology was assembled. Also it was established what the role of a Red Meat Processing Innovation Centre of Excellence in Australia might be and what is needed to gain support for the establishment of any such centre. This was achieved through the analysis of an extensive national industry consultation process. Secondly a review of national and international processing technology and development companies was undertaken which included the uptake of technology. Thirdly a thorough understanding of previous and current research Centre's to fully understand what has driven successful innovation and what hasn't was established. To achieve this, a review of relevant Centre's was carried out. Fourthly, based on the outcomes from the national industry consultation and the literature a value chain analysis of issues around the viability of a potential Centre of Excellence was undertaken. This report discusses the viability of different potential models for a Red Meat Processing Innovation Centre of Excellence and provides recommendations around the feasibility of a potential Red Meat Processing Innovation Centre of Excellence within Australia.

2.0 Project Outcomes

2.1 Summary of national industry processor consultation

The objective of the national industry processor consultation was to identify industry issues with technology transfer, opportunities to improve this and ultimately determine the merit of establishing a Red Meat Processing Innovation Centre of Excellence in Australia. To achieve this, the survey was broken up into four sections, firstly, to identify the perception of risk and uncertainty around implementing new processing technologies. Secondly, the focus was on what are the drivers that influence the adoption and implementation of new technologies. This information was collected in association with commentary on the innovation processes and structures that exist within companies. Thirdly, it was deemed important to understand what potential role processors saw in the establishment of a Red Meat Processing Innovation Centre of Excellence in Australia and lastly what would be needed to gain support for a Red Meat Processing Innovation Centre of Excellence in Australia.

The **key perceptions of risk and uncertainty** (barriers) around the implementation of new technology and **key drivers** to innovation were identified when greater than 50% of companies surveyed considered the factor as "very important" (Table 1). The results presented in Table 1 are not surprising and support outcomes from a recent report by Coleman (2014).

Table 1. Summary of risks and uncertainty and drivers to innovation.

Risks and uncertainty	Drivers
• Reliability of technology • Access to support • Loss of production during installation • Cost • Retention of skilled staff • Prefer to see technology working in another company first • Overtime companies see themselves as been more innovative • Finance (Profits or access to industry funds)	• Labour costs • Energy costs • Consumable costs • Upper level management • Slaughter chain productivity • Boning productivity • Increase processing efficiency by minimising overall labour costs, contamination on chain, product loss on chain/boning/chilling) • Maximise product quality • Productivity per worker • Optimising whole carcase • Increasing potential number of markets • Product quality (food safety, shelf life, visual quality, eating quality) • Regulation (WH&S, animal welfare, food safety, environmental sustainability, HR)

One of the most important outcomes from this study is, understanding what industry believes the **key roles** of a potential Red Meat Processing Innovation Centre of Excellence should be. These roles were identified when greater than 60% of companies surveyed viewed these roles as either “very important” or “important” which included;

- Technology Development
- Technology evaluation
- Industry demonstration
- Meat processing and meat science research
  - Technology for slaughter/ boning
  - Technology for carcase evaluation and online measurements
  - Feedback to producers
  - Meat science and quality
  - Technology for manufacturing and fabrication
  - Traceability
- Library database
- Education and training (industry/students)
- Other includes;
  - Information sharing
  - Extension,
  - Accessible to all – location suitability
  - Collaborative rather than duplication

It should be noted that there were mixed responses for some roles including economic evaluation, product innovation and market research. This is largely reflective of company size and business model as some see this as their "edge" over others while others feel they could be supported in this area. These results also indicate that the optimal Centre may not be a blanket approach.

When understanding if **industry supports** the concept of a Red Meat Processing Innovation Centre of Excellence there are a few key outcomes summarised.

- There was significant support for the concept of a Centre. It appeared that there was less support for physical structure (the legacy of Fututech).
- Majority prefer to mitigate risk of new technology through demonstration of technologies within a commercial plant compared to within a Centre (this largely reflects a strong desire to see technologies under commercial conditions).
- The Centre would need to foster the development of new technologies (engineering, evaluation, pilot testing and concept evaluation).
- The Centre would need to be both visionary and applied.
- Highly supportive of a collaborative approach.

2.2 Summary of national and international processing technology company development and adoption

The first objective was to conduct a review of national and international processing technology development companies, new product development and the introduction of technology to industry. This area of work was contracted to AgInfo Pty Ltd and based the outcomes of this phase a number of critical issues were identified in terms of Australia and companies who operate in the technology development space.

- There is a small market in Australia for technology development which limits local innovation.
- The Australian companies working in developing technology are undergoing consolidation.
- The challenge in working with such companies is apportioning IP and this will be a real issue in the future. Despite this, a number of companies indicated interest in discussing how they could work with a "Centre of Excellence".
- The Australian industry must always keep abreast of overseas developments in meat processing, adapting technology where applicable.
- The Australian processing industry often operates on a low profit margin which limits reinvestment in abattoirs and thus technology.

The second objective was to examine models for the adoption of technology by the processing industry. Although several companies were identified (AgInfo Pty Ltd and Dr Greg Sullivan) there was scant information derived on pathways to the adoption of technology. However the concept of "integrators" (a concept used in the US) was raised. In this model the "integrator" works with a range of companies to identify technologies that could meet industry needs. In a limited way the company Robotic Technologies Australia Pty Ltd operates as an "integrator" linking manufacturing companies to suppliers of robotic solutions, with the provision of technical advice as part of the model. A "Centre of Excellence" could provide this service to industry.

2.3 Summary of Previous Research Centres

Four previous research initiatives that have related to Australian red meat processing were evaluated to understand what has previously occurred in industry and what can be learned from these initiatives. These initiatives included; Fututech, Meat Training Research Centre (Werribee) VIC DPI, CSIRO (Cannon Hill) and MIRINZ.

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All four previous research Centre's reported here had significant capital in "bricks and mortar". Despite the unprecedented investment in Fututech, there was no benefit reported from this type of structure. The concept of Fututech was to develop a fully automated beef slaughter floor, but outcomes fell well short of this. MTRC, CSIRO and MIRINZ were able to show that they all had benefits in;

- Developing technologies that were transferred successfully into to industry
- Useful for critical experimental collection of samples
- Generating a small income (renting of facilities, commercial test product, project funding).

However both pilot plant facilities at MTRC and CSIRO showed that they were not feasible in the long term due to the following reasons;

- Aged facilities needed significant work to be viable (CSIRO)
- Underutilisation
- Slow through put
- Labour intensive
- Staffing
- Removal of product and by-product (MTRC)
- Maintenance.

Before MIRINZ was taken over by AgResearch the pilot plant was still operational, however, now the facility has been sold and operates as a small commercial abattoir.

Funding

The funding model for each Centre was slightly different, but ultimately they all failed due to the respective Centre's not been able to develop financial independence. Fututech was 50/50 funded by industry and Commonwealth government. The MTRC, was initially set up by industry, university and state government, but then was maintained by state government and relied on industry funded projects heavily for it viability. CSIRO was a federally funded initiative, but also relied on some industry funds. MIRINZ was initially a government and industry partnership which appeared to work well whilst there was continuous funding. When a more formal industry body was formed and funding became competitive and based on projects, MIRINZ began to struggle and eventually merged into AgResearch and since then resources and capabilities have been significantly scaled back. In terms of funding, the common outcome is that a continued source of funding is required to keep facilities functioning.

Innovation transfer strategy

Fututech did not appear to have a strategy, other than to demonstrate a fully automated slaughter floor, however due to the lack of success the strategy failed as did the project. Additionally there was little hands on industry engagement. Conversely this is what MIRINZ in particular had proven to do successfully and this was identified to come from working alongside groups and having a strong relationship with industry. The CSIRO facility also showed success in the development and implementation of technologies, this was most likely aided by their extension group and additionally their close proximity to multiple beef processors.

2.4 Summary of Current Research Centre's

A number of international research centres were investigated to gain an understanding of what is happening overseas and what research models (or parts thereof) are working and what is not. To achieve this, five research centres were visited in Europe including; Institute of Agrifood Research and Technology (ITRA), Teagasc, Scotland's Rural College (SRUC), Danish Meat Research Institute (DMRI), Grimsby Institute and three in the United States including; Georgia Tech, Texas A&M, Colorado State University (CSU). Additionally given our close proximately and relationship with New Zealand, AgResearch was also included and contacted via telephone.

Form

All current research Centre's evaluated in this milestone had "bricks and mortar". Table 2 shows what types of facilities are within each Centre. Other concepts that are not listed in the table are that Teagasc has a mobile trailer and DMRI has a mobile truck that can transport equipment/technologies from plant to plant.

Table 2. Summary of Centre's facilities

Centre	Pilot Plant	Wet area	Meat lab	Food safety	Engineering	Education Training
IRTA	✓	✓	✓	✓	✗	✓
Teagasc	✓	✓	✓	✓	✗	✓
SRUC	✗	✗	✗	✓	✗	✓
DMRI	✗	✓	✓	✓	✓	✗
FRPEC	✗	✗	✗	✗	✓	✓
Georgia Tech	✗	✓	✗	✗	✓	✓
Texas A&M	✓	✓	✓	✓	✗ **	✓
CSU	✓	✓	✓	✓	✗ **	✓
AgResearch	✓*	✓	✓	✓	✓	✓

*No longer have, ** Capability in other departments within organisation.

In terms of Centre's which currently have **pilot plants**, IRTA, Teagasc and AgResearch facilities were all reported to be underutilised for various reasons including;

- Speed/throughput
- Species specific (small stock/ large stock)
- Staffing for sporadic use
- Removal of meat product and by-product
- Much work is contracted by industry and work is conducted under commercial conditions.

As mentioned, AgResearch has recently sold their pilot plant facility in 2014 and now has a MoU with the new owners for experimental use. It was also noted that much R & D is conducted in bigger plants to replicate commercial conditions.

Texas A&M and CSU both have pilot plants which have a major focus on teaching. CSU is undergoing a significant upgrade currently and is building a whole new pilot plant as part of an integrated food facility. The primary focus is to teach and train the next generation of meat scientists. Texas A&M utilisation (~ 1000 head/yr) is decreasing partly due to the urban encroachment of the expanding university and hence they are considering relocation. Both universities have fewer burdens as students are often the labour units with support staff and product is sold through onsite butcher shops.

Wet Areas were used by IRTA, Teagasc, DMRI, Georgia Tech, Texas A&M, CSU and AgResearch. These facilities tended to be more fully utilised as they are more versatile and are excellent facilities to test a variety of technologies for example; High Pressure Processing (HPP), slicers, Pi-Vac, CT scanners, Robotics (Georgia Tech, DMRI) and Value added products. In most cases this is where Centres were able to generate small incomes by hiring out wet rooms to private companies to evaluate and test equipment.

Centres which had **Meat laboratories, food safety, engineering** and **education and training** facilities were all very well utilised as they are core to their operations. Due to the diversity of some of the Centres (e.g. IRTA, Teagasc, AgResearch) they are able to offset some of the costs of some of their facilities (e.g. food safety, education and training) across a range of industries (e.g. horticulture, dairy) which mitigates the risk and increases usage. In terms of **engineering** both CSU and Texas A&M have access to these skills through other departments with the respective universities. IRTA, Teagasc and others had shown that they had partnered with engineering companies to develop and evaluate technologies.

Funding

All Centres' funding structures were slightly different. However, all were reliant on funding to be viable, meaning that not one facility was **self-sufficient to remain cost neutral**. There were combinations of Federal, State, EU and industry funding. Income streams were derived through consulting, hiring of facilities and IP, but, these income streams did not fully support the operating costs.

Innovation transfer strategies

The strategies that individual Centres use have been summarised in Table 3 and the common strategies that appear across multiple Centres are;

- Industry engagement (networks, training, workshops, demonstrations, partnerships)
- Collaboration (industry/other R&D organisations)
- Extension.

These concepts are not new and are often in place, however, the degree of success of these strategies can be largely dependent on who might do these things. A good example of taking these strategies to another level is the Teagasc approach where researchers are selected and given the appropriate training to effectively communicate to industry through the Food Innovation Gateway workshops that are held in Ireland.

Table 3. Innovation transfer strategies for individual Centres

Centre	Innovation transfer strategy	Comments
IRTA	- Operational focus is flexible will go where funding is available - Innovation mangers to specifically handle knowledge transfer nationally and internationally - Evaluation of performance	- Inefficiencies in R&D - Gives understanding of industry bridges gaps - Gives accountability
Teagasc	- Major focus on "knowledge management" - Involves key people that have effective communication with industry - National network forum - Effective extension - Collaborative agreements and partnerships - Training, workshops and demonstrations	- Engagement with industry
DMRI	- Small focus areas - Provide support from initial stage to final commercialisation - Project initiation - Cross pollination of skills (e.g. engineers working alongside boners) NOTE: DMRI are in unique situation where they function in a vertically integrated supply with very few stakeholders, hence early industry engagement is critical.	- Gives clarity - Consistent involvement - Involves collaboration with industry and is critical in Innovation Transfer
SRCU	- Did not appear to have any clear strategies but have just gone through major restructure where extension was separated for R&D and appeared problematic. - Although current research has been driven from bottom up	- Extension appears important
Georgia Tech	- Have different contracting methods which result in varying level of adherence to innovation - Focus on education of stakeholders via field days and newsletters (with researcher profiles)	- This is largely reflective of the level of risk (blue sky higher risk of failure) - Extension critical - Raising researcher profiles gives industry points of contact when they have issues.
Texas A&M	- Building capability within industry - Texas A&M AgriLife Extension - Use industry networking forums like AMSA	- Help facilitate innovation through greater understanding
CSU	- Development of alliances and collaboration with industry and other research providers	- Industry driven research - Collaboration
Grimsby Institute	- Use a membership model (via payment) which allows members to help develop priority areas and access results.	- Similar to current AMPC model
AgResearch	- Traditionally MIRINZ had an excellent reputation of working effectively with industry - Extension and collaboration with industry	- Extension and collaboration with industry

2.5 Summary of current initiatives and influencing factors

A section which assessed current initiatives was included to describe bigger picture initiatives that have been occurring within Australia and around the world. The six current initiatives show diversity in investment of form (Table 4) and function. Industry Growth Centres (Australia) is a new concept where the physical structures are yet to be built. However the Industry Growth Centres, Catapult UK and Fraunhofer Institutes are Government initiatives with significant financial backing which has resulted in physical structures. There are 5 broad areas under the industry growth Centres and hence the risk around these is offset by diverse use from multiple sectors. The same philosophy applies to Catapult and Fraunhofer Institutes. The Cost-FAIM and AMSA are both networks and hence are 100% virtual. These networks don't actually fund any research, but fund the gathering of industry, technology providers, engineers and academia.

CRC's are virtual in a sense that they don't really invest in capital, but essentially they do strategically partner with industry and research providers which can be seen as hubs as they provide physical infrastructure essential for CRC's to function. The CRC's have been shown to be a successful mechanism for innovation with minimal capital expenditure. Additionally they have been shown to be successful in building skills and capability within different sectors including the red meat industry.

Table 4. Form of current Initiatives

Centre	Bricks and mortar	Virtual	Hubs	Number of locations
Industry Growth Centre's	✓	✘	✘ *	5
CRC	✘	✓	✓	-
Catapult UK	✓	✘	✘ *	7
Fraunhofer Institutes	✓	✘	✘ *	7
Cost-FAIM	✘	✓	✘	N/A
AMSA	✘	✓	✘	N/A

* Although they do have a core bricks and Mortar and major function of these Centre's are to collaborate with industry and R & D providers

Common strategies which all of these initiatives rely on are;

- Industry led research
- Long term strategic priorities
- Bridging the gap between research and industry
- Increasing knowledge transfer between research and industry
- Increasing capability and critical mass
- Collaboration.

The ultimate goal amongst these Centres is to translate research into commercial outcomes thus increasing the rate of innovation. This goal seems agreeable with the ultimate goal of a potential Red

Meat Processing Innovation Centre of Excellence (CoE). Hence, the above strategies should be applied to a potential CoE and it is demonstrated that these strategies can be applied with various levels of investment.

2.6 Summary of Value Chain analysis of issues around the viability of a Centre of Excellence

The aim of this section was to address issues surrounding viability of a proposed Red Meat Processing Innovation Centre of Excellence, with particular reference to costs and benefits accruing to participants in the red meat value chain.

Research into red meat processing has been shown to generate substantial benefits, and moreover these benefits are spread throughout the red meat value chain and onwards into public good. In the Australian red meat industry, gaps exist between research, and uptake of the knowledge produced by research as innovation. A number of explanations have been offered, including a reluctance to engage with other value chain participants in co-innovation along the value chain. Companies' wait-and-see attitude to innovation, and preference for cost-reducing over value adding innovation, had been identified in the results from the national industry consultation. This section took that analysis further by identification of preferred thematic areas for innovation action, and comparison of different types of companies' preferences across these thematic areas. The five thematic areas are: new technology development; value chain research; new technology evaluation and demonstration; meat science; and education and training. Subdivisions of companies used featured orientation toward the consumer, the value chain and innovation overall, based on response to selected questions in the survey.

In light of the nature of costs and benefits of red meat industry innovation, and the exploration of the apparent preferences of sub-groups of companies, a number of functions of a proposed Centre of Excellence in Red Meat Processing Innovation are identified. To deliver the appropriate costs and benefits, in the context of the red meat value chain, the design of a proposed Centre of Excellence in Red Meat Processing Innovation would include: information provision; facilitation of industry collaboration; engineering of complementarity with existing research and innovation facilities and services; and similarly for training and skills development. A Centre could be a facilitator of co-innovation in the value chain and a communications and public relations provider for red meat industry innovation. A Centre could take a pro-active role in surveillance to identify, investigate and exploit opportunities for brokerage of contacts between suppliers and users of innovation, and for funding opportunities.

2.7 Potential models for a Red Meat Processing Innovation Centre of Excellence

Throughout the feasibility study there were three models which have been identified;

1) Bricks and mortar
2) Virtual
3) Hubs.

A simple Strengths, Weaknesses, Opportunity and Threat (SWOT) analysis was conducted to provide a simplistic summary of the three models mentioned above. These SWOT analyses were filled out based on outcomes from the feasibility study.

Table 5. SWOT analysis Bricks and mortar

Strengths	Weaknesses
• Physical Presence • Common ground for Industry (demonstration) • Provides a test bed for technology • "lunch time" correspondence	• High Capital expenditure • High Operational expenditure • Less flexible (technically / structure) • Access/location will be limiting/ $ • Does not replicate commercial conditions • Staffing (having the best) • Less likely to be supported by industry
Opportunities	**Threats**
• International recognition • Mitigate risk	• Underutilisation "White Elephant" • Industry disconnect • Building capability under one roof • Sustainability/relevance over time • Potential duplication of existing structures • High overall risk

Table 6. SWOT analysis for Virtual

Strengths	Weaknesses
• Low Capital expenditure • Low Operational expenditure • Flexible (technically / structure) • Access (good) • Staffing (have access to the best) • Overall low Risk • Collaborative	• No Physical Presence • No by chance correspondence • Don't seem to conduct research, more network focused
Opportunities	**Threats**
• International recognition • Develop linkages with national and international; - R&D providers, - Peak industry bodies - Industry.	• Communication breakdown needs strong governance and leadership • No capacity for industry demonstration • No capacity test bed facilities for technology

Table 7. SWOT Analysis for Hubs

Strengths	Weaknesses
• Low Capital expenditure • Low Operational expenditure • Flexible (technically / structure) • Access (good) • Staffing (have access to the best) • Collaborative • Uses existing infrastructure • Overall low Risk • Local knowledge	•Not everything is under one roof

Opportunities	Threats
• International recognition • Development strategic partnerships • Develop linkages with national and international; - R&D providers, - Peak industry bodies - Industry. • Co investment (government, industry) • Greater diversity and spread risk	• Requires strong governance to ensure effective collaboration.

3.0 Conclusions/ Recommendations

The outcomes from the industry consultation indicate that there is significant support for a potential Red Meat Processing Innovation Centre of Excellence within Australia. It can also be determined that from all aspects of this report that a "bricks and mortar" type model would appear to be the least viable option (with particular reference to a pilot plant) and least supported by industry. Based on current initiatives and influencing factors a "Hub" or "Virtual" type model is likely to be an effective and efficient way to increase innovation and mitigate risk while maximising capability (infrastructure and personal). Irrespective of which model is used it was determined that the role of the Centre could be broken down into 5 thematic areas including; new technology development, meat science, new technology evaluation and demonstration, education and training and value chain research.

Based on information provided in this report it is recommended that any potential Centre of Excellence would need to be industry led combining blue sky and applied research and long term strategic priorities. The potential Centre should not duplicate, but facilitate use of existing facilities, infrastructure, people and initiatives and increase overall capability and critical mass within the sector. It would need to be accessible and use various strategies for disseminating information including an extension type service. Based on the value chain analysis the potential Centre would need to facilitate the collective action on fixed costs, enhance public relations by identifying and emphasising public benefits (i.e. promotion of health benefits). The potential Centre has the opportunity to bridge the gap between industry and research and increase the knowledge transfer between research and industry through brokerage by identifying supply and demand for innovation, identifying co-innovation and alternative funding sources. The potential Centre would act as an agent of "culture change" for factors such as co-innovation, customer focus. Above all the potential Centre would need strong governance that has a combination of both sound industry and academic knowledge.