The essential question:

What benefits accrue to the consumer and processor when we have an understanding of the processing technologies and systems used by Australian red meat processors to bring us quality cuts of meat?

How does an understanding of the challenges and opportunities that exist, including sustainability considerations, consumer expectations, marketing techniques and media coverage, affect our decision-making about what red meat products we buy?

Step 1: The scenario

The Australian Meat Processor Corporation (AMPC) is encouraging schools to discover how Australian meat processors might produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people, in addition to innovative automated technology systems and robotics.

When consumers buy beef, lamb or goat meat at the butcher or supermarket, all the hard work and innovation that goes into producing the cuts of meat we love to eat is not immediately obvious.

Discover ways red meat processing companies are using, ethical and sustainable production techniques, technologies and systems, and how they are marketing their products.

Explore how ethics, social values, profitability and sustainability considerations impact or influence the design and workings of some processing plants, and the processes and technologies used.

Examine the wide diversity and commonalities of red meat processing plants and their operating systems.

What makes red meat processing plants and their systems interesting to study is their wide diversity and commonalities throughout the world. Some are dominated by processing meat products for export, while others are devoted to processing meat products for domestic consumption. Some processing plants are highly mechanised, others aren't. Some use robotics, others don't. Some are using automated meat processing systems that reduce manual handling and provide a consistent flow of product, while others are using x-ray technology to measure carcass dimensions to optimise cutting accuracy.

Many processing plants have invested in water and energy recovery processes to increase plant sustainability. Many plants have also reformulated their waste into saleable products. Many have also installed automated systems and robots to enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers.

Could future processing plants use drones to move their product? Could processing plants use drones to take photographs or video parts of the processing sequence and gather data to inform the processing of red meats? Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?

What investigations can assist you to research how Australian meat processors use the latest processing technologies and systems? What investigations can assist you to research how they use robotics? Will you investigate how Australian meat processors currently automated systems in the form of robotic sensing and cutting? Will you investigate how Australian meat processors use x-ray systems that create 3D maps of the bones within lamb carcasses which then provide data to robots and help them cut carcasses with accuracy far greater than human capabilities? Will you investigate whether any Australian meat processors currently use robotics and x-rays systems?

AMPC and other meat processors can help out with lots of information, images and videos on their websites. **http://www.ampc.com.au/education-training/school-resources/aust-meat-processing**

Your challenge is to use the websites and a range of activities and videos to help understand how Australian meat processors produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people in addition to innovative automated technology systems and robotics. How will you design the next evolution of Meat Processing Plant in this project? How will your systems work? How might you present your design to others?

Become a Project Designer and use a range of activities, videos, images, information and websites containing information about red meat processing systems in Australia to design a next evolution of meat processing plant.

As part of a Design Team, record and collect information about the systems and technologies used to process and bring red meat products to consumers.

Investigate the current practices used by the industry, envision alternatives and explain how red meat processing systems and products can evolve with consideration for preferred futures and the emergence of new ideas and technologies that could be used in red meat processing, production and event marketing.

Re-imagine processing methods that feature ideas for the future and emerging technologies, and produce drawings to explain your design ideas. Your team is also asked to communicate your ideas to an audience later in the unit.

34

The team is tasked then with designing an identification system that can be applied through a meat processing plant that shows all the on-site processing system features. In particular, you are tasked with showing all the on-site sustainability and ethical considerations within the processing practices.

In addition, you are required to write a script for a great commercial to advertise your new meat processing plant, what it processes and produces.

Finally, each team is required to give a five minute presentation of the design and commercial to an audience, in which you explain how red meat could be processed and marketed in the future.

Put your design mojo to work and design the next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things.

AMPC invites you, through collaboration and clever thinking, to provide the best solutions for their industry.

High, low and no tech options are available.

High Tech: You can design and produce your next evolution of Meat Processing Plant digitally using an app or software to create original graphics. You can also design your identification system and commercial digitally using software to create original graphics.

Low Tech: You can design and produce your next evolution of Meat Processing Plant using a standard computer, graphics provided and editing software. You can also design your identification system and commercial digitally using a standard computer.

No Tech: You can design and produce your next evolution of Meat Processing Plant using art materials, poster board and hand written information and drawings. You can also design your identification system and commercial digitally using art materials, poster board and hand written information and drawings.

What kind of researcher and project designer will you be?

Locate where Australian meat processors are situated and which ones might process red meat products in your state or territory.
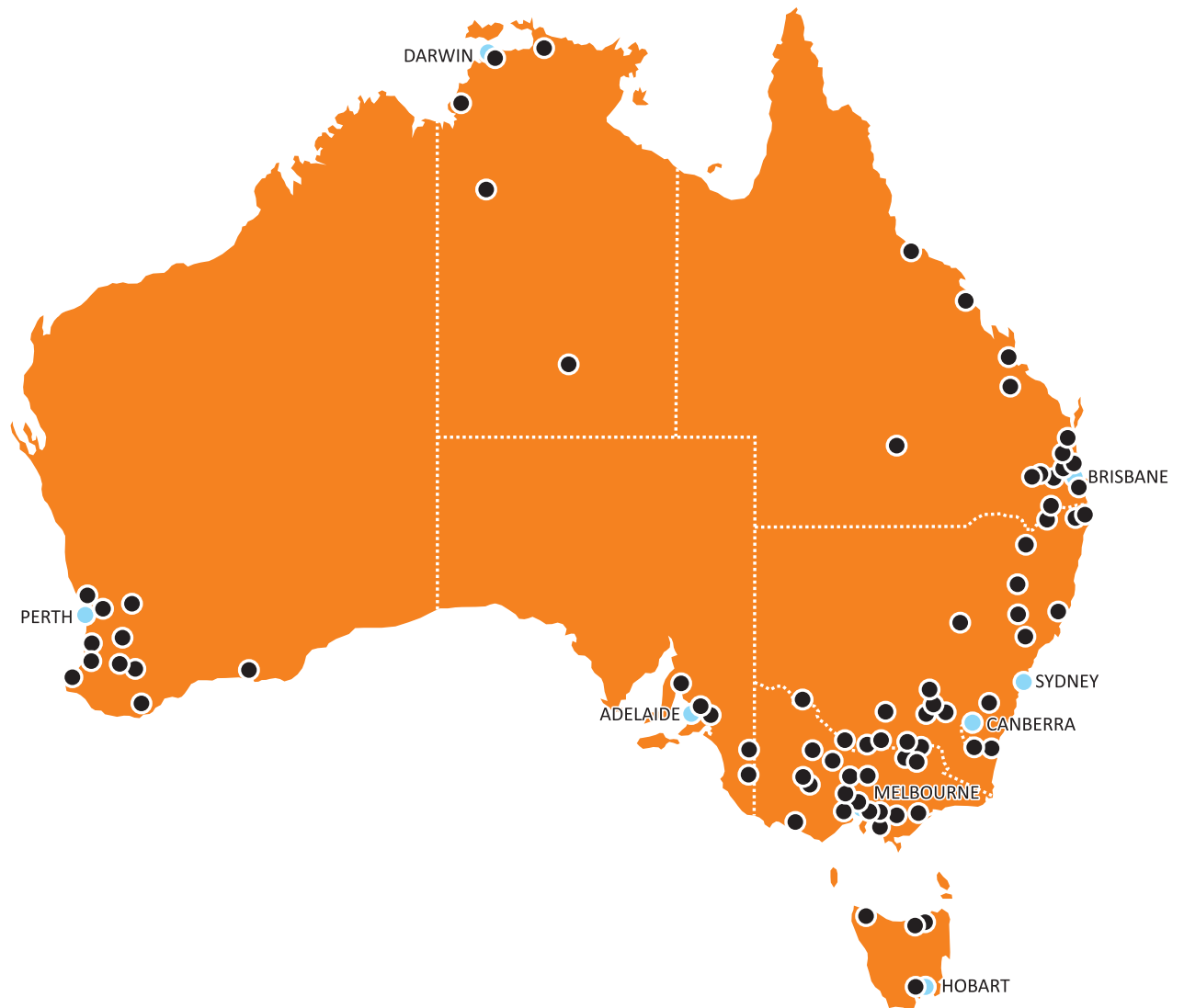
Define

Submit a written definition of the challenges you are to undertake.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Discover

In this stage, the research and digging begins. This involves obtaining the background information that gives the problem its context, and identifying what you need to know and what you need to be able to do to solve the problem.

Links for Research and Reference

View a sample of website materials, videos, print materials and social media tools that cover various meat processing systems, marketing and labelling topics.

Examples include:

- Thomas Foods International
  http://thomasfoods.com/

- Gundagai Meat Processors
  http://www.gmpgundagai.com.au/

- Fletchers International Exports
  http://www.fletchint.com.au/

- JBS Australia
  http://www.jbssa.com.au/

- Teys Australia
   http://www.teysaust.com.au/

Gundagai Meat Processors

View a video and discover the more about the automated systems and robotics that are installed at Gundagai Meat Processors in New South Wales. Hear about the 'Brisket saw' that delivers highly accurate cutting of the lamb carcasses, with a consistent flow of product. Discover more about the 'Sani – Vac' that replaces manually using steam and heavy equipment to vacuum and sanitise each carcass by removing bone dust or contaminants on the carcass itself. Look for other automated systems that move the lamb meat, cut them, package and x-ray them before being boxed and labelled for distribution throughout southern Australia. **https://youtu.be/bZKSsHXO6rc**

Listen to a podcast and hear from Mr. Will Barton, the CEO of Gundagai Meat Processors (GMP) and the systems and technologies used at the plant to ensure sustainable and ethical processing and production of lamb. Find out what Will says about how Gundagai Meat Processors use sustainable resource management practices to process lamb.

Discover something about the sustainability considerations that are integrated into his processing plant's methods and marketing strategies.

Hear about the new and emerging production technologies he makes mention of, that are used in the processing of lamb meat, and the contribution these new technologies and systems have to the red meat processing industry**.**

Learn about any other technologies used at the plant that manage or conserve water and what they have helped the plant do and achieve.

Find out how the company takes into account animal welfare considerations.

Explore his description of how the consumer's expectations regarding animal welfare, environmental sustainability, business ethics and workplace practices inform what is undertaken at Gundagai Meat Processors.

Learn about the hygienic practices, and food safety processes and practices are used at Gundagai Meat Processors, in addition to the quality assurance program that is applied throughout the entire process, from receiving livestock to processing, packaging and shipping to the customer.

Undertake a comparison and analyse videos about the main processing systems used by other red meat processors in Australia. For example Thomas Foods International, an international and domestic processor and supplier located in South Australia **https://vimeo.com/62319210** , and D & S Afflick, a smaller domestic processor who supplies markets in New South Wales.

D & S Afflick Abattoirs

Focus on how the smaller domestic processing plant uses and manages water and energy, and re-uses and recycles waste products produced there in a state-of-the-art Rendering Plant that can be operated and monitored from his mobile phone. **https://youtu.be/y2mPEqIuLVY**

Discover more about the 'Rendering Plant' located on the Afflick's property and investigate the way all solid waste and blood is recovered and re-used to make tallow for cosmetics and blood and bone products that are on sold to other companies.

Focus on the way the Rendering Plant also recovers steam and converts it into hot water used within the plant, in basins, sterilisers, hosing down areas and even for the truck wash.

Discuss the automated systems and technologies used by the smaller domestic processor in Moruya, NSW and the larger processor in Gundagai, NSW. Compare their individual features.

Scott Automation and Robotics

Hear from Project Engineers who design and manufacture meat processing systems that can be installed and maintained in the vast majority of existing meat processing plants. Hear about how they initiate their design projects, execute them, install their designed solution and reflect critically on each step of their process and their final product.
https://youtu.be/4pKzgbypZGM

Discover more about the automated systems designed by Scott Automation and Robotics who design and manufacture lamb and beef processing systems for a range of meat processors in Australia and New Zealand.
Scott Automation and Robotics- Bladestop
https://youtu.be/OisjwCzLm94
Scott Automation and Robotics- Lamb Chine
https://youtu.be/pZ0RmFVuJhA
Scott Automation and Robotics- Robotic lamb processing
https://youtu.be/AT61bXPTFGQ
Scott Automation and Robotics- X Ray
https://youtu.be/7LQnoOl7qIg

View a video and talk about Australia's red meat processing sector and the need to share information about the contribution the industry makes to the economy at **https://youtu.be/tv7o9SkN8PI**

Go further, replay the video and hear about how sustainability considerations have been identified by the red meat processing industry as key to the future of the industry.

39

Sustainability Considerations

Discover more about: R Radford and Son at **http://www.abc.net.au/landline/content/2012/s3615247.htm** and focus on the sustainability considerations in which the meat processing company has invested.

Consider the plant upgrades that have included temperature controlled chilling to enhance eating quality, and the investment in water and energy recovery projects to increase plant sustainability.

Discover how this processing plant uses 100,000 litres of water a day. Brainstorm and list all the processes that might use water at the plant and consider ways that any processor might be able to undertake to conserve or re-use water.

Explore how Oakey Beef, in Queensland generate their own energy from their wastewater resources **http://www.ampc.com.au/2016/07/The-Big-Grey-Bubble-Oakey-Beef**.

View the video and discover how the processor demonstrates environmental responsibility and stewardship by using wastewater and bacteria to create electricity.

Research how Gundagai Meats in NSW takes a 'whole-of-lamb' approach to processing, and minimise waste in their operations **http://www.target100.com.au/Farmer-stories/Gundagai-Meat-Processors**

View images and discover how Thomas Foods International in South Australia uses a state-of-the-art wastewater treatment facility to improve its effluent quality by 99.8% and it then also produces enough biogas to offset the site's natural gas requirements. **http://www.ampc.com.au/uploads/images/Meat-Matters/Aust-Meat-Processing-Images/ThomasFoods-Biogas-Skid-&-Flare.JPG**

Delve deeper and discover how a Tasmanian meat processor 'Greenhams' is using a renewable source of briquette as a bio-fuel in its Boilers **https://www.youtube.com/watch?v=cOrBAd7-Pfo&feature=youtu.be**

View and listen to the AMPC video showcasing the views of various stakeholders around the sustainability issues affecting Australia's red meat manufacturing industry **http://feastofideas.com/welcome**

Read about what a scientist suggests can be recycled and reused from meat processing plants **http://www.awmc.uq.edu.au/dr-paul-jensen**

Record any ideas that are suggested by the scientist, about resources that can be recovered in meat processing operations.

Animal welfare and ethical considerations

Find out about the *Model Code of Practice for the Welfare of Animals* — (Model Code) which is a national code endorsed by the Australian Commonwealth, State and Territory, and Ministers for Primary Industries. Talk about the objective of the Model Code of Practice which aims to detail minimum standards for the welfare of a range of livestock. Explain how the focus is on processing systems and the needs of livestock rather than consumer expectations. See **http://www.agriculture.gov.au/animal/welfare/standards-guidelines**

Hear from Ms. Temple Grandin, who is dedicated to better understanding animal rights and incorporates these understandings into her designs of meat processing plants at **https://www.youtube.com/watch?v=Oy-kAW3beqc**

Sketch and label what a possible processing system that focuses on animal welfare might look like. Might it play classical music, have curved entrances, non-slip flooring, feed the livestock silage laced with an anaesthetic?

Collate ideas about the industry, its processing methods and standards, and how these have changed over time using iThoughts, a mind mapping app or map ideas using a concept mapping technique.

Think about the word 'ethical'. How might the students describe an ethical way to process cattle, sheep and goats? What might they need to be processed ethically?

Hear from one customer about ways processors and their products are regarded locally and overseas and ways they might value add to their products **https://youtu.be/L51CoN4P3ZQ**

Hear from an Australian processor describing how animal welfare, sustainability and worker considerations form the basis of processing operations in many plants **https://youtu.be/1F_F-wu9pQQ**

If necessary, revisit earlier videos or find additional examples of what actual meat processors are doing to address ethical and sustainable processing methods for your research task.

Marketing and labelling

Delve deeper into the current trends and changing consumer patterns and consider how these might influence the way processors market or educate Australian consumers about their products
https://youtu.be/RxROfMj-Fqg

Look at the way meat processors label, brand and market their meat products. Ask students to locate a range of labels and brands. Examine and analyse these and the language used to market them, and talk about 'truth in labelling'. Discuss what the following descriptions might imply to consumers:

- Meat Standards Australia (MSA) Graded;

- 100% grass fed;

- No hormones, Genetically Modified Organisms (GMOs) or antibiotics;

- Premium offering;

- Consistently tender, juicy and flavoursome;

- 100% Halal certified;

- Classic brand;

- Supreme brand; and

- Consumer brand.

Discuss whether any of the claims might mislead consumers? If so, how do they mislead the consumer? What tactics, tools, wording or imaging is used? What might be omitted?

Consider whether consumers could have suffered any detriment due to any misleading claims for red meat products. Similarly, consider any detriment processors and retailers may have suffered due to any misleading claims made by competitors.
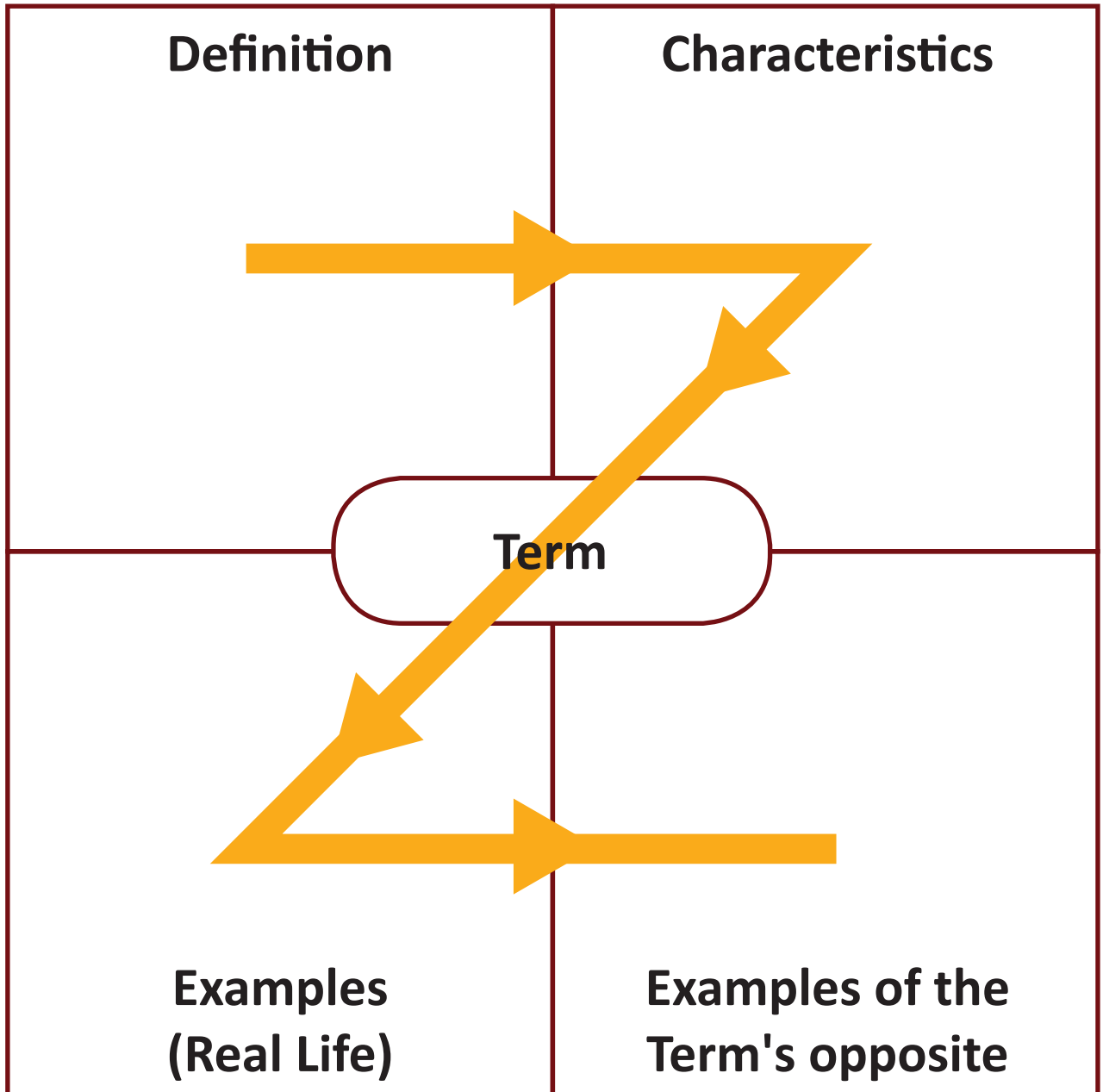
41

Record and refine your ideas about the meaning of 'sustainability' as it applies to meat processing.

The sequence in which you utilise the graphic is highlighted by the dotted lines and arrows.

Definition	**Characteristics**
Term	
Examples (Real Life)	**Examples of the Term's opposite**

42

SWOT Analysis

'SWOT' is an acronym for **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats.

A SWOT analysis can help identify vital areas of a topic to either emphasise or improve.

Use the following links and undertake a SWOT analysis of the automated systems and technologies being used in the meat processing industry.

Video 1 'Bladestop', an automated system that cuts red meat and mechanically stops the bandsaw blade when the unit senses that a person has come within one millimetre of the blade and improves safety for all of the team working there **https://www.youtube.com/watch?v=NiRegdech_E&feature=youtu.be**

Video 2 is about a South Australian processor who has integrated innovative technologies into their plant using a robotic cutting system that reads information from x-ray data and delivers amazing cutting accuracy at **https://www.youtube.com/watch?v=5NRZaiZ9EnM**

Video 3 explores a NZ processor in which only robots and automated systems, process and bone a carcass of lamb into a variety of different cuts of meat **https://www.youtube.com/watch?v=MZIv6WtSF9I**

Video 4 features a NSW processor who has installed an industrial robot to steam clean lamb carcasses, kill bacteria and remove any contaminants via a vacuum. **https://youtu.be/bZKSsHXO6rc**

Analyse what influences the design of the processing systems featured in the videos. Might there be ergonomic influences; health and safety influences; economic, welfare or sustainability influences?

What do you think are:

- The strengths of the processing system featured?

- The weaknesses of the processing system shown?

- The real opportunities that the processing system featured offers in terms of sustainable and ethically produced red meat products?

- The real threats that might impact on industry's suggestions that they are committed to producing sustainable and ethically processed and produced red meat products?

43

De Bono's Six Thinking Hats

Explore the issues you uncovered about the ethical and sustainable production and marketing of red meat products. Use the six thinking hats below to think through the issues according to each coloured hat and the question asked.

WHITE HAT
Information

List the facts that you know about regarding how beef, lamb and goat meat are processed and marketed?

RED HAT
Feelings

What are the emotions and feelings associated with how beef, lamb or goat meat are processed and marketed? How do you feel about this?

GREEN HAT
New ideas

How could the problems related to meat processing and marketing systems be solved? What needs to be done?

BLUE HAT
What thinking is needed?

What has happened so far?
What should happen next?
What questions should we consider?

44

YELLOW HAT
Strengths

What are some of the positive aspects and outcomes of seeking new ways to process and market red meat?

BLACK HAT
Weaknesses

What are some of the negative aspects and outcomes of seeking new ways to process and market red meat?

Dream

This is where you use the knowledge you've gathered to visualize a creative and appropriate solution. This is an holistic process where we imagine what the solution will appear like as it would in the future. Instead of asking "why" we ask "why not?" The question of "what's the worst that could happen" becomes "what's the best that could happen?"

Consider the many possible ways you can design a next evolution of meat processing plant.

On which aspects of sustainability and ethical processing, production and marketing do you want to focus?

How might you integrate these considerations into the meat processing plant?

Can you imagine a way to incorporate 'drones' or 'Unmanned Airborne Systems' (UAS) into the plant?

Could drones and UAS's make assessments about sustainable and ethical processing processes that might be useful to the industry?

Can you imagine how 'sensors' might be used in a plant to relay vital information about how the livestock arrive at the plant; how they're grouped and placed in holding yards; how they are provided with water, food and shelter; how they are led into the plant; how they are hung, bled, and trimmed to a set standard; how they are graded according to AUS-Meat standards; how they are chilled, branded, weighed and packaged?

Might you design such a system of 'sensors'?

Can you imagine how and where to place 'scanning' technologies?

How might your design incorporate odour technologies?

Will your design incorporate water recycling technology, effluent re-use or any renewable energy technologies?

Will your design incorporate 'robots'? How might they enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers?

Could insensibility gases be part of the animal welfare system? Might curved races help livestock not see people in the lairage, ahead of them?

Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?

How do you want consumers to feel when they read labelling, branding and marketing claims?

How do you want the site's staff members to feel when they work in the plant?

Visualise your systems that can manage water, energy and waste productively, and handle animals ethically at a meat processing plant, and in a way that helps tell the story and create new narratives about how meat is processed and produced in the next evolution of meat processing plants.

Develop possible solutions by brainstorming all solutions.

Visualise your creative direction for their next evolution of meat procesing plant, identification system, and commercial.

Imagine the steps involved in designing your next evolution of processing plant, poster and brochure.

Think about the materials, tools, and equipment they will need to design your individual work samples. Will you use digital or non-digital equipment and tools?

How might you communicate the ways your design ideas, technologies, systems and solutions help meat processors manage customer expectations, and reduce impacts on the environment.

45

Plan of a Meat Processing Plant

Check out a design plan of a 'generic' meat processing plant. Review all the steps involved in meat processing. Then, using this information and the outline of a generic meat processing plant on the next page, draft your design ideas.

Livestock unloaded

Livestock placed in holding pens with food, water & shelter

Livestock led to the lairage, stunned & slaughtered

Carcass loaded onto overhead conveyor

Ear tag scanned

Effluent collected in treatment ponds to be used to fertilise fodder pastures

Fluids & other waste collected and converted into tallow* either on or off site or collected for resource recovery
*cooling of an on-site tallow processor can generate hot water used throughout the plant.

Carcass hung to drain fluids

Carcass steam vacuumed to remove contaminants (manually/robot)

Carcass cut in half (manually/robot)

Hide removed

Head removed

Hides sent off site for further processing

Hoof & hock removal

Waste collected and converted into tallow* either on or off site or collected for resource recovery

Offal processed, packaged and sent for distribution

Innards & offal removal

Carcass trimmed

Carcass graded

Carcass branded & weighed

Carcass chilled

Waste collected and converted into tallow* either on or off site or collected for resource recovery

Carcass boned (manually/robot)

Carcass labels scanned for quality control

Carcasses to abattoir boning room via overhead rail or automated systems

Some carcasses delived to butchers for boning

Carcass broken down into different cuts of meat and packaged

Packaged meat weighed and labelled

Packaged meat scanned for quality control

Packaged meat packed into cartons

Meat cartons stored in chiller room awaiting transportation

Refrigerated trucks transport packaged meat to retailers

1 Stock yard 2 Slaughter house 3 Boning room 4 Chilling room 5 Packaging & transport 6 Rendering plant

Australian Meat Processing – *Networked, Ethical, Sustainable and Intelligent*
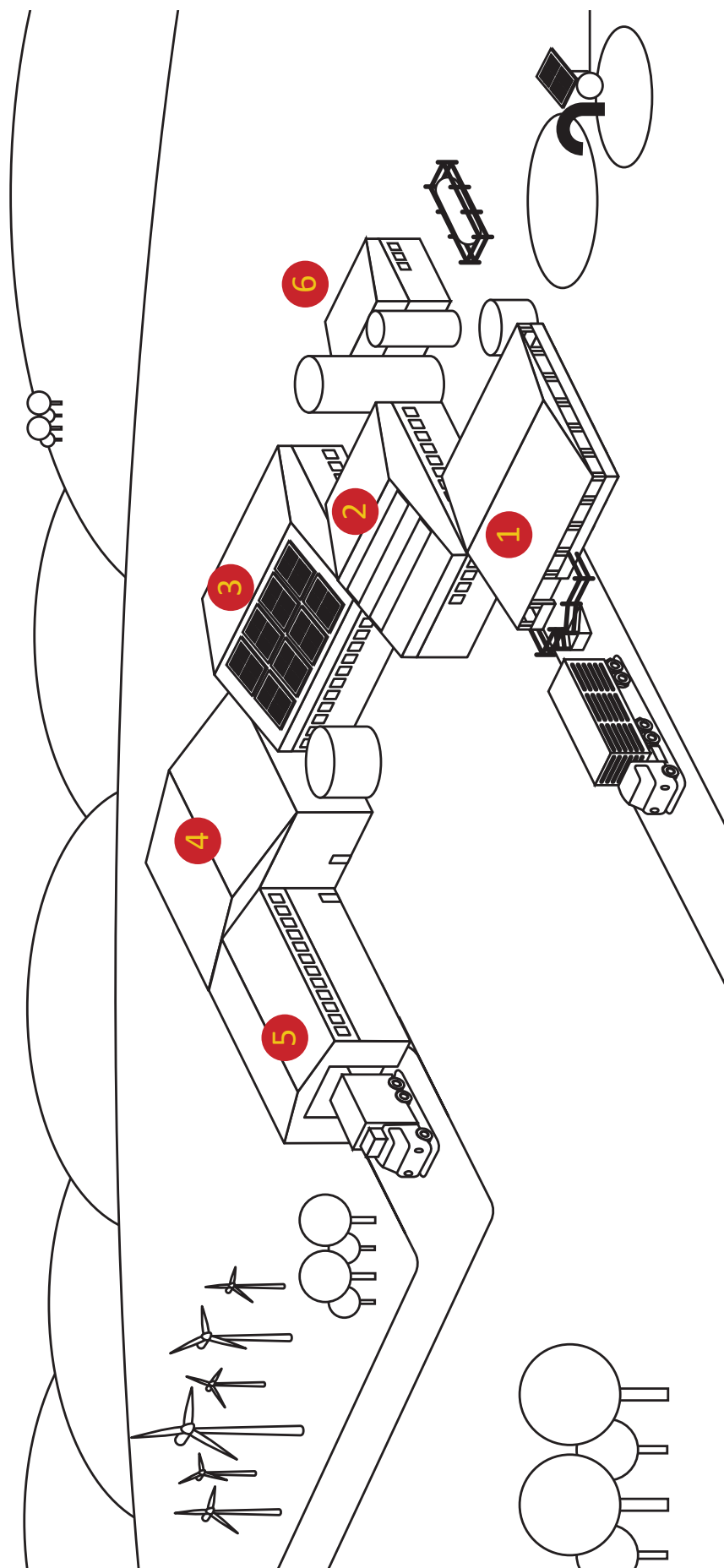
Design

Commence by establishing your desired outcome; then visualise the various steps necessary to achieve the visualized solution in measurable, achievable steps.

Prepare a project plan to outline information that needs to be gathered, who is responsible, where you will seek information from, and how it will be gathered. Try and work out the order in which you are going to do things when researching and designing. Knowing what you have to complete, and in which order, will help you organise your time better during the project. Write it down as a suggested order of work.

What do I need to do?	How will I gather the information? How will I create my designs?	When will I do this?	How can my products and processes be improved?

48

Or, consider another type of Project Plan. Consider a plan with the following headings.

What	How	When	Who and what's needed	How will we know if it worked

You may like to sequence an order of work

Step 1	
Step 2	
Step 3	
Step 4	
Step 5	
Step 6	
Step 7	
Step 8	
Step 9	
Step 10	
Step 11	
Step 12	

Remember your task is to design their next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations.

Remember to include information in the design about how the systems and technologies manage water, energy and waste productively, treat the livestock ethically, reduce manual handling and repetitive work, reduce the risk of injuries, maintain equipment, collect data for the processor, make money or save money, and help meat processors market a quality product credibly.

Don't forget about the importance of sourcing graphics, photos and information correctly.

Review rules on personal safety, group safety, and classroom and furniture safety with the team. Establish a workstation and gather the materials and tools you need. Store your design safely and keep a record of the processes the team uses to create it.

Draft the steps involved in making their chosen digital or non-digital design.

Gather the materials, tools, and equipment needed and then plan each step involved in creating the digital or non-digital design.

Start creating and remember about the need to write a script for a commercial to advertise the plant and what it processes and produces**.**

Think about how your team might share and present your designs to an audience.

Deliver

This stage is the process by which the dream becomes a reality. It's where you actually implement the designs you have created to complete the solution to the problem in two separate steps:

1.   Produce (a design for next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations);

2.   Write a script for a commercial to advertise the plant and what it processes and produces), and

3.   Publish these (presenting the finished designs in your effort to educate others about how red meat might be processed in the next evolution of meat processing plants).

Use the following prompts to write your script.

Write the introduction:

Write the body:

51

Write the conclusion:

Debrief

Self-Assessment –
Things to improve

You need to be able to judge and measure the success of your designs in addressing the original tasks and achieving your goals.

Refer back to the earlier tasks set by AMPC, to see whether you achieved your goals of creating the next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations, and a script for a commercial to advertise the plant and what it processes and produces. Did you present the finished designs and educate others about how red meat could be processed in the next evolution of meat processing plant?

Review your work samples and see whether you/your team achieved the goals.

Reflect on the strengths and any weaknesses in the designs.

Brainstorm any things that could have been done differently to get a better result.

Discuss ways you/your team might communicate its success and engage others to try the ideas that worked.

Write an account of the processes undertaken in the project or develop a flowchart identifying various strengths and weaknesses, opportunities and threats of the strategies used in the final designs.

Reflect on the learning

Complete a self-assessment activity.

Using your learning journal to reflect on and answer the following questions:

- How has my/our attitude and behaviour changed as a result of my learning?

- How well did I/we contribute to any pair/team learning activities?

- How can I/we apply what I/we have learned to another topic?