# From concept to reality – developing new technology in remote Australia

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## Abstract

There is a need for beef businesses to regularly collect and analyse data about cattle and pasture performance, to benchmark and improve business performance, to set and adjust stocking rates, to implement supplementation programs and to plan long-term carrying capacities. High costs of mustering; weather conditions; and lack of labour, infrastructure and on-farm skills can prevent timely weighing of cattle or measurements of pasture. The Precision Pastoral Management System (PPMS) seeks to automate these tasks and deliver the results to the manager's computer. Industry consultation revealed support for the concept, and development began in 2011 by the CRC for Remote Economic Participation. To minimise adoption barriers, beef producers are engaged in development and trialling. While commercialisation of the PPMS is still some years away, the project team's experiences may assist other researchers to develop technology products for beef producers in remote Australia.

## Introduction

Many industries use electronic data to analyse their productivity and to remotely monitor assets; indeed, Parmar *et al*. (2014) identify this as the new way to drive business growth. Within Australian agriculture, it is suggested that research and development must focus on advanced technology such as robotics, digitisation, 'big data' and precision agriculture (Commonwealth of Australia, 2014). At the same time, beef producers are seeking technology to increase production but decrease its costs and filling labour and skills gaps.

Beef producers need to accurately assess pasture over large areas and multiple land types, but they cannot view all the land within paddocks. Producers also have little access to data about individual animal weight and growth rate, due to the costs associated with measurement. From previous research, the Remote Livestock Management System (RLMS) (Ashley *et al* 2008) was developed, which is being commercialised by Precision Pastoral Pty Ltd. The RLMS automatically weighs and drafts cattle, without the need for labour, then transmits the liveweight data to the beef producer. Individual cattle can be managed at a precision similar to more intensive agricultural industries, such as dairy.

The Precision Pastoral Management Tools (PPMT) project aims to develop a commercial system that automates and integrates animal and pasture data into a single package delivered remotely to the manager's computer. Industry consultation revealed support for the concept, and development began in 2011 by the CRC for Remote Economic Participation.

This paper outlines the methods used and lessons to date during the development phases of the system compared with previous technology projects.

**Methods**

The PPMT project conducts research and engagement activities to develop a commercial product. The project is aligned with beef producers' needs via stakeholder engagement strategies: development activities integrate the remote collection of pasture and livestock data and improve the delivery system; an advisory committee of industry members provides feedback on these data; and collaborators at the six research sites provide continuous feedback on the system's performance. This extensive engagement also helps build and educate the market for the commercial product produced at the end of the project.

The research sites are commercial cattle stations across northern Australia, selected based on a matrix of attributes, including management structure, environmental and climatic locations, land and cattle type, markets, accessibility, research experience and their strong desire to contribute to the project.

On-ground quantitative and qualitative research ensures the system is adequately accurate for decision making. It also determines the economic, environmental and social benefits of the product.

Quantitative research is conducted by collecting data on pasture and cattle performance over two wet and two dry seasons. These data are then compared against the data used in the PPMS to validate the accuracy of the PPMS data. The six participating properties contribute to a financial analysis to assess the costs and benefits of using the PPMS.

Qualitative research is based on the cognitive systems framework (McCown *et al* 2012). As each site progresses through the research phases, researchers and participants pause to review progress, then apply it to the next phase (Figure 1).

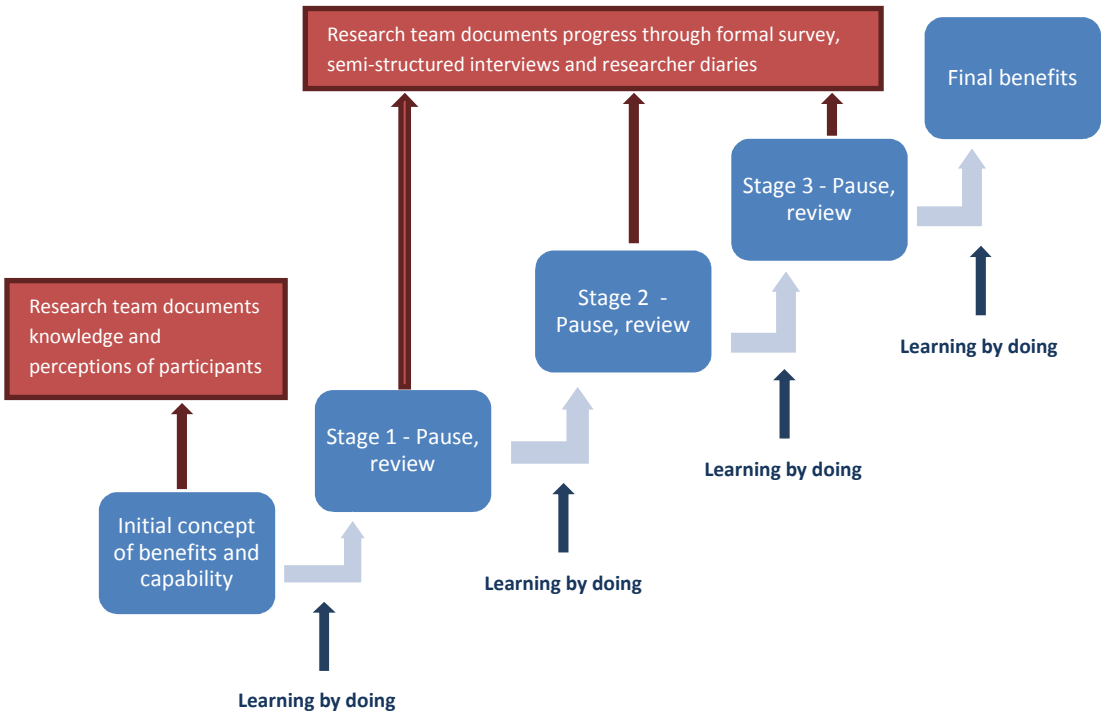


Figure 1. Framework for the PPMT project qualitative research methodology

Research is also determining the value of the PPMS to customers, while commercialisation strategies and business models are being developed to protect the intellectual property in the project. These multiple research, engagement and intellectual property challenges in developing the PPMS are discussed below.

**Discussion**

The PPMS development, research and engagement activities aim to minimise the barriers to its adoption. Despite extensive validation and demonstration, uptake has been lower than expected of previous technology development projects undertaken in Australia's rangelands. *Stocktake* was being used by 13% of beef producers in Northern Australia in 2011 (Hamilton and Banney 2011); water medicator usage in the NT was 7% in 2004 (Oxley *et al* 2006); and only 1% of producers were using water point monitoring via telemetry in the NT in 2010 (Cowley *et al* 2014).

In this project, qualitative research methods discover how each producer interacts with, learns from and uses the PPMS to inform their own decision making; this enhances confidence that other producers will use the software, as industry peers contribute to the attitude of industry members to adopt new technology (Marshall *et al* 2014).

Adoption of the PPMS by beef producers is the priority for the project. Commercial delivery is viewed as the best outcome for beef producers, with them paying for the required maintenance and upgrades. However, the *Stocktake* software example shows that even free software requires continual upgrades to match new operating systems, can be a barrier to ongoing use of the software by existing clients (Hamilton and Banny 2011). Software owned and managed by government organisations still depends on government funding, which may be reduced or redirected at any time.

However, there are also drawbacks in publicly funding a technology development project with commercialisation aims. To maintain a competitive advantage, intellectual property is held as commercial in-confidence, limiting opportunities to share research experience and findings; this may delay the arrival of a competitive product. The price of the commercial PPMS may also be a barrier to adoption and research investors risk the cost of commercialising the technology and product failure or poor uptake. In addition, the Australian beef industry market size is limited, with little room to grow the customer base unless international application is considered.

**Conclusion**

The PPMS development and research aims to meet the industry's need for data about pasture and cattle performance and to identify areas for improving production and profitability. The PPMS must minimise the barriers to its adoption by beef producers, while managing intellectual property to maximise its commercial pathway. Commercialising the PPMS comes with risks for the developer and investor, but for beef producers it could deliver a software system that can be easily adopted, meets their business requirements and is continuously supported and improved.

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