An Exploratory Study in Community Perspectives of Sustainability Leadership in the Murray Darling Basin

Christine Harley · Louise Metcalf · Julia Irwin

Abstract This article explores the emergence of leadership during implementation of a water saving initiative in the rural community surrounding Barren Box Swamp in the Murray Darling Basin, Australia. Qualitative data analysis indicated that the system elements affecting the type of leadership to emerge included the extent to which the groups were engaged in the process, the level of access to resources, and the level of investment in the outcomes of the project. Although these results reinforced key aspects of complex problem-solving through collaboration, they demonstrated varying degrees and types of both engagement and leadership within the case community. Given the current finding that these varying elements can coincide within one system, this case suggests that each community's characteristics, resources and context will determine the optimal combination of leadership style and level of collaboration needed to facilitate sustainable community development.

Keywords Leadership emergence · Community collaboration · Complex systems · Sustainability

Introduction

The literature on complexity has articulated the theoretical definitions and theorised relationships between elements of complex systems. However, evidence as to how complex problems may emerge complexity leadership remains a gap. Recent researchers of the topic in applied settings (Plowman et al. 2007; Angus-Leppan et al. 2009; Du et al. 2012) have found complex problems, such as organisational sustainability, appear to involve the use of multiple, and quite often simultaneous, leadership styles. However, the circumstances which led to the emergence of those different leadership types, and their relationship to each other, were not explored. Further, Clarke (2012) notes the development of complexity leadership is under-researched, and insights into the interactions by which complexity leadership emerges should be gained through studies that focus on the nature of interrelationships within systems. The current research aims to add to the literature by observing and describing these interactions of elements within a case where sustainability is a particularly complex problem, that of the Murray Darling Basin in Australia then to describe the relationships or patterns among the elements of the system in terms of how and what leadership emerges. The purpose of the study is to better understand how certain system conditions may give rise to leadership within complex problems as faced by communities with organisations as part of those communities.

The equitable and sustainable distribution of scarce natural resources is an age old challenge, and the current issues surrounding water allocation in the Murray Darling Basin are clear examples of such dilemmas (Acheson 2006; Bodin and Crona 2009). The Murray Darling Basin is one of the largest and most economically important catchments and food producing areas in Australia. However, it faces serious problems including dry land salinity, biodiversity decline and competition for water use (Allan et al. 2009). These problems threaten the future of the river system and so the survival of the hundreds of communities that rely on

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it for their livelihood. The economic consequences of a significant downturn in the productivity of the Murray Darling Basin would be devastating and wide spread. At the same time, continued over-allocation of water resources to irrigation would have catastrophic ecological impacts. Competing interests and varying levels of understanding among the numerous stakeholders affected by water distribution decisions mean that there are no straight forward solutions. Indeed, the complexity of the situation has led many to describe the problems as 'wicked' (Allan et al. 2009; Boully 2004; Head 2010; Walis and Ison 2011).

Wicked problems differ from other types of problems in several ways. They involve disagreement over their very definition as problems, and therefore cause conflict over what constitute appropriate solutions (Head 2010; Roberts 2000). The water allocation disputes in the Murray Darling Basin are easily identifiable as wicked problems due to the interconnectedness of the natural, economic and social systems affected. Further, the potentially widespread, unforeseen impacts that any decisions or action may have, and the uncertainty surrounding future water availability add to the complexity of the circumstances. The density and multilayered nature of the problems being faced in the Murray Darling Basin by the natural environment and community members alike means that the solutions are likely to neither be simple nor come from a single or even a few points of view (Bodin and Crona 2009; Marshall et al. 2010; Sun and Anderson 2011). Acknowledging this complexity provides insight into why many policies and programs introduced to address the water crisis in the Murray Darling Basin to date have generated controversy, failed to achieve their stated goals, caused unanticipated effects, or were hopelessly difficult to coordinate and monitor (Boully 2004; Head 2010; Ostrom 2009). In searching for solutions to the complex problems faced in the Murray Darling Basin, a number of factors need to be considered simultaneously, including the mechanisms that induce community behaviour change for sustainability (Memon and Weber 2010), and the leadership patterns that emerge when different stakeholder groups interact in such times of crisis or change (Stein et al. 2011).

The overall aim of this research is to explore approaches aimed at solving complex problems, the features of leadership found to emerge from complex systems during the process of dealing with complex problems, and the characteristics of communities themselves which may have facilitated progress towards sustainability. While the likely number and complexity of influences on leadership emergence are acknowledged, the research will endeavour to take into account those variables in an effort to find mechanisms for sustainability leadership. This research will explore these things using the case of a community around Barren Box Swamp in the Murray Darling Basin

which is known to have assisted in increasing water sustainability. It is important to understand the circumstances and characteristics of this case with a view to applying that knowledge to increasing the likelihood of success of sustainability initiatives in other communities and contexts. First, research on leadership will be synthesised and comparisons between the effectiveness of different leadership styles will be drawn. This will summarise the vast amount of knowledge about leadership styles that has been accumulated. Then, in exploring the less well-covered areas of the literature, the emergence and role of leadership in collaboration as an approach to tackling wicked problems will be examined. Further, community characteristics will be discussed in terms of their part in the emergence of leadership, assisting progress towards sustainability. Finally it will be proposed that these mechanisms may be some of the driving forces behind the success in the case under current study.

Leadership in Complex Systems

The literature relating to leadership is enormous, and dominated by the study of managers and the controlling, manager-subordinate relationships within organisations (Angus-Leppan et al. 2009; Onyx and Leonard 2010). However, there is increasing recognition that the traditional, structured, hierarchical view of leadership is becoming less useful as a widely applicable model given the dynamic, complex nature of organisations and other systems of interest (Lichtenstien et al. 2006). The nature of the Murray Darling Basin communities is summarised by Boully (2004) who observed that "there is no such thing as the 'Basin community', but rather a highly complex, interacting set of communities. We are all members of different communities at once, some defined by place, others by interests, some enduring, others short-lived" (p. 2). In viewing the Murray Darling Basin communities and their concerns as a complex system, consideration can be given to the types of leadership which have been found to emerge and be effective in such a context. Characteristics of leaders that have been found to be more successful in complex, dynamic environments tend to differ from traditional conceptions of leaders, and the value of more engaging, communicative styles, rather than power-based styles, is being recognised (Onyx and Leonard 2010).

The literature on complex systems leadership highlights the desirability of particular leadership styles. For example, transformational leadership, which stimulates people to rise above personal interest and benefit, inspires changes in people's values, beliefs, aspirations and commitment to the systems of which they are members (Boehm et al. 2010), appears advantageous in serving to build trust and enhance community resilience (Kimhi and Shamai 2004; Farazmand 2007).

According to Sullivan et al. (2011), a facilitative leader who is diplomatic, inclusive, consensual, and opinion neutral who brings together actors in an open and equal process, is needed for successful collaboration. Given that collaboration to solve complex problems necessarily involves complex systems, complexity leaders facilitate networked system adaptation by disrupting the status quo, being tolerant of uncertainty and ambiguity, and enabling group members to make sense of the situation and surroundings (Lichtenstien et al. 2006). These leadership characteristics differ from the traditional notions of leaders as managers and controllers and leaders who are leaders based on organisational position such as CEO.

Although the less traditional characteristics and triggers of emergent community leadership are of particular interest, Onyx and Leonard (2010) found that a number of more traditional leadership features were still present among the seven themes they identified in their own case studies. For example, the common features that fitted what could be described as more conventional leadership qualities included: vision; project management skills and; succession planning. This is consistent with the observations of Davies (2008) who reported that the transactional leadership skills, that are generally taught in rural community leadership training programs, were important for successful project management, but did not necessarily result in improved community adaptive capacity (Davies 2008). Further, Du et al. (2012) have recently reported that both transactional and transformational leadership styles are connected with instituting sustainable practices in an organisational setting. Their findings suggest that while transformational styles were associated with designing and initiating sustainability initiatives, transactional leadership qualities helped to secure the positive organisational outcomes purported to flow from such socially responsible practices (Du et al. 2012). It is important to investigate the possibility that a combination of leadership styles may have been associated with the success of the sustainability initiative in the community under study. This will add to future efforts being able to identify gaps in capacity of community leaders, who may well be called upon to display or enable transformational, transactional or other leadership depending on the situation. Davies (2008) discussed the lack of success in government initiatives to develop community leaders through a predominantly top-down process similar to Burn's (1978) transactional model. In attempting to secure the development of sustainable socio-economic communities, in Davies (2008) study, leaders emerging from on ground community building projects appeared more likely to display the transformational attributes required (Davies 2008).

In complex systems, while leadership is thought to emerge from the interaction between system elements,

there is little discussion in the literature of the specific circumstances that are necessary for such emergence in a way that might inform either system, or individual development for producing effective leaders. Research has found that perceptions of justice are certainly important variables in understanding social conflict concerning the allocation of water for irrigation farming (Gross 2008). Gross (2008) reported the sense of injustice and perceived need to be heard as a community, as a sufficient trigger to leadership emergence. Beer (2011) found in his study of emergent community leaders, that the roles played can have an adversarial element which is necessary, alongside the need for cooperation and political awareness. In the current study, it is the Murray Darling Basin communities' leaders' views of the circumstances leading to their emergence as leaders that is of interest—whether through their attitude towards the ecological or economic crises, or the need to intervene into interactions between the appointed institutional managers. Thus this research aims to discover the mechanisms which facilitated leadership emergence in this particular context. The work of Toor and Ofori (2008) explored the tipping points that inspired leadership in emergent project leaders. They found numerous antecedents or trigger events including leader attributes as well as institutional and environmental factors. They also flagged the need to qualitatively explore the experiences of emergent leaders to discover the leaders' perspectives of the triggering events or emotions. Therefore the current research will represent an important step towards closing that gap in the leadership literature.

Given the complexity of the issue and community being studied, a complexity leadership approach is warranted, and as mentioned above, looks at leadership emerging from dynamic interactions between system elements. Such interactions between elements occur during collaboration. Collaboration as an approach to problem solving is contrasted with a competitive approach where group members struggle with each other for power, vying for resources, and with top-down or hierarchical approaches which generally accommodate authoritative leaders directing, dictating and managing the other members of the group (Roberts 2000).

Collaborative Leadership

There is a long history of government and community efforts to successfully manage the Murray Darling Basin, dating back to the mid-1800s. Efforts have included the development of numerous instruments (from the 1914 River Murray Waters Agreement, which set out agreed shares of water rights between New South Wales, Victoria and South Australia, through to the current version of the Murray Darling Basin Plan which was distributed for

comment late in 2011) and various committees and commissions brought together to discuss and resolve resource management issues (Boully 2004). However, it has been claimed that these predominantly top-down, hierarchical water resource policy and management initiatives have not worked, have created scepticism amongst community members and, in many instances, contributed to the very crisis they have sought to avoid (Head 2010; Memon and Weber 2010). For these reasons, the current research is important to draw distinctions between the leadership profile of the successful change under study, with those of the many unsuccessful attempts to improve water security.

The situation in the Murray Darling Basin involves numerous stakeholders; farmers, indigenous communities, local business, environmentalists and government, to name a few. While there is widespread acceptance that the overarching problem is water scarcity (Bakri et al. 1999), and all agree that the environment needs to be protected, each group of stakeholders would receive some benefit from having the problem framed with reference to their particular view. As such, the power of one person or group within the community is not likely to prevail. Roberts (2000) proposes that authoritative approaches are suited to situations where power is centred with one element in the system, whereas competitive approach may be appropriate in situations where the power is contested and likely to settle with one prevailing sub-group. However, where overall power is uncontested and distributed throughout the system, it is argued that a collaborative approach is the key to dealing with wicked problems (Roberts 2000).

Leadership for successful collaboration is described in terms of being enabling and transformational in nature, in contrast to traditional controlling or hierarchical notions of leadership. Weber and Khademian (2008) describe network leaders as collaborative capacity builders who build long-term collaborative problem-solving capacity within the community. Supporting this view, Page (2010) points out that successful collaboration around one issue can reduce conflict and build capacity to enable future collaborations around other issues. Sun and Anderson (2011) further argue that multi-sector collaboration requires integrative public leadership, which incorporates the concepts of transformational leadership, but goes further to include the construct of 'civic capacity'—encompassing community drive, connection and pragmatism.

It has been proposed that place leadership is one of the factors which explain why some communities are able to collaborate to not only survive, but thrive and adapt to change while others struggle (Collinge et al. 2010). Collinge et al. (2010) discuss the issue of leadership of place and describe the importance of recognising the unique attributes that attach people to their 'place', in economic, social cultural and emotional terms. A sense of place refers to community members' intimate knowledge of and connection with their environment, and equips leaders to more effectively facilitate adaptation to change (Manzo and Perkins 2006). The effectiveness of leaders also depends upon their ability to empathise with others on the level of attachment to their place—in this case, a community embedded within the Murray Darling Basin. We will explore the relationships between leaders and the wider community in the current research in order to establish the role of such leaders' characteristics in the success of the project.

Collaboration is by no means a panacea for complex problems. Although the aim is to provide favourable solutions for the majority, the level of compromise and trade-offs are not often recognised or quantified in discussions of successful collaboration (Hahn et al. 2010). Several potential disadvantages have been highlighted by Fish et al. (2010). These include the increased transaction costs involved in including all relevant stakeholders, and the risk of power imbalances undermining the credibility and trust within the collaborative group. Maintaining the commitment to long-term goals when benefits are difficult to visualise was also cited as a challenge in the collaborative process (Fish et al. 2010). Hence, the more traditional leadership role of 'keepers of the vision' may still be appropriate for community leaders wishing to sustain collaborative action. Rogers and Weber (2010) claim that the current thinking about collaborative governance structures is incomplete and contend that goals or desirable outcomes from the process should be expanded to include enhancing agency resources, developing and transferring technology, and going beyond compliance. Such outcomes would be beneficial in the resource management scenarios being faced by complex systems, as although there is evidence of reasonably successful collaborative governance processes, there is a distinct lack of credible and realistic community wide shifts in behaviour towards sustainability (Rogers and Weber 2010). Given the purported favourable outcome achieved in the current case being researched, it is vital to investigate the types of leadership that underpin its sustained success.

Leaders displaying styles which facilitate collaboration tend to emerge from within the complex system through interactions between group members (Onyx and Leonard 2010) and the leadership that emerges may result in more than one individual sharing leadership roles at different times throughout the process (Sun and Anderson 2011). Boehm et al. (2010) found that the type of leadership preferred by community members differed according to the current state they experienced—where a community was in crisis, transformational leadership attributes were preferred over traditional transactional leadership styles. However, where communities experienced states of relative stability,
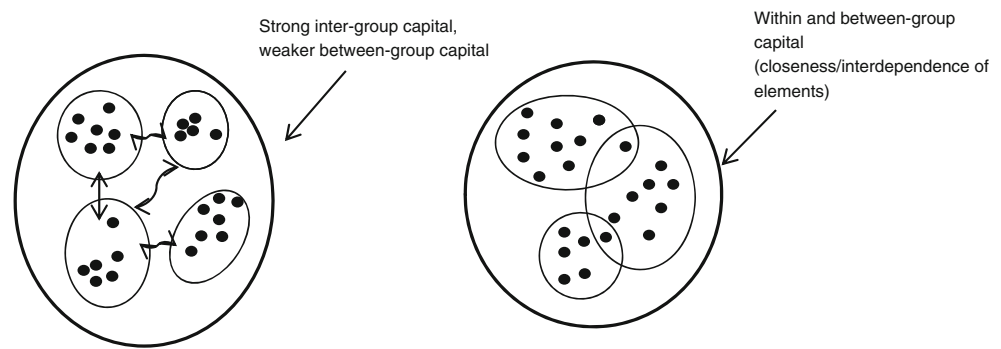
transactional styles were rated as more effective and desirable. The current research will explore whether the adaptability of leadership styles or the ability to interchange leaders at different times may have contributed to the community's sustainability. Further, the characteristics of the community will be considered in terms of their effect on the leadership that may have emerged.

System Characteristics

Social systems, such as communities, are characterised by a number of features, including their level of social capital. Onyx and Leonard (2010) emphasised the importance of leaders' level of 'embeddedness' in community development projects, and viewed this as a proxy for the effectiveness of social capital. Although leadership is nominated as being required to mobilise social capital towards community development, the nature of that social capital is also important. Indeed very different outcomes have been found between communities with varying levels of between-group social capital versus within-group social capital (Hoppe and Reinelt 2010; Onyx et al. 2007). Within-group capital refers to the cohesion and closeness of members of a particular sub-group, whereas between-group capital refers to the amount of interdependency and regard sub-groups have for each other. Between-group social capital, or bridging capital is required for successful collaboration, whereas greater within-group capital combined with weak between-group capital (characterised by conflict and mistrust) can create barriers to change and innovation (Edwards and Onyx 2007). Figure 1 demonstrates this idea. In addition, levels of other community characteristics such as collective sense of place (Rogers and Weber 2010), and the extent to which the community is engaged (Onyx et al. 2007) will significantly influence the type of community leadership to emerge.

Community engagement is an important factor in successful collaboration in that it provides a shared set of mental models, which is crucial. Community engagement refers to "structured dialogue, joint problem solving, and collaborative action among formal authorities, citizens at-large, and local opinion leaders around a pressing public

matter" (Schoch-Spana et al. 2007). While community engagement builds social and ecological resilience, it is important that community members have the same ideas about what the problem is, and what options are best for solving the problems independent of self-interest. To achieve this, effective community leaders are needed (Aslin and Brown 2002). Research has shown that differences in views of what the problem is within a group can lead to sub-optimal outcomes (Nowell 2009). That is, even though the parties believe they are 'all on the same page', the disparity in 'problem frames' prevent effective collaboration (Nowell 2009). The issue of incongruent problem frames is particularly salient in wicked problems, as there is no one definable problem—meaning that different interest groups are potentially viewing the same problem (and therefore their proposed ideal solution) from different standpoints. In this sense then, it is expected that the community leaders that may have emerged during the process in the current Murray Darling Basin study were effective in engaging the community and communicating a consistent vision for the greater good and sustainability of the community.

As discussed above, it is argued that the leadership of complex systems occurs through enabling group members to make sense of the situation and surroundings (Lichtenstien et al. 2006). However, although complex systems leadership is described as enabling rather than controlling, Dyball et al. (2005) make the argument that the term 'enabling' implies that systems *necessarily* have an ascribed purpose or goal, and that the parts automatically cooperate in some way to adapt and achieve that goal. This is rarely the case, and they claim that elements of 'messy', human systems are better described as 'constraints', in that they define the behaviour of their surrounding elements and result in distinct, system-wide characteristics (Dyball et al. 2005). Therefore, although leaders of complex adaptive systems may be effective enablers when systems have relatively broadly, undisputed goals, their role is problematic when the ambiguity and uncertainty mean that the system is divided in the process of sensemaking, in this case collaboration may be even more of a challenge.

System elements can cause barriers to sustainability, which have been found to be intricately linked phenomena. These may reinforce one another and create substantial inertia behind unsustainable patterns of behaviour (Burch 2010). However, it is possible that the same factors that can inhibit behaviour change (such as a group norm of combativeness or mutual disrespect) can also facilitate it (as with a group norm of collaboration or innovation) (Burch 2010). Leaders can play a crucial role to facilitate or mobilise these aspects of the system. Cocklin and Dibden (2005) include leadership skills within their definition of human capital, and therefore advocate leadership development as contributing to sustainability.

Sustainability is a term which many claim is ambiguous and socially contested (Angus-Leppan et al. 2010; Cocklin and Dibden 2005; Matten and Moon 2008). The majority of attempts to describe or define sustainability involve mention of three domains: social, economic and environmental. In addition, community's sustainability is proposed to depend on its stock of capital. Cocklin and Dibden (2005) in their work with the Academy of the Social Sciences in Australia project, described five 'capitals' which they contended underpin a community's sustainability; natural, social, human, institutional and produced. However, although a community's level of capital may be sufficient to ensure its survival given the continuation of the current ecological, economic and social environmental conditions, a change in those conditions could mean that extra capital is needed to adapt.

The unpredictability and changeability of the environment in which a system is embedded means that the amount of capital required for sustainability can never be known. Notwithstanding, actions taken in the belief that they will enhance sustainability do tend to increase the likelihood of survival, and so sustainability remains a concept that communities strive for (Cocklin and Dibden 2005). In the context of the Murray Darling Basin, economic livelihood depends largely on the ability to exploit existing natural capital through farming, which in turn allows the rural communities to collaborate and survive. The intertwined facets of sustainability make it even more difficult to argue whether a community is truly sustainable. Hence, the current study aims to discover community members' perspectives of sustainability and the efficacy of their sustainability efforts.

As noted throughout this review, the research so far has not brought together the concepts of sustainability, complexity, collaboration and community variables in a way which may predict leadership emergence, or provide a framework for future success of natural resource management or sustainability initiatives in communities. As such, through the analysis of retrospective accounts of the experiences of community members, this study aims to provide insight into the interaction of the many variables at play in the specific context of the Barren Box Swamp Water System. This will allow the examination of the interaction between community members and sub-groups that enabled the emergence of leadership that led to the successful community change, and to explore the various community perspectives of the issues and conflict surrounding sustainability in the Murray Darling Basin. This study also aims to determine what leadership and other mechanisms worked effectively to bring about change within the community, and what could have been done better in an effort to provide guidance for future community interventions.

Methodology

This study focused on a community in the Murray Darling Basin in Australia which has implemented a water-saving initiative that is proposed to contribute to its sustainability. The project won the prestigious *Environment & Heritage Award* in the Sydney Engineering Excellence Awards and was showcased at the Sydney Powerhouse Museum throughout 2007. It is held up as an example of "a pioneering project in water savings, environmental improvement and cultural protection in which irrigators, government, environmentalists and the local community worked together to bring about highly successful outcomes for all" (Murrumbidgee Irrigation 2012). To date, there have been no published critiques of the project suggesting that it has been anything but a success.

Prior to the project, Barren Box Swamp near Griffith in Australia was a vast, shallow water storage area, where a significant amount of water was being lost through evaporation. There were also water quality concerns with salinity and other mineral build-up in some areas of the swamp. The project involved dividing the swamp into three 'cells', two with storage functions, which decreased surface area subject to evaporation and increased the degree of control over water levels. The third cell was designated as wetland, to be regenerated and restored to its natural state to support biodiversity. The project involved the managing organisation, Murrumbidgee Irrigation Limited, renegotiating and acquiring land and water licences from some farmers. In addition, the earthworks required the disruption, and in some cases destruction of sites with indigenous cultural significance.

Participants

The current research is an exploratory, qualitative analysis of interviews with community members and stakeholders involved in the project. Although such research approaches

can be challenged on the grounds of imprecision and lack of rigour (Yin 2003), different methods are appropriate for different types of research (Braud and Anderson 1998). Although the literature outlined above suggests certain leadership patterns and collaborative interactions may have been expected, the specific situation was still relatively unknown, prompting us to ask 'what happened?' and 'why did it happen?'. 'What and why' questions are usually described as exploratory, in which case a qualitative approach is an appropriate first research method (Braud and Anderson 1998). As our aim was to offer an understanding of whether and why the case was successful when many other initiatives in the Murray Darling Basin have failed (Head 2010), the transformation of Barren Box Swamp could be seen as a critical case. As discussed by Yin (2009), a critical case has strategic importance in relation to a general problem or issue (Flyvbjerg 2006).

To source interviewees, an initial point of contact within the community being studied provided a number of further contacts, based on their roles during the Barren Box Swamp project. Those further contacts were then asked for recommendations of contacts to interview based on involvement and leadership in the process of reclaiming and restoring the swamp. This sampling technique has been successfully used to recruit participants in similar qualitative research endeavours (for example, Angus-Leppan et al. 2009; Onyx and Edwards 2010).

The majority of the interviewees were contacted and interviewed over the telephone. The researchers travelled to Griffith and conducted face to face interviews with representatives of the indigenous community. All interviews were recorded and transcribed verbatim by the researchers. Further details about the participants are available in Table 1.

There is a widespread reluctance to nominate an ideal sample size in qualitative research (Rocco et al. 1998). Unlike quantitative research, the purpose here is not to make statistical inferences but to draw case-bound generalisations concerning emergent leadership and collaboration across a range of cases. The practical value of this work is in making the most of and adapting the specific knowledge about this case to fit particular other cases—not to generalise solutions (Sandelowski and Barosso 2003). For the current research, 30 participants were interviewed, this number was considered by the researchers to be an appropriate balance between diversity of viewpoints and practical manageability. In addition, participants began to struggle to think of anyone else to recommend, or they suggested interviewees who had already participated. Several potential participants were contacted but not interviewed as they did not feel they had sufficient (or any) involvement in the project. Therefore the researchers determined that the sample had been exhausted when 30 interviews had been conducted.

Method

The interview questions were developed based on a similar study conducted by Angus-Leppan et al. (2009). In Angus-Leppan et al. (2009) the questions were written to encourage exploration of the topic of leadership and sustainability within an organisation in Australia, the current study altered the questions only so as to relate to the community that would be responding to the questions. The questions aimed to discover information about the participants' role in the project and their perceptions of leadership, they were open ended and interviewers were permitted to delve deeper by asking additional questions as needed.

The questions were carefully written to avoid leading the interviewee and they were designed so that responses could potentially disprove the researchers' original notion that leadership had to appear in the study. In other words, care was taken to construct questions where participants could demonstrate they were not leaders, or that leadership did not emerge. The questions also aimed to discover the participants' views on how the project succeeded, what worked and what did not work very well, to gain insight into how system elements interacted and influenced the outcome, and to allow participants opportunity to declare the outcome a failure in their own perspective.

The research followed what Gioia et al. (2013) suggest are the features of the methodology that enhance grounded theory development. That is, to articulate a well-defined phenomenon of interest (leadership emergence in complex systems) and frame research questions in 'how' terms (in the current research—'how did leadership emerge?' and 'how did the project succeed?'). Then, initially consult the existing literature with suspension of judgement about its conclusions to allow discovery of new insights. This was followed by data collection which gave voice to participants, analysis which maintained the 'participant centric' terms (in the form of the Leximancer maps) which led to the transformation of the data structure into a dynamic grounded theory model, with extra consultation of the literature to refine articulation of emergent concepts and relationships (Gioia et al. 2013) once the analysis was complete and interpretation of the findings was required. In addition, the interview questions were taken from a previous similar study and were written to ensure the initial consultation of the literature could be challenged.

Analysis

The analysis of the 30 interview transcripts was conducted using content analysis through a now commonly used for research content analysis software, Leximancer (Penn-Edwards 2010). Content analysis allows the examination of

Table 1 Interviewee details

Code	Interview method	Stakeholder type	Role/institution	Duration (min/s)
Respondent 1	Telephone	Murrumbidgee Irrigation	Employee (project manager)	35.43
Respondent 2	Telephone	Murrumbidgee Irrigation	Employee	24.19
Respondent 3	Telephone	Farmer		15.59
Respondent 4	Telephone	Murrumbidgee Irrigation	Employee	17.22
Respondent 5	Telephone	Farmer		22.16
Respondent 6	Telephone	Expert	Environmentalist	30.00
Respondent 7	Telephone	Farmer		17.52
Respondent 8	Telephone	Farmer		18.49
Respondent 9	Telephone	Community member	Funeral director	17.50
Respondent 10	Telephone	Expert	Murrumbidgee field naturalist	42.27
Respondent 11	Telephone	Murrumbidgee Irrigation	Employee	56.56
Respondent 12	Telephone	Farmer		16.08
Respondent 13	Telephone	Farmer		15.16
Respondent 14	Telephone	Farmer		35.01
Respondent 15	Face to face (Griffith)	Indigenous community	Aboriginal Land Council	36.38
Respondent 16	Telephone	Expert	Wetlands ecologist	23.00
Respondent 17	Face to face (Griffith)	Indigenous community	Aboriginal Land Council	49.58
Respondent 18	Face to face (Griffith)	Indigenous community	Aboriginal Land Council	49.58
Respondent 19	Face to face (Griffith)	Indigenous community	Murrumbidgee Irrigation Limited	19.42
Respondent 20	Telephone	Murrumbidgee Irrigation	Employee (CEO)	27.54
Respondent 21	Telephone	Expert	Wetland ecologist/farmer	28.56
Respondent 22	Telephone	Farmer		35.11
Respondent 23	Telephone	Farmer		36.40
Respondent 24	Telephone	Expert	Murrumbidgee Irrigation Technical Board	21.02
Respondent 25	Telephone	Community member	Department of Primary Industries	26.21
Respondent 26	Telephone	Community member	Department of Primary Industries	27.02
Respondent 27	Telephone	Farmer		37.33
Respondent 28	Telephone	Expert	Murrumbidgee Irrigation Technical Board	20.07
Respondent 29	Telephone	Community member	Rice Growers Association	19.56
Respondent 30	Telephone	Expert	Member MI Technical Board	17.50

language for the purpose of classifying large amounts of text into an efficient number of categories that represent similar meanings (Weber 1990). It is a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns (Hsieh and Shannon 2005).

The main criticisms of content analysis include the lack of reliability in terms of coder consistency over time, and inter-coder uniformity, both of which are improved through the use of software. The use of computer programs to automate coding removes subjectivity and ensures reproducibility. In particular, types of reliability are significant to content analysis: stability and reproducibility. Stability relies on the researcher consistently coding the text in the same way, over time. Reproducibility relies on different human coders consistently classifying the text. Gephart (2004), recommends the use of computer-aided textual

analysis as it allows for more systematic, comprehensive and exhaustive analysis. In the current study, the interview transcripts were analysed using Leximancer.

Leximancer is content analysis software that uses machine learning rather than the researchers' interpretations to generate and apply coding to the text of the interview; this adds reliability to the concepts that are built and the meanings that are attached to informants' discussion (Angus-Leppan et al. 2009; Leximancer 2005). Leximancer was created by Smith 2000 and contains techniques adopted from the areas of "computational linguistics, network theory, machine learning, and information science" (Smith et al. 2002, p. 1), it can be used to either search text to identify "key themes, concepts and ideas" (Leximancer 2005) in an exploratory manner, or the researcher can essentially 'ask' the software to search for specific themes and concepts. It is a form of content analysis software which "employs two
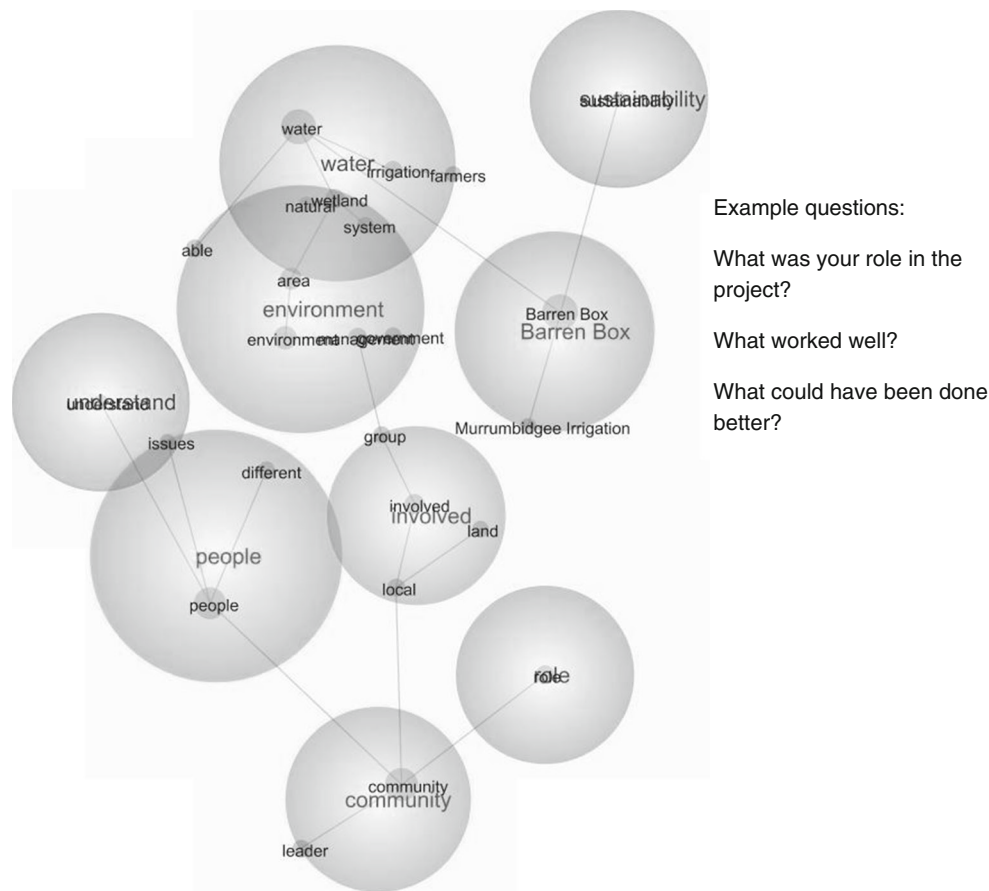
Fig. 2 Leximancer concept map with all data

stages of co-occurrence information extraction—semantic and relational" (Smith and Humphreys 2006, p. 262). It aims to ensure the researcher is "aware of the global context and significance of concepts and to help avoid fixation on particular anecdotal evidence, which may be atypical or erroneous" (Smith and Humphreys 2006, p. 262). An important aspect of the automatic mining of the data is unsupervised ontology discovery (Smith 2003, p. 23), that is, the results of analysis may contain "unexpected relationships that may be relevant to the user's investigation" (Watson et al. 2005, p. 1234). In other words, Leximancer can surprise you with concepts and themes that you as the interviewer/analyst/researcher did not originally acknowledge while collecting or endeavouring to understand the data.

Leximancer is does potentially allow for the specification of the size and number of themes, and the number of concepts it searches for, and so it is essential that we now set out the settings we used to generate the analysis.

Leximancer Settings Used for this Analysis

For the Leximancer analysis we initially allowed the software to automatically generate a list of keywords from the

dialogue. This was done so that the analysis was not driven by an of the researchers' own preconceived ideas about the output and so that the output could essentially expose new ideas about leadership in complex problems that the literature is yet to discover. To that end, the settings were left at the automatic, default settings, which allow for the software to determine the applicable number of concepts and themes based on their frequency and patterns throughout the text, and in reference to an extensive thesaurus.

This initial, exploratory analysis demonstrated surprising connections between leadership and the concepts within the problem, and also exposed commonalities of language use in the interviewees such as: 'thing', 'suppose' and 'probably'. The researchers decided to remove these from the diagram and analysis as a review of the source of these terms was found to be something similar to the use of 'um and ah', in other words, they were used merely to extend a sentence rather than provide a semantic difference in the interviewee's responses. These were removed from the concept list, and this second output is displayed in Fig. 2.

As the specific purposes of this research was to explore leadership emergence, the data relating to views on

leadership was then isolated from the rest of the data set, and analysed separately, this output is displayed in Fig. 3. That is, the data set in Fig. 3 displays respondents answers to questions directly asking about the subject of leadership. In this step, it was possible for the researchers to analyse the issue of leadership merely by 'asking' Leximancer to simply search for the theme and concept of "leadership". However, the researchers were cautious of biasing the resultant research outcomes, as there was still the possibility that the assumption of the existence of leadership was false. Therefore it was decided to separate out the responses to leadership questions instead and again analyse the existence of leadership, using the automatic, default settings, which allow for the software to determine the applicable number of concepts and themes based on their frequency and patterns throughout the text in analysis.

Finally, the themes and concepts were tabularised for the purposes of demonstrating the quoted text that Leximancer drew on to create them. In Table 2, further discussed in the findings section of the current paper, we demonstrate with examples what that table looked like. The example quotes are thoroughly representative of the data collected and the way Leximancer coded it.

In addition, the researchers note that there have been several discussions on how to increase the rigour of qualitative research, to ensure findings of this type of data are regarded with the same level of credibility as quantitative research. As such, the current research has noted and followed the suggestions of the likes of Morse et al. (2002) who advocate that reliability and validity remain appropriate concepts for attaining rigor in qualitative research. The researchers have done this by implementing verification strategies integral and self-correcting during the conduct of the inquiry itself. These strategies are evidenced firstly through the questions which allowed participants to describe the project as being unsuccessful if they felt so inclined, and to talk about their role in their own terms rather than using the language which exists in the literature on the emergence of leadership in complex systems. In addition, the questions themselves were previously found to be useful for exposing surprising and unexpected leadership concepts within complex systems under study (Angus-Leppan et al. 2009). Secondly, although there was no 'coding' performed by the researchers, as Leximancer performed the initial analysis and organised the data into concepts and themes, there was cross-checking and agreement of interpretation of the interrelationships between those themes and concepts to ensure reliability. This cross-checking was done with another researcher who also performed some of the interviews, and with a research team with experts in the area who had no relationship to the data collection and had not contributed to interviewing. This process ensured that all Leximancer exposed themes

and concepts, and relationships between themes and concepts, were discussed in the team, that researcher perspectives were 'checked' with a second interviewer and also with removed third parties.
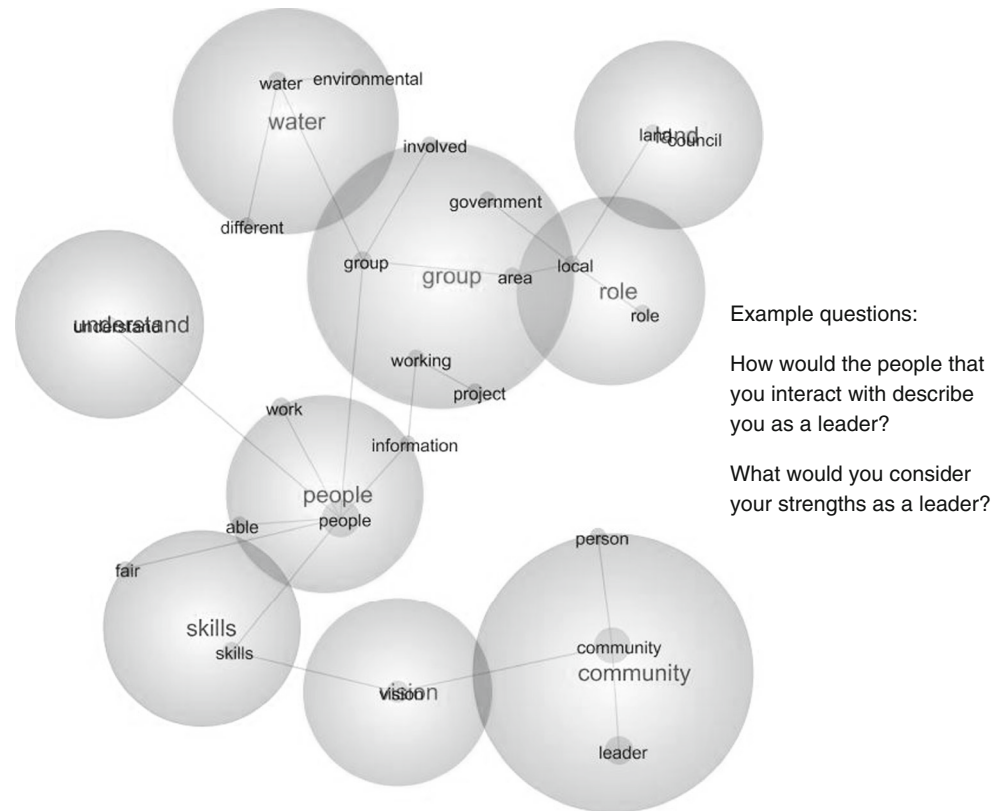
Findings

Figure 2 is the Leximancer output that charts the discourse from the 30 transcripts illustrating the frequency and relationship between concepts and themes. Concepts are terms which the software identifies as generally occurring together in sentences throughout the text. Themes are clusters of concepts, representing a higher level grouping of similar or frequently co-occurring concepts. The larger the circle, the more prominent the theme or concept was throughout the text and the theme is named according to the most dominant concept within it. For example, the word "people" was mentioned 451 times throughout the transcripts, whereas "role" was mentioned 161 times, resulting in the circle representing the concept of "role" in Fig. 2 being substantially smaller than the concept of "people". Therefore the figure illuminates in a pictorial way, the words that have been used more frequently in describing the respondents' experience of the Barren Box Swamp project. Unsurprisingly, the themes that emerged were 'water', 'environment', 'sustainability', 'Barren Box', 'understand', 'people', 'involved', 'role' and 'community'. The overlapping of the circles indicates the interconnectedness of the themes. 'Water' and 'environment' were themes spoken about through the shared concepts of 'natural' 'wetland' and 'system', suggesting that participants, understandably, related to these aspects of the project as being key, and strongly interrelated. 'Understand' and 'people' were connected through the concept of 'issues', indicating that the process involved people endeavouring to understand the issues.

The concept of 'leader' appears remarkably understated, given that the questions specifically sought interviewees' opinions on leaders' characteristics and leadership. This indicates that there was no discernible pattern of response, or common connection to other concepts around leadership, aside from 'community'. 'Barren Box' was linked to 'sustainability' and 'water', and 'Murrumbidgee Irrigation', the organisation which ran the project, was the only other concept to appear in the Barren Box theme.

Figure 3, which displays the text relating to the questions about leadership, also does not reveal 'leader' or 'leadership' as a theme and again only shows the concept of 'leader' being linked to 'community'. Other themes in this map reveal that participants, in discussing their views on leadership, still focussed on the issues around the themes of 'water' and 'land', but also linked these topics through 'group' and 'role'. This indicates that roles in

Fig. 3 Leximancer concept
map analysis of leadership items

Example questions:

How would the people that
you interact with describe
you as a leader?

What would you consider
your strengths as a leader?

groups, being local working groups or government involved with the project were related to environmental and land council issues and that participants linked leadership to formal leadership roles in known groups. The five other themes 'understand', 'people', 'skills', 'vision' and 'community' appear as a separate, leadership-related cluster, linked to the four themes mentioned previously only through the themes 'people' and 'group'. This separation supports the previous finding that participants linked leadership with formal leadership roles and suggests that peoples' views of leadership, the skills and understanding required, and the overlapping of 'vision' with the theme of 'community' are considered as separate issues to the process of the development of Barren Box Swamp. The separation of 'role' from this leadership cluster illustrates that the roles participants played were not considered 'leadership' roles by participants themselves. Table 2 provides some examples of quotes taken from participants grouped into the community sector that they identified with, sorted according to themes. These themes are explored according to stakeholder group in the following paragraphs.

Farmers

A number of farmers were directly affected by the project since alterations were needed to their water licences and the method by which they extracted water from Barren Box

Swamp and, the creek which flows into the swamp, the Mirrool Creek.

Leadership and Its Emergence

When specifically asked whether participants considered themselves to be leaders, the responses indicated that traditional notions of leadership were their point of reference. For example, "Well, I was a leader in that community… I was by virtue of the fact that I was president of the Association." Farmers' views of the strengths needed by effective leaders tended towards having an adversarial role: "…when you know you're right, you've just gotta fight. It's not hard, as long as you win more than what you lose is what it's all about…", and another described leadership as having to "Never take no for an answer. Just be vocal and know your facts before you open your mouth—that usually helps."

Some farmers indicated that their participation as a leader was necessary and emerged as the result of the perceived threat to their rights: "…with another couple of farmers we started up an organisation to just find out what was going to happen with our licences…we formed a committee and I was on the committee of course, and then that's what got it going…" and "…we had a lot of meetings and we talked about the direction that we wanted to go and I was just the one that implemented it…nobody else

Table 2 Example quotes

	Views on leadership	Leadership emergence	Collaboration and trust	Complexity of the project/issues
Farmers	"The biggest strength is when you know you're right, you've just gotta fight. It's not hard, as long as you win more than what you lose is what it's all about"	"…with another couple of farmers we started up an organisation to just find out what was going to happen with our licences…we formed a committee and I was on the committee of course, and then that's what got it going"	"…yeah they asked us to put submissions in and about how we'd be affected and of course we did all that but I don't know if they even read those submissions…"	"Murrumbidgee Irrigation decided to split it into 3 cells to remove evaporation and save water basically, to deliver more water to shareholders…"
Indigenous	"[A leader] needs to be able to take the aspirations of his people, mould that and make sense of it so that the argument is understood by other people, and come out with a good result"	"…the unofficial spokesperson for the area of all Griffith – anything happens in the community, the first person Daniel Johns is calling is me. Daniel Johns is the editor of the local area news so straight onto me"	"Before anything started out there they approached the land council and the land council put it to a meeting, with the community members. You know because they had to get permission to go ahead with it all"	"…good leaders think about – OK, how does this decision affect things twenty years from now. That's what good leaders do. Other leaders… tend to have to then mitigate that decision because of all the other issues that come along after and that's what's happening at the moment…"
Experts	"I think you need to be technically proficient but you need to be able to take a step back from your scientific and technical background and put things in the context of other people's lives and perceptions"	"I think leadership is more a characteristic of a particular situation than a characteristic of a person, so who's leading at any one time is probably - ought to be a reasonably open question"	"I wasn't involved in the consultation process at all. I was involved in the technical process providing technical advice on some specific technical questions"	"…therefore in natural resource management, the situations that you operate with are technically complex and you can't expect one person to be across the whole thing and be able to direct the whole thing, so it is by its nature operational without a team of people it's not going to be very successful"
Murrumbidgee Irrigation	"I think that's what you need to do as a leader is to pass your skills on to others to help them improve"	"…if I went out to dinner with my family, there will be people that will want to talk to you about what's going on…if you can get to them in their own surrounds and their own comfort, and that might have to be on a weekend or when they see you up the street or something, it's about giving them the time of day to talk to them"	"…we did a lot of studies on what would be the best way to improve Barren Box's efficiency while also acknowledging that it is a natural system and we wanted to restore its environment as much as we possibly could"	"…being prepared to step back and look from the outside in and see where all the different pieces of the jigsaw fit…"

was willing to do it which is why I did it…". This is consistent with the findings of Gross (2008) who reported that a sense of injustice and perceived need to be heard was a sufficient trigger for leadership emergence.

There was also the suggestion that the presentation of the project as a 'fait accompli' denied the community the opportunity to suggest alternative ways of utilising what was an enormous amount of money—there was a sense that given the chance, and funding, someone may have come up with a more creative, efficient way of saving water. One farmer noted, "I'm not an engineer, so I thought because it cost pretty close to twenty-nine million dollars, right, now I thought that certain sections of the community were given a little bit too much weighting, and that meant that it was over-engineered…". A similar point was made by another farmer suggesting alternatives were not thoroughly considered: "Cost to the taxpayer for a start, I forget what the final amount was I don't think we were even told, but it

was an enormous amount… and yes it does save water but…compared with the amount of water that the Murray really needs, it wasn't the way of doing it."

This indicates a lack of complexity leadership, which is partially characterised by leaders' encouragement of creativity and innovation from different groups within the system (Uhl-Bien et al. 2007).

Collaboration and Trust

Opinions on the process were divided between those who felt they were not heard, and those who felt included and benefited from the project. A lack of trust and power imbalance was evident in several different farmers' comments: "…we had several meetings and gradually they did build up a policy or maybe they had it all along and didn't tell us about it, that was probably more to the point…". Another noted, "I'm…pretty disenchanted actually with [Murrumbidgee Irrigation] meetings and so-on because even though the general farming community can express their views, it's rarely taken into too much consideration I think." The motives of Murrumbidgee Irrigation were also questioned: "…it was barged through after a great number of meetings and objections by mostly a hundred per cent of people, it was barged through…" and "…yeah they asked us to put submissions in and about how we'd be affected and of course we did all that but I don't know if they even read those submissions". Some indicated their dissatisfaction with the way they were treated: "…it was obvious they were trying to rip us off. We got angry at them, and it could have been handled much better by communication from the word go."

Other farmers acknowledged Murrumbidgee Irrigation's efforts to involve them, describing the process favourably: "…they just come across and saw me and told me that, because basically they didn't want to interfere with the upstream of the Mirrool Creek, and we didn't want them to adversely affect us in any way, because that was very important to us, that it didn't affect our access to water, ah how can you put this, anyway basically that's what it was, yeah and I thought that the process was handled pretty well", and "I think the process and the intention of what they intended to do was explained fairly well…"

However, even the most vocal opponents of the project agreed that the outcome was a success: "It's better for farming", and "It's a great idea, it's just that they went about it a bit… they trod on us. It was a great project and it's done very well and they were able to get through this last lot of floods without any major concerns."

Complexity

In describing the project, farmers tended to talk about the technical aspects of the development of the swamp, for example, "…their idea was that they were losing a heap to evaporation so they were able to do a deal with the state or federal [government], I can't remember what it was, in relation to their water savings so they were funded money to do the development." Further: "Murrumbidgee Irrigation decided to split it into 3 cells to remove evaporation and save water basically, to deliver more water to shareholders." Others made reference to the project's impacts in terms of water savings and/or the effect on their farming operations: "…it's a great concept, I mean to cut out evaporation and pass those water savings on to all the shareholders from Murrumbidgee Irrigation is a great idea, save water and it's good, evaporation and increase the depth in the storage." However, farmers made little reference to the wider implications for the wider community and biodiversity protection.

Indigenous Communities

Members of the local indigenous community were approached by representatives of Murrumbidgee Irrigation prior to the project commencement. The project involved the disruption and in some cases destruction of sites which had strong cultural significance. Therefore, permission was sought to proceed with the intention to minimise any damage to the sites and to preserve as many Aboriginal artefacts as possible.

Leadership and Its Emergence

The indigenous participants' views of leadership included reference to elders as leaders, these people being the keepers of the knowledge and traditions which are passed on to nominated members of their community which is a key aspect of indigenous group leadership. One participant explained "…an elder is the head of your family who passes cultural knowledge to you…the head of family when she passes on then the head of family passes down to the next eldest, that's got that cultural knowledge, so that's how it works."

While the role of interpreter was clearly seen as a crucial factor in enabling their community to engage with other groups, and being an effective communicator was described as a vital, there was reluctance to label these characteristics as 'leadership'. The Barren Box Swamp project allowed for the emergence of indigenous community members as leaders in the sense of representing their community and interpreting the messages between different community groups. For example, "[a leader] needs to be able to take the aspirations of his people, mould that and make sense of it so that the argument is understood by other people, and come out with a good result." and "When you're doing that you're, then you're getting the

consensus – what's the issues here? Bang bang bang - everyone's saying the same thing, just in a different way and then I'll marry them up…and take it back to the members and say 'is this what you were talking about?' Spot on bro." Another participant described his role: "…we gave information back so we kept those lines open, so much so to the point where we organised site visits, things like that so people could see what was happening, so you're very mindful that you've got to keep everybody in the loop… my role was very much about community I suppose consultation and information sort of, I suppose." This leadership role was viewed separately to that of the elders: "[I'm] the unofficial spokesperson for the area of all Griffith – anything happens in the community, the first person [the editor of the local area news] is calling is me."

Collaboration and Trust

The indigenous community was particularly pleased with the process and the outcomes of the Barren Box Swamp project. The results included ongoing strengthened relationships with Murrumbidgee Irrigation which have led to further fruitful projects in cultural heritage protection. The indigenous community was consulted at the outset: "Before anything started out there they approached the land council and the land council put it to a meeting with the community members, you know because they had to get permission to go ahead with it all". The build-up of trust has allowed barriers between the indigenous community and farmers (which were based on misconceptions and lack of effective communication) to be broken down and allowed mutually beneficial relations to flourish. One interviewee observed: "…you know you're continually improving processes and relationships…so yeah it's getting your foot in the door, you know, and showing people that – um we have such a negative, we're viewed very negatively in the press, um there's a lot of misinformation around about cultural heritage - if you have a site on your property you can lose your property and all that, it's bullshit." Making the same point, another recounted: "They found out that we weren't looking to just claim the place, we'll work with them, we weren't looking to claim the place we were just looking to protect, protect our culture, that's all we're looking to do."

This reflects what Sun and Anderson (2011) made reference to as an advantage of successful collaboration, being that it can have enduring effects on future interactions between groups. That is, successful collaboration results in strengthened bridging social capital.

Complexity

The indigenous community members interviewed expressed their appreciation of the effects of the project that extend beyond immediate water savings. The engagement of their people in the process and the building of relationships have expanded their capacity to secure outcomes for their community, especially in the domain of cultural heritage protection. "So you know these are the positives that I've seen that's coming out of Barren Box, the processes, the partnerships, collaboration, the whole lot, which has worked in our favour by this we're protecting our culture, we're training people up, we're building capacity of the community, which is what it's all about, protecting our culture and heritage."

The restoration of the natural environment was also mentioned as valuable outcome from their perspective: "…if they can get it back to the way it used to be with the fish getting back in there, it will be a nice place. It should I believe if they treat it right, the water out there will last a long time, because it's a natural waterhole, it's always been there, and if like well some of them farmers were just abusing the way that water was running out of that place, and now they've put a stop to a lot of it, makes it a lot easier."

Experts

Various consultants were engaged to advise on technical aspects of the project, so were involved in their capacity as scientific experts.

Leadership and Its Emergence

Leadership among this group was spoken of in terms of leadership of knowledge in a particular field, almost as a proxy for expertise, illustrated in one member's description of another: "he had a scientific background…and he was really good at providing us direction but not, um sort of taking over", and there was a sense of working together as associates rather than any one person being in charge: "I'd hope they describe me as a colleague more than a leader" and that a leaders should have "the ability to identify who might be able to contribute to that overall vision", and support them.

This view of leadership is consistent with models of shared leadership that have been found to work well in complex environments, within teams where power is distributed relatively evenly, and where members have high levels of specific knowledge or expertise as the situation changes, different people may act as leaders by leveraging their differing skills and experience (Lichtenstien et al. 2006). One expert described leadership as being shared, and changing according to the situation, indicating the emergence of leadership throughout the expert groups at various times: "I think leadership is more a characteristic of a particular situation than a characteristic of a person, so

who's leading at any one time is probably - ought to be a reasonably open question."

Collaboration and Trust

There was little interaction between the technical experts and other stakeholders. One expert commented: "I don't think we ever interacted with any sections of the community apart from the ecological research team who were running a parallel project…we were very much brought in as an independent team to establish hydrological scenarios that would provide some decision making or some input into the decision making from the ecologists…" A different expert participant concurred: "I wasn't involved in the consultation process at all. I was involved in the technical process providing technical advice on some specific technical questions." Another observed: "As to the nitty gritty of whether the broader community were happy…I really don't know."

This appears to contrast the notion of 'civic science' (Bäckstrand 2003), which attempts to increase public participation in the production and use of scientific knowledge. However, these experts appreciated the value of collecting information from diverse domains in order to tackle complex problems, and realised that any particular person or group cannot effectively address natural resource issues: "…the technical panel that were on the rehabilitation was nicely structured and Murrumbidgee Irrigation really fostered an attitude of cooperation and experts working together to get the best outcome for the swamp…". Further, "…you can't expect one person to be across the whole thing and be able to direct the whole thing, so it is by its nature operational, without a team of people it's not going to be very successful."

Complexity

There was some acknowledgement of the complexity of the context of the project: "Well you can think about the individual components obviously in theory and so forth, but when it comes to dealing with a complex natural system that you have to deal with and how you're going to manage things like water resources, there's just too much for one person to understand and be across." However, experts' responses in relation to coming together to assess and address the ecological needs of the wetland did indicate that the issues they had to deal with may have had the character of being complicated, rather than complex (Uhl-Bien et al. 2007): "…so we knew exactly what we had to produce and our client made sure there wasn't too many opportunities to continue asking for more and different stuff, so I think he managed the amount of information that was required…", and "I was involved with a small group

of technical specialists who were brought together to look at the ecological impacts and prospects of that particular project…"

As Uhl Bien et al. (2007) describe, a complicated problem has many parts which can be individually identified, but a complex problem cannot be easily broken down into separately identifiable components.

Murrumbidgee Irrigation

Murrumbidgee Irrigation was the organisation responsible for the engagement of the relevant groups and the implementation of the Barren Box Swamp project.

Leadership and Its Emergence

The views of leadership expressed by past and present representatives of Murrumbidgee Irrigation reflected characteristics consistent with Burns (1978) notion of transformational leadership, being that leaders ought to pass on skills and knowledge to those willing to learn, and inspire looking beyond individual interests: "…passionate about what they do, certainly, and is interested in passing on knowledge to anyone else who's interested in learning…". Another employee highlighted the need for leaders to question and debate: "…asking questions about designs that came from someone who wasn't a designer who was able to say 'why haven't we looked at this, why haven't we looked at that, did you look at this, could we do this, what would be the impact of this?'".

There was evidence that Murrumbidgee Irrigation representatives transcended their roles within their organisations to emerge as civic leaders displaying a passion for the project and dedication to the sustainability of their community: "Yeah, I really like the diversity, the people that I meet, and the opportunities I get to actually get out of the office and in amongst the people and hear what they have to say…" and "…if I went out to dinner with my family, there will be people that will want to talk to you about what's going on… it's about giving them the time of day to talk to them."

One employee commented on leadership priorities "…not only from a work perspective, but using my skills to - the skills I got here that I developed through work, using those to help other parts of the community. I guess probably that's why I'm on the school board. Yeah, so I can use the skills I got here to try and help the school."

Collaboration and Trust

Those from Murrumbidgee Irrigation saw the project as a success, touting it as a win–win proposition which enjoyed the support of most, if not all of those involved. According

to these participants, the plan was carefully conceptualised and designed, and then presented to the stakeholders. Great effort was taken to ensure concerns were heard and addressed. However, in describing the process, it was clear that the 'collaboration' being spoken of more closely fitted the description of informing, or educating stakeholders, having to get them on board: "…they took a fair bit of convincing some of them though I think most of them are on side now…" and in describing the preparation for the project another employee explained: "…we'd spent a considerable amount of time on planning a project as opposed to just going and doing it. And why that's important is you, and not from an engineering perspective because I'm not an engineer, but it was more important from a 'how do you bring the community on board'".

This indicates a potential area for development of civic capacity, as described by Sun and Anderson (2011) who observe that the leadership processes necessary to guide public or multi-sector collaboration should include transformational leadership aspects, augmented by civic capacity which includes drive, connections and capacity. Framing the agenda, convening stakeholders and structuring deliberation are leadership tactics described by Sun and Anderson (2011) that perhaps were lacking in Murrumbidgee Irrigation's implementation of the Barren Box Swamp project.

Murrumbidgee Irrigation representatives suggested that the varying level of farmers' understanding of the project may have contributed to some of the difficulties encountered during the process, in suggesting what could have been done better, one participant commented "…a bit more education for the irrigators in the area to really explain to them exactly how it worked, although we tried that a lot of them just, the ones that were a problem didn't want to understand…" and "…it was only the odd one who thought they'd be losing some of their water storage, who didn't understand the real benefit of not having that amount of evaporation…". Further, Murrumbidgee Irrigation representatives' views on the farmers' involvement in the process was described: "…they wanted to understand all of the detail behind what we were doing, they challenged quite a lot and this was a good thing, they challenged quite a lot the assumptions we were using and how we calculated water savings, they challenged what that meant to their own long term future, and how were going to make sure that was built into it…But we deliberately did that to try and get them to understand what we were doing…".

The model outlined by Ansell and Gash (2007) suggests that ideal starting point conditions for successful collaboration include power-resource-knowledge symmetries. It could be argued that such a balance was lacking between Murrumbidgee Irrigation and the farmer group. This disparity in levels of and access to knowledge about the

project perhaps could call into question the assumption that a collaborative approach was desirable over other approaches to tackling wicked problems. As argued by Roberts (2000) collaboration is most effective as a wicked problem-solving approach where there is reasonably uncontested and equally distributed power throughout the system.

Complexity

Participants representing Murrumbidgee Irrigation believed that the project provided numerous and widespread benefits to the community and the environment. There was evidence that the project was seen as having lasting benefits not only to the irrigation community but to the environment and wider community: "It's been successful from building relationships, particularly with the local indigenous community…I think it was successful in clearly demonstrating to the wider public that you can have environmental outcomes and you can have irrigated outcomes but they're not competing and I think that's particularly important in the current Murray-Darling Basin debate."

At the same time, there was recognition that issues with the project may have partially been explained by Murrumbidgee Irrigation's organisational context, with one employee remarking "It was a difficult process, very difficult process… there was a whole range of things that we might have done wrong and I think one of the things you've got to remember that in those days we were still coming out of being a government department and being a locally owned or privatised entity."

Discussion

The current study set out to explore the dynamics and mechanisms at play in the local community throughout the implementation of a water saving initiative in the Barren Box Swamp. Interviews with local community members were conducted to gather views on the success of the project in terms of leadership and community engagement. A variety of views were found spanning the spectrum of definitions of leadership, and differing perspectives of the implementation of the Barren Box Swamp project indicated that the process had wide ranging impacts on stakeholder groups. The analysis illustrated a surprising lack of emphasis on the word 'leadership' despite being asked questions such as "do you consider yourself a leader?" and "what would you consider your strengths as a leader?"

As mentioned earlier, the leadership literature indicates an increasing recognition of the dynamic, complex nature of organisations or other systems of interest, and that the traditional, structured, hierarchical view of leadership is becoming less useful as a widely applicable model

(Lichtenstien et al. 2006). The findings here show that participants' conceptions of leadership appeared to be varied with some based on the traditional notion of power and control, while other discussions touched on concepts of complexity leadership and indicated emergent, transformational leadership. This indicates that different styles were present within the community at the same time, and the data suggests that each contributed to different outcomes. Different types of leadership being identified, coexisting and achieving different sustainability outcomes within a system have been found within the organisational setting in relation to firms' sustainability practices (Angus-Leppan et al. 2009; Du et al. 2012). The current study provides further evidence that in solving complex problems, a system's ability to call upon a variety of leadership styles needs to be considered.

The results also suggest that the type of leadership to emerge varied with, and in turn, influenced each group's levels of capital—whether social, natural or human. Farmer group leaders emerged through the formation of associations forged from a strong sense of injustice and uncertainty around access to the natural capital they rely upon, i.e. their water rights. Indigenous leaders emerged through the need to interpret and communicate, as an interface between their community, and Murrumbidgee Irrigation and the farmers, strengthening bridging and human capital. Scientific experts came together to form a time and task bound group with leadership and knowledge being shared among them, depending on situational needs. Murrumbidgee Irrigation leaders, though charged with formal leadership roles, took on the role of community leaders outside of the organisation in order to effectively engage stakeholders and mobilise social capital. These different outcomes can all be seen to have contributed to the sustainability of the community. Therefore wider conceptions of leadership are necessary to account for what emerged within the complex system structures throughout the Barren Box Swamp development process.

Interviewees' views of the process and level of collaboration also varied. Some described how community members were invited and involved from the very early stages, and others strongly implied that by the time they were consulted, the project was virtually a done deal, and it would go ahead whether they agreed or not. As discussed above, the process for increasing the likelihood of success of collaboration includes the building up of trust, face to face meetings, gaining commitment to the process and shared understanding (Ansell and Gash 2007). It appears that the ideal model for successful collaboration may not have been followed in this case. Where the suggested best practice principles of collaboration for complex problem solving were employed, as was the case with interactions between Murrumbidgee Irrigation and the indigenous

community, the results were notably more successful than where the process resembled an exercise in selling the benefits of the project to farmers, who perceived they were being 'ripped off', where the outcomes were less favourable. Given the seemingly short term yet complicated, rather than complex nature of the role of the experts involved, their involvement in any collaboration was clearly not as crucial. The interaction between the subgroups varied, with Murrumbidgee Irrigation building strong bonds with the indigenous community, despite differences in views of leadership. It is clear that their interactions were conducted on a level where neither party considered itself or the other as more powerful. However, the interactions between Murrumbidgee Irrigation and the farmers, particularly those who felt aggrieved by the process, were less productive. The farmers who displayed more traditional views of leadership as an autocratic, power-based concept, felt that the leadership of their group needed to fight, be aggressive to protect their rights, whereas the Murrumbidgee Irrigation reported that they adopted a more persuasive and inclusive approach to negotiations, attempting to promote the benefits of the project to the wider community.

The level of complexity of the project and its impacts also proved to be a source of contrasting views. Some recounted the project as merely an exercise in constructing a levy bank to reduce evaporation. Others described it as a triumph of collaboration and community cooperation to produce a ground-breaking achievement which has left a legacy of strengthened relationships between numerous stakeholder groups, as well as a more resilient natural environment. Although the impacts of the project on the wider community may not have been immediately apparent, it has been argued that the results have increased the sustainability of the community by securing greater volumes of water, which in turn helps secure the livelihoods of all community members. The regeneration of the wetland has also helped to increase biodiversity, the impact of which is likely to be widespread yet extremely difficult to quantify. Interviewees' appreciation of the complexity of the project and its effects on the community varied widely.

The diversity of views may be better understood by examining the perspectives of each sector of the community. The results revealed that those who tended to take a more traditional view of leadership were those who saw the project as a fairly straight forward activity, and viewed the implementation process as an adversarial, 'us' versus 'them' exercise in defending their rights. This is understandable when the level of resources available is considered. Farmers are dependent upon water allocations for their livelihood, and have little, if any, scope to implement any more innovative or creative ways to ensure the sustainability of their operations without additional

technological and financial resources. As participants from different groups' exposure to the issues become less critical to their immediate sustainability, that is, the less they had to lose, the more conceptions of leadership widen to include less conventional and more transformational notions such as the enabling of others to perform, and encouraging and inspiring others to develop and learn.

A bigger perception of collaboration in the process seemed to come with this expansion of perspective. This also appeared to coincide with greater access to resources. From the perspective of Murrumbidgee Irrigation, financial resources were accessible through the government funding of the project. The indigenous community was buoyed by an increase in social bridging capital resources, human capital (in the abilities, knowledge and skills of individuals who received employment and training) and capacity through the recognition and acknowledgement of the importance of their interests in the area. Experts seemed to bring with them all of the resources they needed to successfully contribute to the project, that is, their knowledge. Thus access to resources, whether financial or social or human, appeared to affect the level of engagement and perceptions of outcomes from the project and process. Given the qualitative, exploratory nature of this study, this observation has been drawn from the data without specific measurement of any particular type of resource or capital. Future research may benefit from more tightly defining and measuring these variables within a different community to explore the impact of such varied resource levels.

The data has been interpreted and results presented as a possible explanation for the events and interactions which occurred, and a summary of the system and process is illustrated in Fig. 4. Before the project, The Barren Box system was vulnerable to the effects of evaporation and poor water quality. Murrumbidgee Irrigation and farmers interacted, though were both exposed to fluctuations in unpredictable water supplies. Neither group had the financial resources or capacity to effectively address these issues. The indigenous community, though part of the system, was not effectively engaged.

During the process, Murrumbidgee Irrigation was granted government funding to resource the project. The farming community was split between those who were informed by Murrumbidgee Irrigation and perceived they would gain from the project, and those who were not thoroughly engaged and informed—who conflicted with Murrumbidgee Irrigation. The indigenous community and Murrumbidgee Irrigation collaborated from the beginning, with two-way flow of information and knowledge. Experts were involved to input knowledge into Murrumbidgee Irrigation.

After the process, the Barren Box system and its elements have increased capital and are therefore arguably
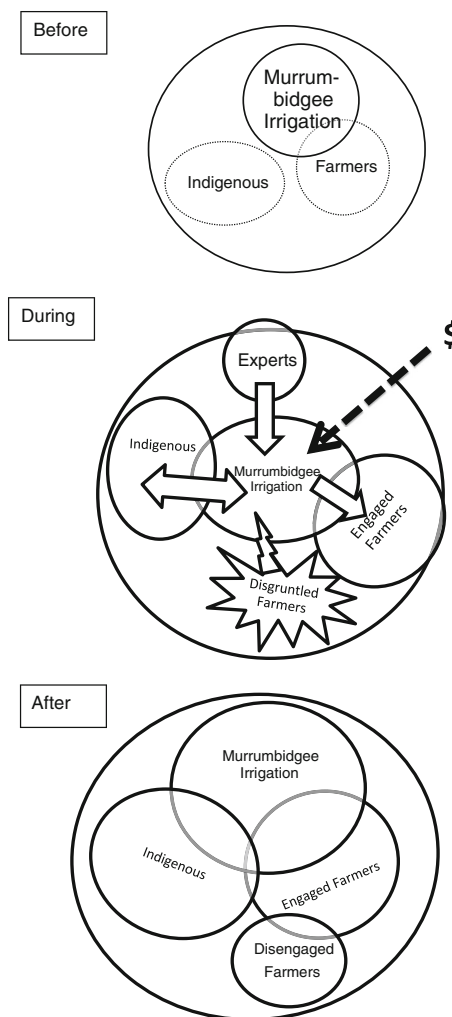

Fig. 4 Summary of system before, during and after the change process

more resilient, sustainable and relatively stable. The indigenous community continues to benefit from increased social capital within and between their group and others, and human capital including permanent employment of cultural heritage officers within Murrumbidgee Irrigation. Farmers enjoy increased resilience through higher security of water access overall, with those adversely affected during the process, being satisfactorily compensated. However, future interactions between Murrumbidgee Irrigation and the disengaged farmer group is likely to be best approached by firstly establishing trust and attempting to secure the power-resource-knowledge balances recommended by Ansell and Gash (2007) ensuring there is shared understanding of what is to be achieved. Murrumbidgee Irrigation have greater capacity to control water through the swamp development and deliver water savings benefits to members, stronger relationships with the indigenous community, and learning from the project will inform future projects.

These findings illustrate that complex systems involve many levels of understanding and meaning among even those within the same group, presumably pursuing the same goal of sustainability for their community. This research suggests that the type of leadership to emerge depends on the influences upon the system sub-group during processes of change. A group's perception of whether it is being treated fairly, its level of access to resources, and the investment it has in process outcomes all heavily impact on the type of leadership that emerges. This research has brought together concepts of complexity leadership and community collaboration, explored and discovered the mechanisms which influenced the emergent leadership that helped facilitate increased community sustainability. The research has provided insight into the considerations which should be made prior to future initiatives. Further, these considerations have managerial implications in that the type of leadership desired by an organisation is more likely to emerge where appropriate levels of engagement and resources are available. Also, a collaborative approach to solving complex problems does seem more likely to succeed where group members enjoy equally shared power, resources and knowledge (Ansell and Gash 2007). Otherwise, a combination of problem-solving approaches may be more appropriate.

The data gathered provide insight into the views of participants which would not have been possible through quantitative methods. However, the common criticisms of qualitative research, including the unreliability of the method and subjectiveness of interpretation, may still apply here. While all efforts have been made to isolate the investigators' bias in the process of this research, personal opinions and preconceptions have inevitably influenced the findings to some degree. In the interests of transparency, it has been stated throughout the discussion that the interpretations are those of the author, drawn from the data as presented in the results. However, it is argued that the objectiveness of the software and the provision of direct quotes have sufficiently mitigated these issues as serious concerns or significant barriers to being able to use these findings as a foundation for further investigation.

Another limitation is the extent to which participants' recollections of events may be influenced by hindsight. Hindsight bias tends to skew recollections to only include favourable aspects or outcomes and minimise the importance of negative outcomes. Conversely, those who felt disadvantaged may have emphasised the negative aspects of the project. Further, cognitive dissonance may have played a part, where participants explain their behaviour by changing their attitudes as opposed to behaving in line with their true values (Festinger 1957). This may explain participants' agreement that the project was a success after having agreed to the negotiated terms resulting from legal compensatory proceedings.

Future Research

Future research in this area could utilise the successful aspects of this case, bearing in mind the ultimate success in delivering water savings to the environment as well as securing, as far as possible, future water supplies for irrigation farmers. This should take place given the knowledge of what did not work well, including the level of engagement of all necessary parties at the outset. The nature of the project and the context of the community around Barren Box Swamp lent itself to a hybrid approach of informing, consulting and collaborating. In applying the lessons from these observations in different contexts, the fact that each group of stakeholders will have different levels of resources, engagement and conceptions of the complexity of any given development initiative should be considered in future cases. These distinct features of projects and communities will vary case by case and so future research in either replicating this study or applying the lessons learned should carefully consider the optimal combination of the various levels of engagement required, based on the complexity and characteristics of the project being undertaken. Future research may mitigate some of the limitations mentioned above by varying the data collection methods, and conduct focus groups and/or survey participants to collect quantitative data in order to validate the success of the project and the desirability of the outcomes in terms of community sustainability.

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