

Third party roles of brokers in temporary knowledge networks

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Abstract: Agriculture extension advisors play key roles as intermediaries, or brokers, within temporary knowledge networks including within Australia's agriculture innovation system which is generally referred to as research, development and extension (RD&E). The purpose of this paper is to provide differing insights into the intermediation roles of public and private agriculture advisers in RD&E projects. This paper draws on empirical research based on a mixed methods case study that included social network analysis, participant observation and semi-structured interviews. The findings suggest that the roles of private advisers cannot be substituted with those of public advisers for a range of reasons that include firstly, how institutional rules are prioritised and secondly how social capital resources are invested. Findings also show that when called on to act as intermediaries within transdisciplinary (RD&E) initiatives, different roles and functions of public and private advisers need to be clearly understood and identified to ensure alignment with project objectives and processes.

Keywords: temporary RD&E networks, innovation systems, public and private extension advisers, intermediation, social network analysis

Introduction

Historically within the agriculture sector public extension agents have made significant contribution to the transfer of agriculture research to farmers. However with the international ascendancy of neo-liberalism policy changes have resulted in a major decline in public support for extension services over the last three decades (Klerkx, et al., 2006). Public extension services in Victoria, Australia are among the latest to be privatized based on expectations that more efficient private advisory services will emerge to fill the gap.

In Australia research, development and extension (RD&E) initiatives are often complex, temporary knowledge networks created to deliberately stimulate innovation opportunities for agricultural stakeholders (Nettle, et al., 2010). These networks require investment in human capability to cultivate knowledge sharing processes. Extension advisers who participate as intermediates in such networks require technical and relationship building competencies as well as a clear understanding of how institutional context enables or constrains change.

Project 3030 was a major Australian dairy industry RD&E project funded by government and farmers to increase home grown forage on dairy farms by 30% and increase RoA (Return on Assets) by 30% (Chapman, et al., 2009). It was a knowledge network comprised of a transdisciplinary mix of agriculture researchers, extension advisers, farmers and service providers working together to trial new forage practices to improve the profitability and productivity of dairy farms. This paper focuses on the public and private extension advisers who acted as innovation intermediaries within the RD&E network and on their role as facilitators of knowledge sharing across all project participants. Therefore in this paper intermediation is discussed at the scale of individuals rather than organisations. The capacity of public and private extension advisers to

work across the diverse institutional arrangements and social capital resources within a temporary knowledge network is also considered.

Background

Agriculture extension and intermediation

Agriculture extension is undertaken by advisers who have typically been trained in the science and technology of farming practice. Australia, like most countries provided extension services through the public sector up until the 1990's but, also like most other countries has been privatizing extension delivery over the last two decades (Rivera and Cary, 1994). Globally there are now many different forms of privatization and an increasingly pluralistic private sector participation in extension services (Klerkx & Leeuwis, 2008; Hall 2006). Despite the diverse range of structures and delivery arrangements played by the private sector, opportunities for innovation and change are created and realised through the expertise of individual advisers in their roles as intermediaries within the agriculture sector. Creating opportunities for change however involves not only technological knowledge and skills but also understanding and awareness of the institutional context that enables or constrains change (Klerkx, et al., 2010).

Intermediation is a function and process that involves roles, relationships, action and agency (Howells, 2006). Intermediaries are actors within networks who perform a range of tasks to enable the sharing of resources and innovation processes. They act as 'third' parties (also referred to as brokers or information exchangers) and may be individuals or organisations (ibid). Agriculture extension advisers are brokers who facilitate knowledge sharing in agriculture innovation systems (Hall, 2005; Klerkx, et al., 2009). As knowledge brokers they require social competencies in facilitation, relationship and social capital building as well as technical expertise (Hall, 2006). Some intermediaries however may be more inclined towards making substantive contributions as knowledge or technical experts while others may be more specialized as intermediaries who act as facilitators of innovation (Klerkx and Leeuwis, 2009). For some advisers this may create an issue of 'functional ambiguity' in which their dual role as both knowledge experts and social brokers complicates their capacity to do both effectively (ibid).

The structural position of advisers within networks combined with facilitation competency enables them to make connections between otherwise unconnected or dissimilar social groups. As critical agents of social connectivity they may also act as 'gatekeepers' and choose to share, partly share or not share resources between different groups (Cross & Parker, 2004). As brokers they may act as boundary spanners connecting and enabling resource sharing between otherwise unconnected networks. Intermediaries are critical for building social capital within and between networks, particularly bridging social capital that creates links between socially similar but unconnected groups to enable collaboration and coordination (Klerkx and Proctor, 2013). Boundary spanners may also facilitate linking social capital by creating connections between socially dissimilar networks (Granovetter, 2002; High, et al., 2005; Klerkx and Proctor, 2013)

To illustrate the complexity of intermediation processes Howells (2006) identifies ten functions that may be involved through successive phases of a process or project (refer Table 1 below). Intermediaries may deploy some, all or a mix of functions depending on technical and social skills, business purpose and institutional arrangements.

Table 1: Innovation intermediation functions (ref. Howells, 2006)

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| <ol style="list-style-type: none"> 1. Foresight and diagnostics/articulation of needs 2. Scanning and information processing/scoping filtering 3. Knowledge processing and combination/generation/recombination – new knowledge drawing on clients knowledge (inward focus) 4. Gate keeping and brokering/contractual advice (outward focus) 5. Testing and validation, training – requires independence and impartiality 6. Accreditation – formal/voluntary 7. Validation and regulation – formal/informal 8. Protecting the results/IP and results of collaboration 9. Commercialization/exploiting outcomes 10. Assessment and evaluation of outcomes (post innovation but may also be a starting point) |
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The focus of this paper is on how public and private advisers provide benefit for clients such as farmers throughout the innovation processes outlined in Table 1 above. The early phases of the innovation process (functions 1-3) may be described as ‘precompetitive’ from a market perspective because the work and ‘value proposition’ contributed by advisers may not be clearly visible to their clients (Klerkx, et al., 2008). It may therefore be necessary for public intermediaries to undertake these functions during the early phases of innovation processes. During later phases (functions 5-10) the value of intermediation services becomes more explicit thereby creating greater opportunities for private sector intermediaries to become viable and competitive knowledge brokers.

The complexity of knowledge will impact on how effectively it is shared in any given context and therefore influences intermediation processes. The complexity and ‘stickiness’ (King, et al., 2009) of knowledge sharing processes become progressively more demanding of, and for, intermediary facilitation and capability as this moves from relatively simple access to information through the Internet for example, to knowledge transfer and collaborative recombination to improve knowledge in decision making or to foster the co-production of knowledge (Shaxson, et al., 2012). Knowledge sharing processes are also likely to become ‘sticky’ when there are high learning demands and when learning occurs between participants who are new to each other. The visible or explicit value of intermediaries is likely to depend, again, on the functional stage referred to in Table 1. Therefore when knowledge sharing involves ‘sticky’, complex learning challenges and weak social connections, particularly during early phases of innovation processes, there remains a role for publically resourced intermediaries because these contexts will be unattractive for private brokers (Klerkx and Leeuwis, 2009). This highlights the need to understand the institutional factors of any given social context including rules, social habits, practices and trust that enable or constrain the operation of innovation networks (Hall, 2006) and also the intermediation capability required.

Privatization of agriculture extension is underpinned by an assumption that this activity can be provided more efficiently by the private sector as well as better allocate resources that generate private good and therefore such activities should be made available on a ‘user pays’ basis (Rivera & Cary, 1994). Implicit within this thinking is that public sector extension resources are substitutable with the private sector. The notion of substitutability accords with the theoretical concept of structural equivalence in which two network actors are structurally equivalent if they have the same ties to all other actors (Hanneman & Riddle, 2005). However even when actors may be perfectly substitutable with respect to their structural connections within networks, their relational substitutability is unlikely to be equivalent due to the unique technical and social knowledge and skills of individual advisers. For intermediaries in real world networks structural measures are therefore only approximate indicator of equivalence or ‘substitutability’. The implications of privatization relating to the deployment of social capital also need to be considered.

Institutions and institutional change

Institutions are explicit and implicit boundary conditions within which social interactions occur and include 'hard' institutions such as laws and regulations as well as 'soft' institutions including norms, values, cultural habits (van Mierlo, et al., 2010). The different habits, routines and practices of public and private organisations therefore impose different institutional 'rules of the game' (Paine, 1997; van Mierlo, et al., 2010) despite common technical focus or expertise.

Battilana (2006) suggests that individuals seek to be regarded as legitimate within their own institutional context. This creates additional challenges for intermediaries who need to make connections across institutional environments including, at times, the sometimes multiple formal and informal institutions of other network stakeholders. Institutional priorities for private, self-employed advisers will therefore influence, for example, how they prioritize business values such as profitability. Private advisers support their clients to achieve business goals but they must also ensure their own business remains viable. In this respect they are likely to closely identify with the business institutions valued by their former clients. In contrast public advisers are subject to the policies and regulations that make up the institutional context of public organisations and are therefore likely to share a similar institutional context to public sector researchers even though their functions are quite different.

Differences between institutional priorities may become evident in the intermediary roles of private and public advisers. Obstfeld (2005) draws on the notion of the 'tertius' to distinguish between an intermediary who joins others motivated by anticipation of self benefit ('tertius gaudens', or the third who benefits) and an intermediary who makes connections for the benefit of others (the 'tertius iungens', or the third who joins). For private advisers, self-interest may incline them to act as *T. gaudens* in order to maintain long-term relationships and trust with their clients at the expense of other network relationships. This may be manifested in gate keeping strategies that prevent or limit resource sharing. Advisers may do this if they perceive that sharing certain knowledge may put their own or their clients' interests at risk (Cross & Parker, 2004). A practical implication for innovation processes requiring open sharing of knowledge and other resources is that privatization of extension services in Australia, and elsewhere, may contribute to the loss of '*T. iungens*' capability that served the public interest. Further, this may exacerbate intermediaries experience of 'functional ambiguity' referred to earlier (Klerkx and Leeuwis, 2009).

Social capital

Relational ties, and the social capital carried through them, depend on the context and purpose of relationships and on the bonding, bridging and linking qualities that confer different levels of trust and reciprocity (High, et al., 2006). Bonding social capital is that which is 'shared between individuals with similar socioeconomic characteristics' and therefore is likely to occur in close knit groups (ibid). The closeness between group members is likely to reinforce views shared within the group and over time may isolate them from wider social exchanges. Such relationships facilitate trust and reciprocity as well as impose sanctions for non-conformance (Lin, 2002).

Bridging social capital occurs between members of groups who share interests or goals but have dissimilar socioeconomic, ethnic or religious backgrounds and therefore enables different resources to be shared between group members as they interact for a common cause (High, et al., 2006; Klerkx and Proctor, 2013). The way that members interact influences their reputation and encourages them to be trustworthy (ibid). Bridging social capital is correlated to the concept of weak ties through which dissimilar groups gain access to different resources (Granovetter, 1973). While bridging ties may be 'weaker' than bonding ties they facilitate the sharing of new ideas or resources between heterogeneous groups (High, et al., 2006; Klerkx and Proctor, 2013).

Linking social capital is 'weaker' again than bridging social capital despite having the potential to provide access to critical resources or opportunities between dissimilar social groups such as may occur for example in hierarchies (High, et. al., 2006). Relationships forged through linking social capital typically lack the trust and reciprocity implicit to bonding and to a lesser extent, bridging capital. According to High et al., the balance between bridging, bonding and linking social capital influences the extent to which social groups or networks are oriented 'towards fragmentation, cooperation or hierarchy' (2006:9).

Relational elements of social capital are based on values and norms associated with reliability, cooperation and reciprocity that are realised in individual relationships. These values potentially develop trust which represents an outcome of social capital (Fukuyama, 1999). In the context of social capital, trust serves to promote social stability, cohesion and collaboration (Lin, 2002). Trust is fundamental for facilitating cooperation as it provides a 'psychological lubricant for smooth social processes' (Igarashi, et al., 2008: 88).

Understanding different types of social capital helps to explain, from a structural perspective, why certain groups appear to work together more effectively than others (Lin, 2002). It also provides a focus on the interface between groups and the intermediary capability required to enable interaction. In temporary knowledge networks such as those assembled for the purpose of RD&E, intermediaries are needed who can fast-track the building of trust between diverse stakeholders and promote reciprocity to reduce transaction costs that undermine innovation potential. The close conceptual alignment between the elements of trust and reciprocity inherent in the notion of social capital and the formal and informal conditions that bound institutional contexts provides a useful theoretical lens through which to consider and contrast the intermediary work of agricultural advisers in the public and private sector. Empirical findings from a temporary Australian dairy industry RD&E case study, Project 3030 illustrate differences in the intermediation roles of public and private advisers in a temporary knowledge network. These are discussed next.

Method and Case study

The dairy industry of Australia has historically been dynamic and highly integrated (Dairy Australia, 2009). This sector contributes significantly to the wider Australian economy as one of the three most important rural industries and ranks fourth nationally in terms of agricultural exports (ibid). However, as a biological industry the business of dairy farming is vulnerable to physical elements, notably the climatic effects of drought. It is also vulnerable to marketplace instability, including supply and demand swings in both international commodity markets and domestic markets, uncertainty about input availability, price volatility and exchange rate variations. The R&D policy environment in which the Project 3030 research goals were developed (2001 - 2004) coincided with a phase in which research investment objectives were focused primarily on enhancing productivity and profitability of rural industry.

Project 3030 was a major Australian dairy industry RD&E initiative conducted between 2005 and 2011. Its purpose was to undertake research through agronomic trials, farmlet trials and commercial farm testing (on Partner Farms) of forage practices in order to enable dairy farmers to achieve a 30% improvement in return on assets through 30% increase in consumption of home grown forage' (Chapman, et al., 2008:11). The breadth of the project meant that this temporary knowledge network brought together a transdisciplinary mix of public sector agricultural researchers, commercial dairy farmers, and extension advisers from both the public and private sector to share and coproduce knowledge. Public sector advisers were contracted to organize the Partner Farms and private advisers (consultants) were contracted to facilitate the groups. For the purposes of this paper the focus is on the structural and relational attributes of the intermediary work contributed by public and private sector advisers to Project 3030.

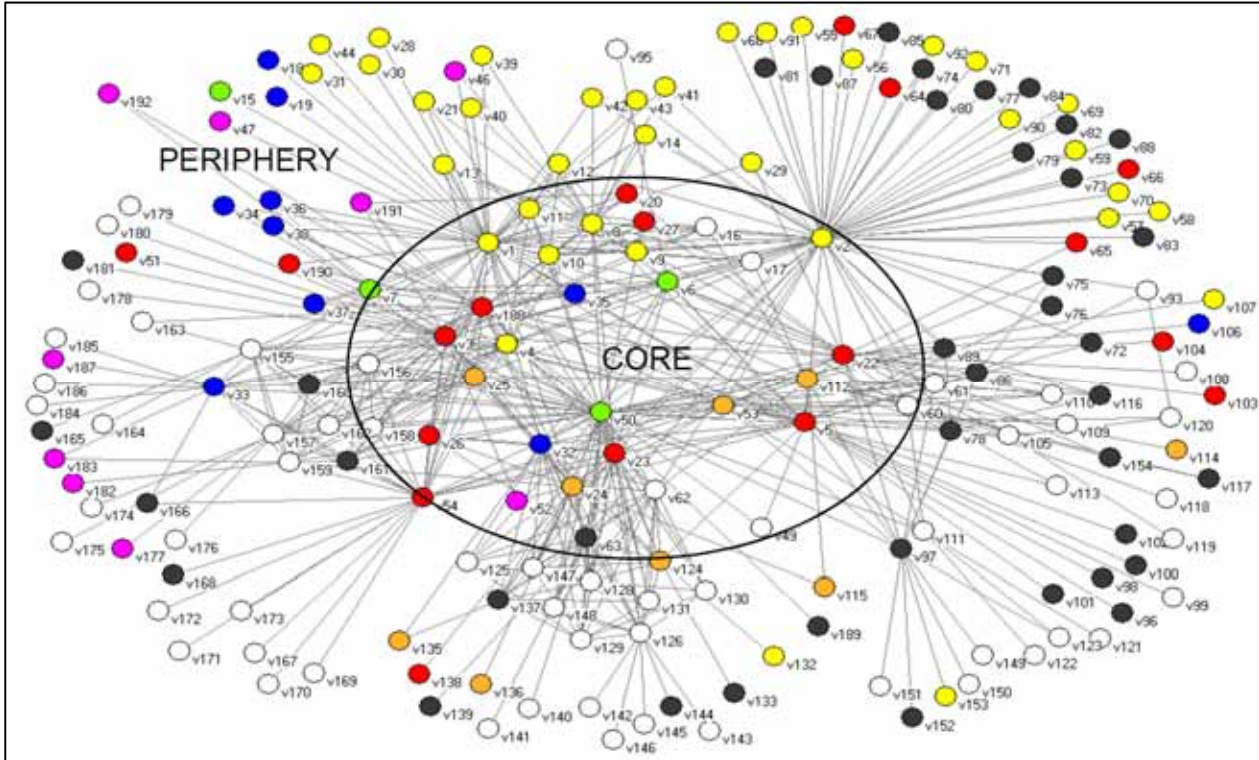
The research design on which the empirical findings discussed in this paper are based was a single case study - Project 3030. Data was collected using a combination of social network analysis (SNA) and ethnographic methods to provide both structural and relational insights. The case study provided access to an empirical RD&E context and was the basis for exploring and explaining real-life social processes in order to both test and develop theory (Yin, 2003). A social network structure is based on the relational links between individual actors (the participants) within a nominated social context (Wasserman & Faust, 1994). Large volumes of data about complex social interrelationships can be mapped relatively simply and presented in a coherent, accessible form and visually modeled as a sociogram (ibid). Such models represent a ‘snapshot’ of a network structure at a particular point in time and cannot be generalised beyond the specific social network.

All empirical data was initially collected in qualitative format. The relational question on which the Project 3030 social network is based to explore how knowledge was co-constructed and shared in Project 3030, was, ‘who talks to whom about Project 3030 issues’. Data for the SNA was converted into numerical format prior to analysis ‘Pajek’ (specialist SNA software, see de Nooy et.al., 2005). However to address qualitative ‘how’ and ‘why’ questions, for example ‘why do network participants act as they do?’ requires more than the structural data offered by SNA (Kilduff & Tsai, 2003). Therefore (27) semi structured interviews and participant observation of 21 Partner Farm meetings were also used to collect ethnographic data that was then transcribed, coded and analyzed with NVivo 8.

Findings and discussion

The Project 3030 social network was comprised of a transdisciplinary team of agriculture researchers, farmers, extension advisers from both the public and private sectors, steering committee members, social researchers and service providers. However, this paper focuses specifically on advisers. A sociogram of the Project 3030 social network is shown in Figure 1 below.

Figure 1: Sociogram of Project 3030 (2009)



KEY
Ag researcher
Social researcher
Public adviser
Steering group
Private adviser
Farmer
Service provider
Other

The Project 3030 social network has a core-periphery structure comprised of 192 nodes (dots). The intensity of interactions within the network is indicated by the lines (edges) between the dots (representing individual participants in the network). The lines provide an indication of which individuals and groups have relationships within the network and are therefore able to share knowledge. The actively engaged public (red dots) and private advisers (orange dots) are located within the core or close to the interface of the core and periphery. Structurally they are both highly connected as would be expected of an intermediary. Both public and private advisers are connected with farmers (white dots) and with each other which reflects their roles as coordinators and facilitators of the Partner Farms. Public advisers however are more closely connected with researchers (yellow dots) although this does not reflect the transdisciplinary intent of the project (refer to Project 3030 Milestone reports for further findings from Project 3030).

The social network structure shows relational patterns at a mature stage of the project (2009 - four years into Project 3030). To interpret the qualities of relationships within the structure in order to understand, for example, whether public advisers are more likely to have relationships with researchers than with private advisers, or how public and private advisers are interacting with farmers, requires ethnographic insights (Jack, 2010). For example, public advisers in Project 3030 were responsible for coordinating Partner Farm groups and interacting with researchers to provide extension support for the project. Public advisers regarded sharing 3030 knowledge with researchers and their extension peers as an opportunity for team building and professional learning:

We are trying to make sense as a team, of the information coming out of 3030. As extension officers we are trying to understand the limitations and strengths of cereals so we can make sense of it, know what to watch out for. So this is currently part of our learning thing. (Public extension adviser)

In addition private advisers (consultants) were contracted to facilitate the Partner Farms and work alongside the public extension advisers. They expressed frustration that research findings were not available in the early stages in Project 3030 and felt this made them unsure about how to support farm based evaluation of home grown forages without guidance from researchers.

The scientists had nothing to offer. They had set up a linkage to offer the farmers and the facilitators something but when it came to the crunch at the start of the project the scientists didn't have anything. So my constant question to the extension leader was what am I meant to be doing? I am meant to be facilitating this but what is it meant to be about? I had to be specific. And because I was facilitating I was in the center of it and I had to work out what we were meant to be doing. The only seed that was sown by the project people was that there was quite a push for cereals and having pushed that, I think that was the end of the input from those people. (Private adviser)

The perspectives above are examples that reflect that how public and private advisers were aware of their intermediary function within Project 3030. However while public advisers felt connected

and recognised opportunities for team work and learning among their peers, private advisers felt disconnected and unsupported. Further, even after four years of project work private advisers interacted almost entirely with farmers and other private advisers whereas the public advisers interacted with all other stakeholders particularly those aligned with the Partner Farms. The technical skills and experience of public and private advisers were commensurate.

Key structural and relational differences emerged from the findings that illustrate how public and private advisers who worked on Project 3030 were not qualitatively interchangeable. Firstly, within the network structure public advisers were more likely to be positioned at the interface or periphery between different groups whereas private advisers were more likely to be positioned within the Partner Farms that formed tight clusters, or cliques. Secondly, public advisers created bridging and linking social capital for Project 3030 as they worked with and across the transdisciplinary interest groups and individuals within the network. Public advisers also helped to create bonding social capital within the Partner Farm groups they coordinated. Private advisers created very strong bonding social capital through their interactions with farmers in the Partner Farms they facilitated and with their fellow private adviser colleagues, however, their contribution to bridging and linking social capital outside the Partner Farms was limited. This may be explained by their identification as farm advisers rather than RD&E participants as well as their self interest in maintaining long term trust based relationships with their clients. The latter reflects a *T. gaudens* style of intermediation in which a ‘third who joins’ acts out of self interest and may deliberately drive a wedge between others (Obstfeld, 2005).

In contrast the empirical data suggests that the intermediary orientation of public advisers towards others, including public sector researchers, was more typical of the ‘*Tertius iungens*’ – a broker who seeks to join or ‘yoke’ others by creating relational trust to smooth and foster sharing of resources. This in turn may be linked to the shared institutional perspective of public advisers and public researchers to achieve research objectives rather than commercial objectives as well as a shared understanding of government policy, regulations and rules. Private advisers on the other hand prioritised the values of farmers in the Partner Farm groups rather than the institutions underpinning a temporary research network. Further work is needed to understand the implications of ‘functional ambiguity’ for public and private advisers working in temporary knowledge networks and also to understand how informal intermediaries, including farmers, arise throughout the course of innovation processes.

Finally, as suggested by O’Kane (2009), risk perceptions were an emergent, but critical factor in the Partner Farm activities of Project 3030. If private advisers perceived the potential for forage practices being investigated within the project as likely to increase risks to farm profitability or management, they acted as gatekeepers, controlling the flow of information between farmers and researchers. They identified with farmers as business people like themselves who needed to work within the institutional boundaries around running a profitable business. Table 2 below summarises the attributes of public and private advisers within the temporary knowledge network of Project 3030.

Table 2: Summary of attributes of public and private sector advisers within the temporary knowledge network of Project 3030

Attribute	Public sector	Private sector
Network structure	Peripherality	Cliques
Social capital	Bridging, linking	Bonding
'Tertius' orientation	lungens who seeks to 'yoke' or joins others	Gaudens who seeks to join others for self benefit
Institutional arrangements and priorities	Accountable to government policy, regulations and rules	Accountable to clients to support business and commercial goals; also to ensure the success of their own business
Risk perspective	Focus on risks relating to achieving project objectives	Focus on risk to farm profitability and management

Structural patterns within the social network model of Project 3030 suggest that public and private advisers contracted as intermediaries to support research and extension activities of the Partner Farms hold similar structural positions in the network. However case study findings reveal several functional and attitudinal differences with respect to social capital, intermediation styles, institutional orientation and risk perceptions. This requires then, a need to better understand where advisers should be positioned within temporary knowledge networks to support research and extension processes and also how and why their individual agency affects resource sharing (Battilana, 2006). For example, both public and private advisers in Project 3030, through their actions as intermediary agents, directly influenced how social capital resources were deployed and how institutional rules were prioritised. These actions have significant consequences for knowledge sharing between stakeholders within temporary knowledge networks and influence the development and maintenance of trusting, open relationships at least for critical phases of the project.

Conclusions

In this paper we have discussed implications of social network structure and agentic attributes of public and private advisers acting as intermediaries to support research and extension processes within the temporary knowledge network of Project 3030. Empirical findings showed that technical expertise underpins the credibility of both public and private advisers, however when acting as brokers and facilitators private advisers and public advisers are not substitutable with each other. This is due to differences in their institutional priorities and deployment of social capital. When called on to act as intermediaries within transdisciplinary (RD&E) initiatives, the explicit implications of these differences need be identified and understood to enable effective coordination and successful delivery of project objectives and processes. The findings provide insights for understanding the critical intermediation role of extension advisers in temporary transdisciplinary RD&E knowledge networks. Further work is needed to develop a fuller understanding of how both public and private extension advisers may contribute successfully as intermediaries and knowledge brokers within RD&E knowledge networks.

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