

RESEARCH PAPER

Innovation agendas: the ambiguity of value creation

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Innovation is said to be the key to future markets, business development and economic growth, yet the concept of innovation remains abstract and ambiguous. This paper suggests any value creation intentions need to recognise that innovation is a context-dependent process which is implicitly and fundamentally informed through the social agendas and consensus of those involved. To inform this social perspective of innovation value creation, we ask, how does the 'sociology of innovation' influence value creation? Using a 'sociology of innovation' standpoint, a qualitative study of participants in Australian bioindustry research and development (R&D) was undertaken to explore how the various socio-contextual frameworks and dominant outcome intentions were involved in value creation in the development of new biotechnological innovations. Through the two themes of context and community, we reveal how value creation was shaped by dynamic social processes involving multiple stakeholders and diverse perspectives of innovation. This research improves our understanding of how those involved in innovation development negotiate a complex social milieu of interpretive schemas to leverage various aspects of value creation. These findings present insights to managers and policy makers seeking to advance innovation value and advantages.

Introduction

'We need to innovate' is a catch cry of modern organisations, and both the quantity and the quality of innovations are considered priorities in contemporary business culture. Despite enthusiastic commercial pursuits, there is abundant reification of innovation through multiple academic and popular works. Consequently, the concept of innovation remains abstract, ambiguous and diffuse. So too does the value created by innovation. Depending on the type of innovation pursued, the commonly expected outcomes include new products developed, patents, intellectual property (IP) agreements, and technology licenses – all manifestations of novelty or newness, but often with an uncertain eventual value.

In the extreme, innovation can be an ambiguous activity in pursuit of uncertain outcomes. To see this, it is only necessary to observe how related terms like 'research and development (R&D)' and 'design' are far easier to pin down, and are often embedded within specific departments (e.g. R&D centres), associated with specific occupations (e.g. designer) or described by specific processes (e.g. engineering research). 'Innovation', in contrast, is everywhere but nowhere. There are outcome measures such as new products developed, patents, IP agreements, technology licenses, etc., and there are input variables such as R&D spend, technology alliances,

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collaborative agreements, number of technical staff, research portfolio, etc. Yet innovation itself is neither a discrete business function, nor an occupation nor even a single process. This ambiguity clouds the efforts of those in policy and business as they seek to target action and agenda to take advantage of the espoused opportunities and value of innovation.

A significant part of the problem is there are also many explanations for innovation. The Organisation for Economic Co-operation and Development (OECD)'s definition of innovation is quite clear: 'An organisational innovation is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations' (OECD, 2005). Yet a clear definition does not resolve the ambiguity of innovation in practice. The OECD describes an outcome, the implementation of something new, but how that something new is created in the organisation is still an uncertain practice. Further to the innovation challenge is the ambiguity arising with the locus of innovation – is it an idea or the product or the process? Is it the novelty or the knowledge or the value of the combination of these? These tensions and indeed the complex affirmation that all these things are, in part at least, 'innovation' have led us ask: how do we reconcile these elements to help develop innovation as a value-creating process? This paper aims to help provide an understanding of innovation value pre-market, pre-diffusion and pre-development to reveal how perspectives of value inform its ultimate value creation.

The defining feature of an innovation is novelty: innovations are 'new', and innovation processes are concerned with the production of novelty. The trouble is novelty does not, of itself, create value. The challenge for organisations is not to produce novelty, but to create value. The existence of novelty, or otherwise, is rarely clear cut. Most commercially produced new products combine many elements of the old with a few of the new. Instead of a headlong search for novelty, the challenge of innovation is often about what combinations of old and new to incorporate in a product, and where the balance of risk and return might lie. Such questions are not addressed in an abstract theoretical sense, but in a situated way, and how these questions are asked and answered depends largely on the context. Indeed, there is a body of research which examines perceptions of value in product innovations by exploring them through the various stages from diffusion (Rogers, 1995), how the various features of the innovation are perceived (Rindova and Petkova, 2007) as well as the influence of customer-producer interactions on value (Rosa *et al.*, 1999). This focus on the value of innovative outcomes nonetheless overlooks the supply side of innovation, its emergence through an uncertain development process. We suggest that may be informed by considering the 'interpretive schema' of those in the development stage of innovation – their way of perceiving and understanding their actions in that context – and asking how it contributes to the value creation of the subsequent innovation (Pinch and Bijker, 1987). In exploring the innovation intentions and notions of value of those intimately involved in the process, the ambiguity of innovation and, indeed, its value creation potential may be informed.

By recognising that interpretations of innovation are context dependent and subject to a social process in which participants' interactions and activities help shape attitudes and inform directions, we suggest the development of innovations and thus their subsequent outcomes are implicitly and fundamentally informed through social shaping (Williams and Edge, 1996). The purpose of this paper is to reveal the extent to which social processes situate and thus inform perspectives about innovation and value creation in organisations, and duly improve our understanding of how to

facilitate an appropriate organisational social milieu to drive innovation. We examine the diverse theoretical perspectives of innovation and reveal that they are vastly distant from the practical reality of scientists at the cutting edge of research. Using a 'sociology of innovation' perspective to position our work academically, and an inductive approach to further inform it (rather than 'confirm', as is the case with deductive approaches), we explore the interactions and activities of biotechnologists as they seek to create innovative research outcomes. In considering sociology as an interpretive frame, we recognise that a unique combination of factors and patterns of behaviour and expectations exists which will provide valuable insights into understanding the relational dynamics and value interpretations in this case.

As organisations increasingly pursue innovative solutions to achieve competitive advantage, there remains the question of whether those innovation-driven activities will actually achieve value creation. In exploring this issue of innovation value, we examine how divergent perspectives shape innovation attitudes, intents and ambitions. Despite the multitude of studies on innovation products and processes, outcomes, attitudes and approaches, there remains a gap in the literature on the social dimension of innovation; in particular, how it is inevitably and fundamentally involved in the development of innovation agendas, and consequently implicitly contributes to the shaping of value. From this view, the sociology of innovation with respect to its impact on value creation perspectives and activities remains under-explored.

Following this introduction, we examine contemporary academic literature first from the view of the conceptual perspectives of innovation, then from the more experiential/contextual perspectives of innovation in organisations. We explore these areas to reveal the diverse foundations of the concept, all of which contribute to the malleable social interpretation of innovation. From those literature foundations we then go on to discuss the nature of the research problem and present the key research question. The methodological section follows with details of the empirical investigation. Our results are subsequently presented and discussed and the paper is concluded by highlighting contributions to R&D management and innovation for academic understanding and managerial practice.

Literature review

Despite the extensive literature, there is still a fundamental ambiguity about the concept of innovation and it remains a largely malleable term. Indeed, Pohlmann (2005, p.2) states, 'innovation itself remains unpredictable, non-calculable, indistinct and fuzzy'. As though in reply to this, Adams *et al.* (2006) review measurements for innovation management in an attempt to develop a process to identify common loci for evaluation of innovation in organisations (e.g. knowledge management, commercialisation, organisational culture, strategy). Wong and Chin (2007) similarly explore innovation with a view to identifying a holistic innovation management framework. Although both papers explore a range of factors which contribute to an 'explanation' of organisational innovation, the role of sociological factors is not considered. While an abundant literature variously presents diverse contributing elements supporting innovation, there is nonetheless an inherent and understated sociological platform on which all the diverse perspectives of innovation rest. We draw attention here to two paradigms that support this platform by considering the context and the community that inform the discourse on innovation value creation.

Experiential context of innovation

As innovation research proliferates, there is clearly a need for a comparative approach for assessing *how* innovation occurs and is supported in organisations, beyond quantitative output frameworks. The literature is replete with discussions of the experience of innovation in organisations. From our examination of these discussions, we recognised that the innovation experience is manifest in three key dimensions, each fundamental to leveraging effectively the organisation's innovative potential. Activities, conditions and intangibles are the three dimensions of innovation widely explored in the literature in an effort to understand these outcomes. While there are inevitably blurred boundaries between them, they are essentially clear areas of concern.

There is no doubt that the dominant view of innovation in the literature focuses on its intended outcomes, such as research commercialisation, licensing, new product developments, technology transfer, collaborations, patents and IP licenses. This is very much a part of the *activity* dimension of innovation. There has also been extensive research into the particular *conditions* that facilitate innovation, such as risk tolerance, resource flexibility, learning cultures and forward-thinking strategies. This 'conditions' dimension of innovation is important because the activities needed for innovation will not occur in a vacuum. But innovation cannot easily be arranged. Even with the appropriate activities and favourable conditions, there is another crucial dimension to innovation. There will be unique tacit requirements, such as knowledge sharing and learning, insight and experience, creativity and vision, lateral information, extrapolation and informed speculation. These are elements of the *intangible* dimension of innovation. More specifically these dimensions can be considered as follows:

- (1) *Activities* are the interactions, actions, tasks and deeds through which a creative endeavour is sought (e.g. research, collaboration, communication, support, information activities, exploration, investment, diversification). For example, Adams *et al.* (2006, p.21) derived a framework of seven activities they view as essential for innovation. These are 'inputs management, knowledge management, innovation strategy, organisational culture and structure, portfolio management, project management and commercialization'. Collaboration is another activity which is well established as a primary conduit to innovation. From Etzkowitz and Leydesdorff's (2000) 'triple helix' model of research collaboration between government, university and industry to Chesbrough's (2003) 'open innovation', there has been widespread recognition that collaboration, cooperation and networking are activities that aid the development of innovation.
- (2) *Conditions* are the circumstances of the environment and organisation in which the professional, administrative and functional activities occur (e.g. risk/tolerance profile, learning environment, flexibility/time constraints, diversity and openness). The literature suggests conditions will be influenced by the degree of flexibility or control imposed and, further, that control stifles creativity. Alternatively, as Butler *et al.* (1998, p.776) suggest, 'fuzziness is needed to promote the adaptability to change and innovation'. The conditions of innovation are also affected by issues such as rewards, strategy, resources, opportunity and environmental complexity. For example, in order to facilitate

innovation, Galbraith (1982, pp.11,19) suggests orchestrators must use rewards and processes to attract and retain idea generators. Similarly, Scott and Bruce (1994) find innovative behaviour is related to the quality of the supervisor-subordinate relationship through to rewards, support for creativity and tolerance for differences. Berglund suggests 'Risk is central to innovation' (2007, p.497), while Day (2007, pp.111,112) creates a risk matrix to help inform organisations about the distribution of risk across their innovation portfolio.

- (3) *Intangibles* are the implicit influences, feelings and tacit atmosphere that are manifest or understood in organisational processes (e.g. knowledge, trust, inspiration, insight, faith, hope and curiosity). Intangibles that support innovation may be recognised in concepts such as encouragement and tolerance for change, as found by Susanne Scott and her team (Scott and Bruce, 1994, p.601) in their study of innovative behaviour. In their exploration of the innovation process, Clegg *et al.* (2002, p.416) find that trust is important to employees participating in innovative challenges. Knowledge is another intangible that has been widely explored in innovation research. Its relationship to innovation has been examined through such concepts as absorptive capacity (Cohen and Levinthal, 1990), notions of exploration and exploitation of knowledge through learning (March, 1991) and also the work of Liao (2007), who explores knowledge management strategies with a view to improving product innovation. Tacit knowledge is particularly recognised as inherent in innovation, both with respect to its ability to leverage expertise (Howells, 1996) and also because of its conservative nature (Rebernik and Širec, 2007).

To summarise, these dimensions reflect the intrinsic parameters of the innovation experience to reveal the processual complexity of conditions and intangibles as part of innovation activities. While these dimensions of innovation (activities, conditions and intangibles) have been widely explored (albeit frequently understated) in the literature, so too has the explicit organisational context in which innovation occurs.

Organisational context of innovation

The second facet of the context of innovation places organisation design centre stage and asks how different design features frame innovation outcomes. In reviewing the innovation literature, it was apparent that the situated context of any particular innovation enquiry was generally researched from one or more of the following four organisational domains – structure, culture, operations and the physical environment – sometimes explicitly, but frequently peripherally. We suggest the influence of these contextual domains is inherent in the nature of the innovations cultivated, regardless of contextual scope (whether at the organisation level, team, cluster or network, or even regional and national levels). These domains will be linked through the situation or design of the system undertaking the innovation. The domains can be defined generally as follows:

- (1) *Structure* – the controlling arrangement of the organisations, which is usually articulated through administration, policy, rules, assignment of tasks, delegated authority, reporting procedures, coordinating mechanisms and

hierarchies which dictate the division of labour, specialisations and functional relationships. Hoyt and Gerloff (2000, p.290) note that ‘organisational structure plays a key role in facilitating innovation in an organisation through its direct effect on communication and information transfer’, while Rogers (1995, p.205), in his discussion of fourth-generation R&D, recognises that structure, in particular organisational hierarchies, can be a major obstacle to innovation through the separation of knowledge resources. Governance structure has been shown to have a constructive effect on innovation through a competent board and managerial equity incentives (Wu, 2007).

- (2) *Culture* – the social environment of shared norms, beliefs, ethics, customs, traditions, history and behaviours that links groups of people with similar expectations, values, standards and understanding. Culture has been noted both to stimulate and to hinder innovation (Kenny and Reedy, 2006, p.119). Indeed, Pohlmann (2005) suggests the cultural hegemony of the organisation will define the interpretive standards of innovation. Jassawalla and Sashittal (2002) and many others have illustrated how supportive cultures can foster creative, innovative and initiative-taking behaviours among participants. Corporate culture is recognised as having an enormous role in establishing such an environment (Hoffman and Hegarty, 1993; Claver, Llopis, Garcia and Molina, 1998). James (2003) talks about culture as the ‘soul of innovation’, essential to facilitate the creative mysteries and new ideas that emerge through knowledge sharing.
- (3) *Operations* – the practical association of people, as individuals or as teams, groups, or units evident in their day-to-day working relationships, professional interactions and informal organisational structure. These associations may be obvious and logical or they may be either personal or understood. The domain of ‘operations’ offered here broadly embraces the practices and relationships, activities and associations, experiences and interactions that take place between organisational members in their work to achieve their tasks and fulfil their roles.
- (4) *Physical setting* – the material environment including infrastructure and technology, resource inventory, product and process technologies, equipment, devices, tools and machines that supports the tasks, activities, relationships and production of outcomes. Aspects of the physical setting contributing to innovation may be as obvious as infrastructure or the effective use of physical space in an organisation (Haner, 2005; Moultrie *et al.*, 2007). Tools and technology are also fundamental aspects of the physical setting (infrastructure) for innovation for many organisations. However, the physical environment goes beyond tools and workspaces. Physical design has been noted for its cognitive (particularly learning) (Beckman and Barry, 2007) and experiential (Kristensen, 2004) contributions to organisational innovation. Some suggest the ‘workscape’ in an innovating organisation will recognise the need for individual retreat (research and thinking), space for concentrated collaboration, and open interactive zones for serendipitous contact and informal interactions (Leonard and Swap, 1999; Haner, 2005). Proximity is another issue; while personal space is important, the likelihood of achieving interaction or collaborative insight is reduced as the distance between employees increases (Becker, 2007).

To summarise, these three experiential dimensions and four domains of the organisational situation constitute lenses with which we can consider the context and its propensity to influence innovation. Certainly we acknowledge that the academic delineation of these features of context is subjective and arbitrary; nonetheless, these elements provide a recognisable framework for contextual insights around innovation processes. In considering the research question posed here – how does the ‘sociology of innovation’ influence value creation? – these parameters of context are relative to the innovating community in question and so contribute to understanding the foundations of their perspectives and motivations in creating value in their innovations. As Brown and Duguid (2001) suggest, it is the context of practice and thus the framework for the knowledge and interactions that can facilitate or, indeed, impede innovations.

A sociological perspective of innovation

At this point, we acknowledge that the literature reveals considerable diversity with respect to contextual views of innovation. In assembling these literatures, we affirm their somewhat kaleidoscopic contribution to understanding innovation. Consequently, it’s apparent that any innovation must come about through a confluence of these elements in the informing context as they are experienced and understood by those in the innovation system (its participant community). The two preceding contextual paradigms are typical of perspectives in the literature and yet they give a peculiarly low status and agency to the participant innovators who, according to the two paradigms, either undertake the practice of innovation or inhibit innovation. These are the individuals who form a ‘participant community’, to which we turn next.

We recognise that studies of management and R&D often emphasise the contribution of social capital in communities to achieving outcomes. Indeed, social capital has a long history in organisational research in areas of knowledge (e.g. Yli-Renko *et al.*, 2001; Inkpen and Tsang, 2005), learning (e.g. Autio *et al.*, 2005; Atuahene-Gima and Murray, 2007), innovation (e.g. Landry *et al.*, 2002; Chen *et al.*, 2008) and technology (e.g. Myint *et al.*, 2005; Maurer and Ebers, 2006). However, the sociological component of innovation goes beyond the broader social capital of the group to embrace the unique interpretive interplay of social and technological domains. Indeed, Pohlmann (2005, p.3) proposes that the social factor is the reason for the ‘blackness of the innovation [black] box’.

This sociological perspective initially considers technology as proxy for innovation and has been gaining recognition and precedence through its roots in the social influences in technology. For example, it was a little more than half a century ago that Trist and Bamforth (1951) presented their socio-technical systems (STS) theory, which demonstrated the importance of balancing social and technical aspects of innovation for maximum integration and efficiency. By the 1980s, MacKenzie and others were setting out their position on the social shaping of technology (see MacKenzie and Wajcman, 1985). Since the 1990s, the literature has revealed the increasing importance of the social dimension in innovation activities, most specifically technological innovation (Fleck *et al.*, 1990; McLoughlin, 1999) and Orlikowski’s (1992) co-evolution of technology and the human experience.

The human dimension of technology and change (that is, innovation) is addressed in the literature on the sociology of technology (MacKenzie and Wajcman,

1999). This concern for understanding innovation in relation to its social implications and the human experience has been examined largely from the perspective of change, particularly that brought about through technological advances and their implications for work and society (see McLoughlin and Harris, 1997; McLoughlin 1999). The evolution of this perspective has emerged over a number of decades to the position of Grint and Woolgar (1997) who take a slightly different view of the social implications of technology and change with their social construction of technology (SCOT). They argue that in the social construction of technology there are no boundaries between social and technical dimensions, with the exception of those that are socially imposed. Their suggestion implies a fluid process of technological innovation with the human experience. The SCOT perspective illustrates how 'interpretative flexibility' is inevitable and fundamental to a sociological explanation and, indeed, the evolution of innovation processes. In other words, there will always be a multitude of different ways in which individuals and groups will interpret and make sense of the innovations they develop and utilise. McLoughlin and Dawson's (2003) mutual shaping perspective develops this position further.

In all of these examples, social experience is seen to be closely connected to the process of innovation, yet how that social experience informs innovation value creation is largely overlooked. A sociological perspective of innovation recognises that the situated social system is fundamental to interpreting and negotiating innovation evolution. This goes beyond the interrelationship of the innovation and the actor and is more in keeping with the perspective of Hellström (2004), who puts forward a comprehensive reconceptualisation of innovation as 'social action'. He suggests human actors are at the center of innovation, acting either individually or collectively to create a physical manifestation of something new. We suggest there is more than a central social hub in innovation development, and that a complex relational dynamic is at play in the innovating community which is fundamental in the development of innovation. This presents an enormous contingency for its value creation and management, and significantly contributes to the complexity of the innovation system as a whole. From this premise, there is considerable importance in achieving a supportive and constructive socio-contextual basis for professional relationships and interactions, particularly those needed to contribute to the knowledge personalisation inherent in innovation development (Daniel, 2012).

Building on this, we argue that a socially malleable interpretive frame will come into play with respect to value creation in the development of innovation. Knowledge, sense-making activities, preferences and agendas will have both explicit and implicit influences on what and how emerging innovations evolve (Daniel and Dawson, 2011). In considering the influence of socio-contextual factors on innovation value creation, we assume that the intrinsic role of collective sense-making and sense-giving occurs through a shared experience in the innovation process. When Hellström (2004) asks how the intention is formed and how the process of conceiving the innovation takes place, he implies that a dynamic social process is at work. He concludes that a rationality of purpose arises through a situated process of work, thus affirming that the context of the relational dynamics is fundamental to intentions for development and thus the potential value of innovations. This iterative evaluation process is recognised by Maitlis (2005) when she suggests that innovation value creation occurs as sense is both sought and shared in a dynamic environment.

Clearly, diverse and complex interactions and relationships underlie the extensive relational dynamics of the innovating community as various matters arise, such as

technological challenges, financial issues, professional agendas, market preferences, regulatory requirements and changing industry settings. The sociology of innovation recognises that a social corpus of knowledge in the innovating cliché is continually negotiated, debated, shared and advanced through iterative contributions, insights and opinions (Daniel, 2012). We explore how that sociology of innovation influences value creation in our case example.

Research question

The literature reveals diverse views of innovation, all attempting to help understand novel commercial activity. Indeed, innovation is emerging as one of the universal explanatory variables in business, well beyond its technical or creative origins. Innovation now constitutes an influential framing of the nature of progress, the nature of competition and the role of enterprising individuals within that process. Its comprehensive use in business is echoed by its use by politicians, policy-makers and industry agents. However, the complexity and uncertainty in its tangible evolution means the subtleties in the development and direction of innovation value creation are a challenge over and above pragmatic deliverables.

In this paper, we suggest that innovation value creation can best be understood as integral to a complex sociological discourse involving sense-making, negotiation and reflection within the community of those involved. We present literature to support this, suggesting interpretation of value in praxis arises through the experiential context and the social community of those involved in its development. The decision-makers, the managers, the technicians, the scientists and the policy-makers collectively contribute to the interactions and activities, the agendas and outcomes that make practical innovation so valuable. So, the question posed by this research is, how does the 'sociology of innovation' influence innovation value creation? With this question we acknowledge the academic diversity in interpretations of innovation and move beyond them to explore experiential context and social community as key influences in innovation value creation.

Methodology

We adopt an interpretive sociological perspective in our empirical investigation of innovation in the Australian biotechnology industry. Rich disclosure and meaningful narrative will provide insight into the perspectives and interpretations of participants. This methodology and this method of data collection are appropriate for exploratory research (Eisenhardt, 1989). The use of interpretive philosophies as a method for grounding research in a sociological perspective is well established in management studies (Zammuto, 1984; Alvesson and Deetz, 2000) and has been adopted to enhance the understanding of the relational interactions and hermeneutics of organisational issues (Robson and Rawnsley, 2001; Prasad, 2002). Given the emphasis on both context and community in this research, this approach was considered the most appropriate.

A qualitative study of approximately 50 participants from four cases in Australian bioindustry R&D was undertaken using a multi-level, in-depth semi-structured interview approach. Purposeful case selection was undertaken to contribute to theoretical development as well as to transferability, generalisability and empirical soundness. An analysis of four different sub-cases covered government, academic,

commercial and industry perspectives on biotechnology innovation. These cases ensured different contexts of bioinnovation were presented.

The empirical evidence for this research was gathered from interviews with representatives from different positions in the bioindustry, all involved in biotechnology innovation. This was a multi-level analysis of stakeholders in various roles and hierarchical positions to ensure representation of the perspectives of diverse participants in these innovation activities. Interviews were conducted across multiple bioindustry stakeholder groups, including industry (multi-national companies, publicly listed companies and spin-outs), research (public, private, corporate and government), government (local, state and federal) and business professionals (financial/accounting, venture capital, entrepreneurs and marketers). Table 1 reveals the positions and roles of the stakeholders interviewed. Interviews provided over 50 hours of qualitative data which revealed significant insights into the relational experiences of stakeholders in the process of biotechnology innovation development. Following individual case analysis, a cross-case analysis enabled the examination of the collective evidence to reveal empirical parallels across the cases and congruence across the sectors.

This multi-level research provides a critical view of these interactions and experiences by recognizing that biotechnology stakeholders interact in a heuristic process of innovation development and negotiation in the common commercialisation agenda. This critical approach is gaining greater acceptance as organisational

Table 1. Bioindustry case study interviewee details.

Case study	No. of interviewees (n = 47)	Interviewee positions
Tertiary/university human therapeutics research centre	12	3 x post-doc researchers 3 x scientific research assistants 2 x scientific research fellows 1 x program leader/scientist 1 x centre director/scientist 1 x head of school/scientist 1 x head of faculty/scientist
Government agricultural research organisation	11	4 x technical research officers 3 x biotechnologists 2 x research scientists 1 x director/scientist 1 x policy officer
Commercial medical diagnostics research and development corporation	11	3 x team leader/scientists 3 x research scientists 1 x production manager 1 x marketing manager/scientist 1 x new product manager/scientist 1 x regulatory manager 1 x chief financial officer
Wider Australian bioindustry	13	3 x industry executives 6 x government agents/researchers 5 x directors/managers/CEOs 4 x scientists/entrepreneurs (Some interviewees held more than one position in the bioindustry.)

Note: CEO, chief executive officer.

research seeks to understand the co-evolutionary influences of complex environments and multiple stakeholders (Lewin and Koza, 2001). Moreover, it is useful here as it enables heterogeneous knowledge inputs of stakeholders to be recognised as contributions and contingencies to their interactions in the development of bioinnovations.

Results

We interviewed researchers involved in biotechnology for their perspectives on developing innovations in their organisations. Empirically rich evidence from the Australian bioindustry was interrogated using Nvivo qualitative software to assist thematic analysis and support interpretative exploration of interviews. The following evidence is presented here through two major themes – (1) context and (2) community – as platforms for examining the hermeneutics of value of those involved in developing bioinnovations. The first of these themes illuminates participants' understanding of innovation value in their work in relation to their professional contexts, their disciplinary backgrounds and their company's objectives. The second theme relates to the nature of innovation value as participants consider their roles and activities within different levels of community. These results duly lead to a discussion which strives to improve understanding of how the organisational social milieu influences innovation value creation in practice.

Context

The context of participants was presented in their interviews through four perspectives:

- (1) the perspectives they held of the science and innovation research they were undertaking,
- (2) their social view of their roles as cutting-edge scientists and researchers,
- (3) their perceptions of broader professional agendas in advancing bioinnovation development, and
- (4) the organisational context.

These contextual perspectives revealed participants' goals and attitudes with respect to the innovations they were developing or involved in.

The research context of bioinnovation. At the outset, it was evident the researchers involved in developing bioinnovations were committed to and enthralled by the science they explored:

Oh the science is amazing. You know, recombinant DNA and all that stuff; the insights it can give are just incredible.

As a scientist you think science is the most important thing.

What I enjoy about the projects I've been working on is the obvious impact we're going to have on the agriculture in some of these countries.

That's big picture stuff and that's the reward for me – being able to see where it all goes.

This enthusiasm for their field of work ensures a level of engagement which may be difficult to cultivate by other means. Engagement at such a personal level clearly has a role in commitment to the research agenda. This commitment may have fuelled the motivation of researchers to find elusive answers to their work. Those involved in developing bioinnovations explained the importance of establishing and developing connections with other researchers that could contribute to their knowledge and advancement of their activities:

Of course, you have to utilise people that are going to benefit you, but then you have to manage that relationship because they're not going to work with you unless they see what's in it for them.

Your formal networks are important in terms of helping you do things that you may not have as skills in house. Your informal ones give you the information you need.

Part of me knows that it's going to be fundamentally extremely important at some stage in the future and, while you may not be able to get too much out in the field at this stage, I know enough to have faith that it's going to be fundamentally important regardless of the flak.

The implication of expected reciprocity and faith in its future is apparent. People of value are sought, but that association also allows these people to receive value. There is a conviction that the work will be important and thus will have significant value in the future regardless of the perspectives of others.

The social context of the researchers. The importance of the social context of research interactions was very clear in the interviews, and it was apparent that a conducive research context was considered to be one in which positive attitudes and quality relations with colleagues were shared:

I think it has to be an open and trusting relationship. If I want to learn from them then I should show that I'm willing to teach and exchange what I know as well.

Respect is also a very big thing I think you'll find in science.

I can see that in the other groups that are here everybody sort of works on something that goes to a greater goal and I think that there is a team – well, I feel like I'm part of something good and valuable.

These quotes reveal the intractable influence of context with community as the effect of intangibles such as trust, openness, respect and engagement. The importance of a cooperative attitude and willing professional connections between scientists was also evident:

The good person you know is sometimes slightly better than the slightly better person you don't know because the arrangements and the connections are already there.

You know, like you find with a lot of scientific stuff you hear on the grapevine that someone might be working on this or that and if you know someone has had it working you can get in touch with them.

So where you have scientists working alongside each other with room to scuttle around a bit so they can have a chat, that's a very good way of going. The important thing is to keep scientists in large laboratories where they can see each other and chat to each other.

There is an expectation of active communication among those working in the field and clear value attributed to having the physical environment and time to do so. Thus, conditions supporting such communication activities are clearly an important part of the context. An established association is revealed to be preferable, *ceteris paribus*, as the existing relationship has established a platform for interacting. Nonetheless, seeking help further afield is accepted as standard practice and the value of frequent and informal communication noted as important. While the value of the intended innovation outcome may be unclear, the personal and professional value of these elements in the innovation process is evident.

The professional context of innovation value creation. The preceding sections reveal that social and research contexts support innovation development by providing intrinsic value to the professionals. The researchers participating in these innovation processes indicated the significance of those elements in the broader context of constructive innovation, research activities and concomitant value creation. Further to this, the influence of participants more widely involved, implicitly through commercial agendas or directly through funding bodies or as external partners, is also seen to contribute to this context:

The goals and expectations of our research group are the ones of our people that fund us.

Who's funding the project and your budget, that's always going to be a limiting factor on what techniques you can use.

Unmet need is the key driver. If there is a need and we don't have a way of doing it or if there is a need and it's not servicing the requirement – that's what drives the whole innovation process.

Funding, budgets, market needs and commercial innovation opportunities frame the context and activities of those undertaking the innovation development. Here, we see that the importance of commercialisation in the process of developing bioinnovations was accepted, together with the recognition of the integral nature of outcome-driven funding – 'that's what drives the whole innovation process'. There is an interesting implication for the innovation community related in these quotes through phrases such as 'our people that fund us', 'your budget' (implying not *their* budget) and 'we don't have a way of doing it' as opposed to '*they* don't have a way'. This inherent delineation of involvement has a significant influence on how value is leveraged in research activities:

I think in the commercial environment there has to be a real focus on the fact that someone at the end has to be willing to pay money for this product. It's a completely different perspective, it's not research for research[']s sake. It's more little r and big D.

So if you come up with something innovative, it's got to be cheap, it's got to take up a little bit of R&D time, and it's got to dramatically increase the performance of that product, otherwise it's not worth it.

I think sometimes you have to let go of the scientist in you to meet the demands of the commercial aspect of what you're doing.

In the above, we can see value is expressed in innovations which are high performing. These may not be the output of typical research agendas ('you have to let go of the scientist'), but rather of recognition that such a shift in attitude is necessary in innovation development. Interestingly, those interviewed appeared to have a somewhat cynical view of innovation as a generic objective in its own right, as they felt new products were constantly being developed to provide economic returns rather than a contribution to the advancement of humanity:

The whole idea of the industry is churning things out as quick as you can so if you're not open to new ideas you just get left behind.

If that company sees that it's something that's not favourable and the (wider) community won't like it, I don't think they'll fund it.

The science is subservient in the sense that there will be external pressures to come up with a particular outcome.

The suggestion that innovations are 'churned out', must be 'favourable' and are 'subservient' implies a negative attitude to a context which understates the humanitarian or technical value of innovations for other demands. In keeping with this, it was also clear in the interviews that the perspectives of those more involved in the commercial arena were considered to be vastly different from the researchers more closely involved in the development process. The divergence was tied to the different value agendas, with commercial professionals largely focused on a return on investment and market opportunity, while researchers valued the success of the science:

The experience I've had with commercial partners is that they set unrealistic time frames and that's more about money ... than ... science.

There is always a constant battle between the research scientist trying to explain to other people about the technical difficulties.

[It's] very difficult because scientists use different parts of their brain to finance people.

The biggest barrier is probably the lack of understanding of how business and academia/research can work side by side.

Tension arises when the focus shifts from the process to the outcomes associated with developing novel technologies. We see an apparent segregation of agendas and an 'us and them' attitude which can be seen through different identity labels such as 'commercial partners', 'other people' and 'finance people', as opposed to 'real science', 'research scientists' and 'scientists'. Researchers are compromised by the priority given to the commercial agenda as they face 'unrealistic' time frames, 'constant battles', 'barriers', 'lack of understanding' and 'an uneasy friction'. These elements present challenging conditions, potentially creating a less-than-conductive context.

Organisational influences. Organisational limitations to innovation were seen to be the result of budget constraints and restrictions caused by expensive licensing of various patented technologies, and focused on cost-effective delivery of organisational outcomes:

At your regular weekly meetings, you present your research and you tell them your ideas and they'll say if it's too expensive, or if we don't have clearance for that.

I know that there are limitations on technology that we can use according to patents.

Other times ... scientifically it's very interesting doing something, but if the outcomes would be similar to a simpler and more cost efficient technique, then there is no point in using the more innovative technique.

The development of bioinnovations was limited by commercial constraints ('too expensive', not 'cost effective') and regulatory requirements (limitation by patents or clearance). Despite this, access to funding, commercial partnerships and patent opportunities were all cited as providing avenues for organisational value creation. Clear technical objectives also delivered opportunities for value creation:

We had to achieve the outcome, but the reason biotechniques were used was because it had to be innovative as well, because it had to be something that they didn't have patents on that we could patent so the commercial partners could make some money out of it, so to that end it really had to be biotech.

They are always open to new ideas if we can find some new things to patent and things like that. They're very eager to know things like that because that puts us in a better position funding-wise.

While activities supporting organisational value creation through bioinnovation development may have been limited by budgets and technological restrictions, and leveraged by funding and commercial opportunities, ultimately the market pull of bioinnovations was considered the driver for market value creation: 'So the whole goal is to get something that is marketable and very profitable. So, ultimately that's where the value is going to be'.

Finally, the interviewees were very aware of the opportunities for value to be gained through developing novelty in their research. Intellectual property was both the stick and the carrot for these researchers – a stick when it was a restriction requiring alternative techniques to avoid licensing costs, but a carrot where their own research output had sufficient novelty and application to warrant a patent. In some cases, the final research product was a patented technological tool targeted for the research market. It was apparent that intellectual property was considered as valuable an outcome of bioinnovation research as market profits, since it provided significant opportunities and returns to the researcher and the research team:

The other driver being the value chain is really just the generation of intellectual property because again you may not have an unmet need, but the IP may give you a marketing edge. IP and unmet need I think are the drivers of innovation.

If there's intellectual property or potentially big money involved, yes, I think you've got every chance in the world [of developing innovations].

There is abundant evidence from these interviews of the influence of context on the nature of relationships and interactions. The contextual influences include intangible elements (such as trust, engagement and commitment), conditions surrounding relationships and interactions (such as open communication, quality, relationships and professional engagement) and activities (creating novelty, IP, satisfying market needs and profitable goals). These influences supported value agendas which were (1) personal ('I'm part of something good and valuable; everybody sort of works on something that goes to a greater goal'), (2) scientific ('It's getting to the really deep questions about biology'), (3) professional ('the obvious impact we're going to have on agriculture; it's going to be fundamentally important'), (4) organisational ('so the commercial partners could make some money out of it'), (5) market-based ('unmet need; you've got to have a product focus') and (6) technical ('they are always open to new ideas if we can find some new things to patent, the generation of intellectual property'). Furthermore, the context establishes both background and framework for the negotiations, relationships, exchanges and communications these participants undertake.

Community

One outcome of the context of scientific passion, collegial support and commercial imperatives is the strong sense of community among the scientists developing biotechnology innovations. It was clear the innovation process was replete with value-laden activities. However, many of these were implicit or understated within personal agendas and the social dynamics of the community rather than apparent in more obvious commercial value creation intentions. We consider the evidence of the community influence on value in bioinnovations in this section by grouping comments into three sets; personal, the research team and, finally, professional and broader participant support.

Personal. Many bioinnovation researchers felt their activities were rich in purpose. They were fuelled by a passion for science and a desire to contribute to society. These personal values are consistent with the research context revealed earlier where 'being part of something good and valuable' and having an impact could be seen as a motivational foundation:

So we were very, very aware of how our work would be used by the Vietnamese scientists, but also how it would assist the growers that we're trying to help.

I just enjoy the thought I'm doing something that will help someone.

It's kind of nice for scientists to get together and communicate their ideas, but it means nothing unless the broader world gets to benefit from it. It has to be something that does change the world or change the way we look at things, and makes a material difference to people.

Team support. Engagement in the research community is fundamental because everyone at each level of the research project hierarchy is contributing something towards the achievement of project goals. It was evident that the applied nature of the

research meant that those involved needed to be able to discuss their results and feed back findings to their group, to share what they had learnt and achieved, as well as to discuss challenges. With everyone relying on each other, active engagement in group discussions was essential:

At the level of the group ourselves, I think everybody contributes and is listened to, it doesn't matter whether they're a research assistant, a PhD student, honours student, postdoc, lecturer, whatever.

You present your data and you talk about problems that you have and things like that and everyone has an opinion and everyone has experience in different fields. It does influence on what you are doing.

The importance of the engagement is reinforced through the fact that each member of the team is working on a part of the overall goal, so the challenges and successes they experience are important to the rest of the project. Such shared activity results in a collective perspective where any research challenge will have an impact on the whole team, and developments come about through group consensus:

It's all entirely peer group and what other people are doing and what works basically.

Usually people tend to discuss with others. If they can relate to somebody who is more knowledgeable in one field, then other people can overhear it and have their input.

The acknowledgement of informal and opportunistic contributions of input from other group members further supports the acceptance of a group perspective. The perception that any knowledge-rich communication is a public good freely available for anyone in the research team is evident, revealing a clear absence of knowledge gatekeepers. There is strong evidence in the interviews of the importance of the team in creating a perspective of their research which supports engagement, consensus, value and motivation:

So, one of the things you do is set milestones that are achievable. They're a stretch but they're achievable, and very open and highlighted up there and let's go for them. Yes, we're going to get there and when you get there you celebrate that because they're important.

Professional community and broader influences. The researchers interviewed also suggested that a level of professional value was derived from working in a committed research environment:

I'm thinking of two things usually. Getting the results for the group means publications which helps us get more grants, but I'm also thinking of the end users, how can this test be used to benefit the people that we're trying to help.

The first to publish is really important in a new thing, absolutely.

I'm getting the results that I need to get and I can see all the data's coming in, and I'm finding interesting things and I can see that it's worthwhile and it's getting me to where I want to go.

Significant professional value arises through the innovation development process as opposed to the production of a successful commercial outcome. Beyond the value gained through the immediate collective of innovation researchers, other peripheral participants involved in the development of bioinnovations, such as historic and professional networks of peers, provided valuable connections:

If it's something new and a technique I've not used before, I'll find whoever is using it and an expert at it to get advice.

The other thing too is ... you can always contact the people who are involved there, but it's usually through somebody else that you find out people who can help you.

You'll often be chatting with someone in an informal way and then find out that they have got something that's of extreme value to you and so you'll formalise the relationship in some way.

The perspectives and opinions of researcher directors and project managers will influence the direction a bioinnovation will take:

If the person who's supervising you has used one of those techniques and is proficient in that technique, then that's the technique you're going to learn and most likely going to use, even though it might not be the best technique, but it's the one available to you.

All of a sudden you're sort of limited in how you can go about transforming plants because the technique has been set up and it's been optimised. So I suppose you'd lean towards using that one as opposed to branching out on your own.

While there is much communication about possible techniques, selection of techniques is ultimately determined by the available resources and expertise. There is no doubt that a collective purpose exists among these participants. Although their goals and processes in the development of the innovations were related to various professional objectives, there remained a central involvement (a rationality of purpose). An understanding of this broad objective – rationality of purpose – involved sense-making and sense-giving through shared experiences, common paradigms, collective agendas and common knowledge.

Discussion

We have suggested that any assessment of value creation in innovation needs to recognise it as greater than a discrete outcome, acknowledging it as a complex socio-contextual process. The evidence presented here reveals that social complexity, and in doing so affirms that value creation in innovation is multi-dimensional and intrinsically intertwined in the socio-technical dynamics of the development process.

The organisational agenda to acquire value through the search for novelty for commercial opportunity was a major driver of innovation development ('someone at the end has to be willing to pay money ... it's not research for research[']s sake'). The challenge for organisations seeking to advance their commercial innovation, however, is not to produce novelty *per se*, but to produce the right sort of novelty. There is no doubt that such pragmatism has a significant impact on decision-making

(‘the whole goal is to get something that is marketable and very profitable’), and certainly the importance of ‘fit’ with existing technologies, skills, knowledge and stakeholder objectives is also acknowledged. Thus, the context of emerging or developing innovations here is at once framed by market opportunity, commercial success and stakeholder expectations, as well as technological and knowledge resources. The essential innovation dimensions (knowledge and acceptance as *intangibles*, market *conditions*, research *activities* that ‘fit’) are in this case framed by organisational agendas.

The significance of community is less obvious. However, it is through the collective influence of participants and their perception of place and purpose that community affects innovation development. The evidence reveals tensions between researchers and business (‘scientists use different parts of their brain from finance people’), between science and commerce (‘science is the most important thing; someone at the end has to be willing to pay money for this product’) and between the greater good and market iterations (‘big picture stuff is the reward for me; the industry is churning things out’). We expect innovation to occur in a dynamic environment where tensions and debate are mechanisms for insight and creativity. Community dissonance contributes to the relational dynamics of the innovating collective. The interactions and relationships, attitudes and activities that reciprocally inform these social processes are fundamental to creative tension and innovative impetus. As a consequence, there is value in the community as a constructively interactive milieu in its own right (‘it’s usually through somebody else that you find out people who can help you’), but additionally the various relationships have unique relational value with respect to their associative contribution. Consider the personal significance (‘I’m finding interesting things and I can see that it’s worthwhile and it’s getting me to where I want to go’) and it is apparent that there is significant value inherent in the innovating community which exists beyond organisational agendas and institutional mechanisms.

The behaviour and attitudes, relationships and associations of those participating in the innovation development process can be understood as an outcome of the social processes (‘there is a lot of consultation that goes on; everybody contributes and is listened to; everyone has an opinion and everyone has experience in different fields, it does influence on what you are doing’) and institutional mechanisms (‘your regular weekly meetings; things you do is set milestones; the main influence is from the board; the other driver being the value chain’). We can understand these relational dynamics better when we recognise that they cover the spectrum of collective negotiations and exchange (‘they’re not going to work with you unless they see what’s in it for them’), consensus and debate (‘you have to let go of the scientist in you to meet the demands’), shared knowledge and learning (‘if I want to learn from them then I should show that I’m willing to teach and exchange’), acceptance and difference (‘they’re two very different cultures and so you’ve got to meld’) as value is sought at both institutional and personal levels. A shared and malleable corpus of knowledge and understanding embraces the collective perspectives of value and innovation and links these participants as members of the bioinnovation community, despite their differences (‘It’s an industry which can bring together different elements to create an enablement. It is one of the few industries which has the potential to create better quality of life’). It is from this collective position that all other value agendas are derived.

The empirical findings in this paper revealed just how diverse the perspectives of innovation value can be ('something that is marketable and very profitable; results for the group means publications; it has to be something that does change the world; we could patent so the commercial partners could make some money; it should be public knowledge; it's getting me to where I want to go; I'm doing something that will help someone'). Some of these outcomes are far from obvious; they may be personal, organisational, situated within a business agenda, or derived from a professional attitude or a personal ethic. These participants are involved in sense-making (Weick, 1995) as they negotiate their contextual parameters and interpret their community expectations to create meaningful value from their innovation activities. They are reflexively making sense of the scientific field in which they work, the social and economic context, the actions and reactions of competitors, and all manner of factors which inform their context and relationships. This ongoing process of interpretation and sense-making is context dependent and subject to an inherently social process in which interactions and attitudes help shape activities and agendas ('respect is also a very big thing; everyone has an opinion; the good person you know is sometimes slightly better').

Innovation value is implicitly and recursively informed through socio-contextual interpretations of (1) organisational ambition ('they are always open to new ideas if we can find some new things to patent'), (2) professional agendas ('we were very, very aware of how our work would be used') and (3) personal goals ('I know enough to have faith that it's going to be fundamentally important'). These relational dynamics provide a discursive space in which sense-making, negotiation and compromise on the nature and direction of innovation value contribute to a common agenda ('everybody contributes and is listened to; it means nothing unless the broader world gets to benefit from it; I'm also thinking of the end users'). Sense-making is central throughout the innovation process, where perspectives of value are satisfied through the interpretation and negotiation of shared understanding and knowledge, or with the support or expertise of others. The value creation in these innovations is diversely personal, collective, organisational and dynamic (Table 2). It is important to note that while a commercial outcome (IP or product) may be the end point of this process, other aspects of value are inherent, abundant and intrinsically important to the successful outcome objective.

These results make clear that innovation value is sought and achieved by many people differentially throughout the process of development of bioinnovations. Thus, the influence of the sociology of innovation on value is supported through the recognition of the relational dynamics of that sense-making social corpus. Importantly, while there is a convergence of collective innovation agendas supporting organisational value, a diversity of individual perspectives of innovation value is also apparent. So, we see a recursive revision of value judgements and an interplay of personal and collective value arising through the relational dynamics of the participants in the development process. Ultimately, these dynamics are an outcome of both the social processes (affirming interpersonal and tacit contributions) and institutional mechanisms (acknowledging the explicit contextual agenda) that frame their activities and interactions (Table 3).

A dynamic sociology (a unique combination of factors and patterns of behaviour and expectations) is involved in innovation value creation in this case, overturning the notion that innovation value is determined by a successful commercial outcome. We suggest there is a need to pay heed to the dynamic of social milieu of innovation.

Table 2. Value created through the innovation development process.

Innovation value	
Organisational	<ul style="list-style-type: none"> ● Financial returns – Return on Investment (ROI), additional funding/grants ● Market uptake, paying consumers ● Intellectual property, patents, technical novelty ● Technological advantage ● Commercial partners
Multi-dimensional	<ul style="list-style-type: none"> ● Societal contributions (greater goal, important future benefits, helping/assisting/making a difference) ● Reciprocal professional benefits (learning/sharing/alliances/networks) ● A dynamic process of knowledge development and sharing ● Social corpus of knowledge and platform for engagement
Personal	<ul style="list-style-type: none"> ● Personal gain/contribution (satisfaction/involvement/feeling of worth) ● Relational richness (colleagues, respect, valued participation) ● Publications ● Professional rewards/scientific interest

For managers and policy-makers seeking value from innovation, recognition and support of the complex contributions and gains by those involved in innovation are essential.

Contributions and limitations

The challenge in innovation studies is to establish an understanding of principles that fit disparate settings. The disparate nature of innovation development goes beyond the settings (context) and extends into the innovating community. Our theoretical foundations contribute to the literature on innovation, as we consolidated much research on innovation to reveal three fundamental dimensions of innovation – activities, conditions and intangibles. These dimensions have the potential to provide a sound conceptual tool for researchers with a consistent base for appraising innovation in organisations.

The question of how value creation is influenced by both context and community we have sought to address through the notion of a sociology of innovation as a unique relational paradigm. Through that lens, we were able to view complex interactions and relationships, and the various contextual parameters, as a holistic innovation system. Revealing a confluence of factors both informs and challenges ideas of value. This approach to considering innovation value from a complex sociological perspective contributes to the literature by extending our understanding beyond explicit outcome agendas to embrace more subtle elements of value creation in the supporting community.

In exploring the relational dynamics of innovation development to interpret value, we exposed the dual imperatives of social processes and institutional mechanisms as parameters framing the relational dynamics of the innovating community. These parameters contribute to the empirical investigation by revealing the different mechanisms guiding the negotiation process as participants sought to make sense of

Table 3. Social processes and institutional mechanisms as factors influencing the relational dynamics of those interviewed.

Social processes (<i>interpersonal</i>)	Institutional mechanisms (<i>organisational agendas</i>)
<ul style="list-style-type: none"> ● Professional associations as assets ● Being part of a team with a good cause ● Quality relationships (trust, respect, openness, engagement) ● Familiarity and established connections facilitate collaboration ● Informal communications supporting knowledge sourcing and thus learning ● Open communications to exchange information, ideas and feedback ● Professional ambidexterity (science/commercial divide) ● Historic and professional networks of peers ● Engagement with the field – rewarding, amazing, having an impact ● Positive attitudes to science ● Being part of something good and valuable ● Supportive professional collaborations ● Informal consultation processes 	<ul style="list-style-type: none"> ● Commercial objectives/opportunities (unmet needs) ● Research project groupings, team meetings ● Cooperative alliances ● Project goals and expectations ● Funding sources, grants, publications ● Board directives and governance issues ● Supervision ● Open space to facilitate interaction and dialogue exchange ● Budgetary restrictions ● Market need/acceptance ● Patents/licensing/intellectual property ● Approval subject to wider community acceptance ● Technological fit/restrictions ● Performance expectations and time frames ● Industry expectations/regulatory requirements

their contributions and value. In distinguishing institutional parameters from social processes, we were able to reveal subtle but important value-laden activities together with the organisational mechanisms that support them. There is sufficient conceptual utility in this duality to yield further insights into other fields of social and interpretive research where complex interpersonal situations are integral to key organisational activities.

The generalisability of this research may be limited by its focus on the Australian bioindustry. Innovation in other industries may be quite different. It may be that bioindustry scientists have a stronger sense of disciplinary identity than other industrial innovators. Nonetheless, there is much scope to utilise this approach in other areas of innovation. Given the novelty of the approach, we believe this study makes a significant contribution to understanding the complex sociological and organisational drivers of innovation value.

Conclusion

Improving our understanding of how to facilitate an appropriate social milieu to support innovation is an ambitious goal. However, these results support the proposition that there is a unique sociology intrinsic to the innovation process. Further, this is inherently directed by the context and community involved. We have revealed that recursive interpretations, negotiations and sense-making are undertaken in the

process of creating value in innovations, revealing that there is a complex interplay of context and community. These insights into the importance of the socio-contextual environment in supporting innovation may be useful for managers, policy-makers and industry leaders.

Acknowledgements

Many thanks to those in the Australian Bioindustry that contributed their time and effort to help make this research possible. Supporting funding from the Rural Industries Research and Development Corporation is also gratefully acknowledged.

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