Collaborating for Innovation: the socialised management of knowledge

Abstract

Although the importance of diverse knowledge is widely recognised for open innovation, there may be a gap in our understanding of the social processes that shape how collaborators engage in knowledge exchange. This social gap may be significant because of the powerful, but largely unexplained, role attributed to trust as a social artefact. Moreover, we see trust as a process and that different types of trust are involved in the collaborative process. Thus this paper uses a qualitative methodology to capture the experiences of innovation collaborators. As explanation of the dynamic interplays of knowledge and trust, we offer a description of phases in the process. Our analysis finds that the relationship moves from transactional to social. The early phases are characterised by technical knowledge, but the later and mature phases are identified with knowledge of the person and by personal trust. The success of innovation is a result of relationships with augmented trust. We found that a fabric of trust is woven from the weft of professional knowledge and the warp of personal knowledge to support innovation. We propose that this developing of relationships might be conceived as becoming more open in the sense of sharing with one another. If so, we seem to have described and offered a social dimension of open innovation.

Keywords

Open innovation; social processes; knowledge exchange; relationship development; biotechnology.

Collaborating for Innovation; the socialised management of knowledge

1. Introduction

This paper examines relationships where knowledge for innovation is brought into play. Whilst we know that collaborative relationships can mobilise knowledge for innovation, we know less about how these relationships become productive. Accordingly, we examine the technical and social dynamics of innovative relationship development and the effects on knowledge acquisition and application. As the networking literature demonstrates, the formations of knowledge via collaborations can be understood as a social process. Moreover, these processes are important for small technology firms which have limited resources, yet have a technological and competitive imperative to acquire knowledge for innovation. Consequently, the purpose of the paper is to try to establish how knowledge exchange relationships work and how innovation is produced.

Knowledge is connected in the co-creation of novel products. It is rooted in Schumpertian innovative combining of knowledge (Schumpeter 1934), which is largely an economic perspective on a social process (Ferguson et al. 2016). In the last three decades (Chesbrough 2003) the innovation literature has introduced and developed the term 'open innovation' (OI), to reflect collaboration in firms' innovation practices in, emphasizing the importance and benefits of managing in- and out-flows of knowledge. This study extends the literature of OI and explains the process of co-creation as being a socially enabled process. We examine customer-supplier engagements in OI because these have previously been shown to be fertile relationships leading to innovation success.

The paper contributes by applying our empirical descriptive accounts of collaborative practices to conceptualise and explain how collaborations work. In identifying phases in the relationship development, we found that collaborations were formed from technological competence, but were facilitated through relational capabilities. Our analysis showed that relationships move from transactional to socially enacted through communicating to engagement, but remain instrumentally functional. In shifting from transactional to a more personalised relationship, the formation of ambience and growth of trust enables collaboration and facilitates the

sharing of useful tacit knowledge.

2. The research problem and the literature

Chesbrough (2003) proposed the concept of open innovation that explains how innovation, shifting from a closed to an open format, depends on firm-specific knowledge *and* external knowledge (Huizingh 2011, Natalicchio et al. 2014). Indeed, Ritala et al. (2015) suggested that sharing and acquiring knowledge is often a precondition for innovation. Similarly, Valkorar et al (2012) expanded on Drucker's (1993) fundamental point that innovation is the application of knowledge, to argue that success depends on both internal and external knowledge. As Rothwell (1992) summarised, the 5th generation of innovation is a networked model (Malecki, 2010). Innovation is thus presented as a distributed knowledge based networking process (Hobday et al. 2012). This model envisages the knowledge necessary for innovation as distributed across networks and held by different members. Anderson and Li (2014) argue that innovation cannot be produced in isolation, relying on internal resources within the small firm. Instead, as Malbera (2006) shows, the current structure of innovation is a network structure of relationships. For Edwards et al. (2005), emphasis is given to the social shaping of innovation; a favouring of process models. As Thomas et al. (2009, 393) propose, "innovation is a coupling process". Consequently, managing knowledge across organisational boundaries is critical (Nonaka and Takeuchi 1995). Moreover, Alegre et al. (2013) found convincing evidence that knowledge management enhanced innovation performance. However, "most innovation projects will require a combination of some knowledge that is simple to move and other pieces that are extremely complex to mobilize" (Williamson 2007, 198).

Thus innovation practices may be perceived as a knowledge management process (Crossan and Aoaydin 2010, Lai et al. 2009), the creation and use of knowledge (Algere et al. 2013, Jaywarna and Holt, 2009). Collaborations can combine purposive outflows of knowledge- *technology exploitation* - with purposive inflows - *technology exploration* (Van de Vrande et al, 2009). For Freel (2003), this conception is acknowledged with an emphasis on the social embeddedness of technology push or market pull, and places knowledge in a social process. Sharing knowledge involves interaction between actors (Aarikka-Stenroos and Jaakkola 2012, Valkokar et al. 2012). As Berger and Luckmann (1967) pointed out, knowledge is transmitted

within social contexts (Edvardsson 2011). Innovation is perceived as a social process involving diverse actors (Adamides and Karacapilidis 2006) where knowledgeable people share knowledge, often tacit knowledge. Valkokar et al. (2012) suggest the management of tacit knowledge is informal and linked with social structures and interaction and is thus an interactive process (Lundvall, 2009). This suggests that knowledge management that has a social dimension is less well studied in the innovation literature (Edwards et al. 2005, Ulhøi 2005).

Because knowledge lies in people, Adamides and Karacapilidis (2006) suggest we examine this social dynamic, the interplay between social and knowledge processes. Styhre et al. (2001) point out that knowledge does not only reside in routines, processes, and communication, but is also mediated through emotional, cognitive, and perceptual processes and interactions. Knowledge, they argue, evolves from the texture of human relations. Open innovation theorists recognize that customer involvement informs internal innovation processes (van de Vrande et al. 2009). However, as Edvardsson (2011) notes, research in this area has tended to focus on the central issue of value-creation rather than the social setting in which the co-creation occurs. Moreover, Swan and Scarbrough (2005) point out that networked relationships are "negotiated". Accordingly, our objective is to examine customer-supplier relationships to better understand the processes of knowledge collaboration and how they affect innovation.

Small firms represent a useful place to explore collaborative supplier-customer relationships. Le Dain and Merminod (2014) note how research in supplier involvement has stressed the central role played by inter-firm knowledge sharing (Zeng et al. 2010, Gertler and Levitte 2005). Doloreux (2004) also emphasises the importance of customer-supplier relationships for innovative small firms. Aarikka-Stenroos and Jaakkola (2012) suggest that value creation for supplier and the customer is dependent on each other's knowledge and resources. SMEs lack resources and need to obtain them through collaboration (Hadjimanolis 2000). Moreover, biotechnology entrepreneurs operate under challenging conditions (Maine et al. 2015); as Geneste and Galvin (2015) explain knowledge resources have a special role to play in SMEs and accessing external knowledge resources through networking is critical (Traore 2006).

Small biotechnology firms offer a convenient unit for analysis (Curran and Blackburn, 2001); processes are likely to be less complex and easier to observe and identify. Moreover, much of what we know is about large firms (Alegre et al. 2013, Van de Vrande et al. 2009) and small firms are not simply smaller large firms (Oh et al. 2009). They have specific characteristics, short organisational distances (Padula et al. 2015) and personalised style of management (Harbi et al. 2009), limited resources (Anderson and Ullah 2014) and market reach so that networking is typical (Lee et al, 2010). Furthermore, Kim and Vonortas (2014) argued that smaller technology firms are more inclined than larger firms to establish collaborative agreements (Lane and Probert, 2007, Maine et al. 2015). More specifically, Lane and Probert (2007) point out the pre-dominance of quantitative analysis (Krafft et al. 2014, D'Amore et al. 2013, Smith and Bagni-sen 2006, Cooke 2006) and call for a qualitative research approach into innovation and external knowledge exchanges in the sector.

A much noted characteristic of collaborative relationships is "trust" (Hemmert et al. 2014, Blomqvist et al. 2005, Le Dain and Merminod 2014, Davenport et al. 1999), especially for smaller firms (Petrakis and Kostis 2012). Geneste and Galvin (201: 280) explain the importance of trust, "*it underpins effective inter-organisational relationships*" (Anderson et al. 2007, Jack et al. 2004, Sanzo et al. 2012). Soetano and Geenhuizen (2015) similarly demonstrated the value of trust embedded in networks, whilst Berg et al. (2011) emphasised the importance of trust for sharing knowledge. Ritala (2015) explains the beneficial role of trust on collaborations for sharing of tacit knowledge. Trust among collaborative partners enhances knowledge sharing because it allows the partners to put more effort into knowledge sharing and less effort into formal partner-monitoring activities. Thus trust and positive reciprocity serve as important moderators between shared tacit knowledge and innovation.

There is however, a danger when trust becomes a universal explanation; "*all you need is trust*". Welter explains how "*the label 'trust' has become something of a catch-all phrase, afforded to every entrepreneurial phenomenon that involves any form of non-contract-based collaboration*" (2012, 194). Nonetheless, Belderbos et al. (2015) explain how building up trust supports the exchange of tacit and fine grained information and knowledge. Similarly, Shazi et al. (2015) argue that trust is particularly salient for the innovation process. A problem arises when *unexplained* 'trust' is tantamount to explanation; "the knowledge integration process is

likely to be smoother when both parties have trust towards each other" (Yang et al. 2014,150). Trust is treated as part of the innovation process; Brunswicker and Vanhaverbeke "they build upon trust" (ibid, 4), or "with whom they established trustworthy relationships" (ibid, 11). These views stress the importance of trust, yet tell us little about how this trusting relationship develops.

For us this is problematic because of the implied circularity in process and content- trust is considered to create trusting relationships. Trust becomes self-referential; it is used to explain the relationship in terms of trust, without much specification of the process. Notwithstanding this issue of seeing trust as both catalyst and process informing and transforming relationships, few have studied of how trust arises. Given the importance attributed to trust, we think it will be useful to critically examine it as an enabling condition; (*how) does trust make innovation open*? Thus we examine the processes that determine the establishment of trust.

These interesting elements and their relationships present our research problem. We want to know and to explain, the social processes that shape innovation in buyer-seller relationships in our respondent small bio-technology firms.

3. Methods

The processual nature of the research problem indicated a qualitative approach would best capture appropriate data about relationship formation and processes (Patterson and Ambrosini 2015). The UK biotechnology is the second largest in the world (Smith and Bagni-Sen, 2006), in particular the sector in Scotland is well known for its excellence in entrepreneurship and strong innovation culture (Cooke 2006). There are 590 biotech organizations (Scottish-Development-International 2015), around 31,000 are employed and the industry generates a turnover of over £3bn (Gourley 2012). Most firms are small, 90% of the biotech firms have less than 50 employees (Oxford-University 2012, Scottish-Development-International 2015).

The study had two data collection elements. The first was participant observation by one author who spent a week helping with administration in a small innovative bio-tech company

we knew. Our objective was to get a "feel for the field" and to compare practices with what we had seen in the literature (Moustakas 1994). The very nature of academic papers can create a rather clean cut and refined view of process that may mask the messiness of reality. Participant observation also helped shape sampling and interview schedules for the main element; interviewing respondents (Curran et al. 1993, Curran and Blackburn 2001). We supplemented the material with desk research looking at firms' websites, brochures and other documents. We did this before, during and after the field work.

As is typical in this kind of study, we used purposeful sampling (Bruneel et al. 2012). This approach seeks a sample which is likely to have the characteristics that interests us (Anderson et al. 2007). Findings cannot be generalised to a wider population, however, they may be conceptually generalisable (Jack et al., 2004). We selected biotechnology firms that were small, independent and developed innovative products from customer networks. Our respondents were boundary spanning individuals who networked with customers in collaborative innovation (Liamputtong and Ezzy, 2005, Larson 1992, Johannessen and Dolva 1995). In total 11 firms that met the criteria were selected (see Table 1).

3.1 Analysis

Our principal data were presented in a mixture of respondents' stories, examples and anecdotes, so that our first task was to try to sort these data by looking for any patterns. We searched for repeated occurrences of apparent themes across the transcribed data, using NVivo 10 to help manage the volumes of data. We were guided by the literature review, what Glaser and Strauss (1967) call presensitivity. This meant that we were informed about themes that we might expect to find, but took great care not to purposefully seek them out. We were acutely aware of the methodological weakness in some qualitative work of merely finding what we were looking for. Indeed, we approached the data very critically by looking for disconfirming examples. This gave us confidence in the robustness of our analysis.

As is typical in constant comparative analysis (Bøllingtoft 2012), this thematic identification was not mechanical nor a linear process. Some themes were obvious; trust was an example, but other themes were more difficult because respondents used different words and

descriptions. This suggested that the broad meaning was related but could also have quite different connotations. For example, trust was regularly discussed, but the iterative analysis showed that our respondents understood trust in different ways. Later we were able to establish how the concept of trust was applied to different things. Initially trust developed in technical competences, but later trust was placed in people's capability. Later still we saw trust invested in reliability. Only by employing this discriminate analysis of themes in context were we able to properly distinguish how trust was employed.

In practice, we first identified a provisional theme then scrutinised the data for similar, but not identical expressions of the theme. Typically, we found some similarities, but expressed in such a way that they didn't quite fit; so we had to redefine the theme. We persevered until we were satisfied that we had captured the nuances of our respondents' meanings and practices.

This preliminary analysis was a *descriptive* analysis of what went on in these collaborations. We will explain later how we used this for our *explanatory* analysis. This involved linking and relating patterns to explain how the processes worked. Thus the first step was sorting and thematically categorising the data and the second step was identifying any plausible causality in the relationships in the patterns and between themes. Of these relationships, we believe that sequence holds explanatory power in that it enabled us to identify process in the ordering of events and practices.

4. Findings

4.1 Sample suitability and utility

Our first task was to establish how well our purposeful sample fitted our purposes. We were interested in small biotech firms who collaborated with their customers to produce innovation. The respondents' comments gave us confidence that we were looking at an appropriate sample to enquire into processes. All our respondents had identified innovation as a key element. Ronald from CML's comment was typical,

"Innovation is very important … it's what we are looking for, and defines our company"

(R, CM)

"We are dependent on innovation all the time." (G, TP)

We found customer collaboration and lots of examples of the reasons for collaboration.

"We got together; because we both recognise this mutual benefit here." (I, AI)

Indeed, some respondents saw this as a priority, *"The customer drives us"* (D, BT)

But we also saw an interesting social dimension to this collaboration,

"We built up a relationship between business development people but also the scientists … got to know each other" (J, CL)

Consequently, we were assured that our sample had the characteristics that interested us; they were innovative, they collaborated with others and did so in what appeared a process over time. Moreover, we had found an interesting aspect of the collaborations, the social, to explore. Table 1 below describes our respondents.

Insert Table 1

4.2 Patterns and sequences in the findings

From the literature we had anticipated the collaborations to be founded in some kind of technology fit, a complementarity of knowledge (Hess and Rothaermel 2011). We found evidence for this, for instance Greg at CR told us how customers first approached them with a problem asking, *"Can you help?",* thus obviously seeking specialist knowledge. In this case the problem was about drug metabolisms. New or different knowledge from outside was required to find an innovative solution to an existing problem. Indeed, Greg described innovation, *"think of solutions, that is where innovation comes in",* he summarised innovation as, *"the whole solution to the problem"*. Jason at Rmd even used the expression, *"complementary"* to describe the advantages of collaboration.

Acquiring and applying knowledge was obviously a motivation for collaborating and was the purpose of the collaboration. However, it quickly became clear that knowledge acquisition was a process rather than an event. Moreover, we found that the collaboration was a relationship that changed and developed over time. We were intrigued by the respondents' references to social relationships in their collaborative practices. Charles had told us, *"you have got to get that relationship"* (C, BT). Two elements stood out in the process; the technical knowledge we expected, but also a more social component that involved trust. Moreover, the stories we were told indicated changes, a patterning of relationship formation as process. We identified patterns of phases as the collaboration developed. These phases were characterised by particular types of behaviour and each phase involved knowledge, but in different ways. We identified three phases of collaboration development; discovering, connecting and coupling. The processes at each stage were characterised respectively as: specifying, relating and engaging. We continue by describing the phases, and then offer an analysis that helps explain what we found.

Discovering phase

This initial, indeed, initiating phase can be characterised as discovery; discovering potential collaborators and discovering what they know. Our respondents' attention to discovering was probably a reflection of the very competitive biotech environment (Bianchi et al. 2011) and a need to be at the leading edge (Khanna 2012). Certainly respondents seemed to be constantly alert for opportunities, as Thomas explained,

> "Y*ou are always looking for something new." (T, BT)*

Moreover, they saw people as the source of innovative knowledge,

> *"When we go on a trip, if we are in the area, we'll try and see people...you pick up ideas." (G, CR)*

We noted how this seeking out of new people and renewing acquaintances fitted what Israel

Kirzner (1973) had described as entrepreneurial alertness. However, practicing alertness involved what seemed like some sort of technological reconnoitring of the people they met (McKelvey et al. 2015) - discovering opportunity. Robert, for example, described how early conversations were used to discover any overlapping interests and potential.

> *"If it is somebody I have not met before, (we talk) to identify interests." (R, PK)*

We saw this phase as a sounding out to establish if collaboration could be useful. Did they share areas of interest as common knowledge territories?

> *"… asked all sorts of questions, very searching …" (I, AL)*

Not all initial meetings were about sounding out or discovering common interests; some were very specific knowledge enquiries. Greg provides an example of a knowledge enquiry opening in the discovery phase,

> *"… customers come and ask if we can help with their particular problem." (G, CR)*

Nonetheless, we observed that technical knowledge was employed as a key indicator of the potential for beginning a collaboration. In effect, knowledge was the lynchpin on which the collaboration could be founded. Greg, from the supplier's perspective, talked about how the discovery process continued by learning about the specifics of the customers' problem,

> *"We need to know the technical details of that problem." (G, CR)*

He then explained how he saw the process developing,

> *"Once scientists know the problem, then we can go in and handle it." (G, CR)*

For us, this demonstrates the centrality of knowledge in both the purpose and process of initiating a collaboration.

"We have developed questionnaires which we can send … they come back with the information" (P, AI)

Discovery was about the nature and extent of the potential collaborators' knowledge and its usefulness for a collaboration. Conceptually we might see this process as establishing what Enkel and Heil (2014) call technological distance. In contrast, the next stage seems to be about establishing cognitive distance.

We saw a variety of communication techniques employed to discover potential collaborators. Some were employed by the sellers and some by the buyers, but the processes were similar. Trade fairs were one example of a "meeting place". Obviously visitors and exhibitors share some interests. Greg explained,

"You know who these people are because they have been around in various scientific meetings" (G, CR)

Alternatively,

"If it's someone I haven't met before, we try to identify interests, products and applications" (R, PK)

Thus Trade Fairs became knowledge forums, good places to meet appropriate partners and good places to discover collaborators with knowledge that could be useful. This utility was aptly described as,

"It is about being…. complementary… we give them differentiation and add value (J, Rmd)"

Connecting phase

The preliminary phase was discovering interests, but the following phase is about beginning the relationship and establishing how it could be made useful. Knowledge remains important

but rather than technical knowledge, knowledge of the other became evident. In this second phase the emphasis was thus about creating a connection and bringing human relationships into play. At this stage there was considerable emphasis on getting to know more about each other. C at BT drew this out by highlighting human connections,

> *"People like to see people, talk to people"*

He pointed out that,

> *"People buy from people" ...... it's about building relationships"*

I at Cl expanded on how this took place, often by socialising,

> *"… of course it was like going out for a meal, things like fish, and all the rest whichever aren't very important' (laughs) … It was actually very difficult until you know what people think like."*

Eating together and socialising together helped them to know and understand each other.

> *"you go out in the evening, you ask what life is like in the US … You may have a meal in the restaurant or they may take you out to something, sporting event …"* (M, Cyp)
> *"They like to see you, they like to know about you."* (I, CL)

> *"… probably been to the house, probably share something with them …"* (D, BT)

It was evident that this connecting socially was seen as an essential step in the technical collaboration. We saw this as a step from establishing the extent of knowledge potential towards working out how well the collaboration would work.

> *"It's almost like a social thing first, then business talk … discussion of work, going to technical aspects …"* (I, CL)

Repeatedly we were told about the collaboration developing from "*knowing each other*". We thought this particularly interesting because by this stage the extent and type of technical knowledge had been established. We interpreted this as a shift from a simple knowledge transaction. In a transaction each party knows what would be exchanged, the boundaries of

the business deal have been established. We made a comparison with shopping; if I want to buy a can of Heinz beans, I know exactly what I want and can buy it from anyone who stocks the product. However, if I want somebody to help care for my elderly mother, I am purchasing a personal(ised) service. Certainly, I can specify what type of care is needed, even how it should be delivered. Yet specifications are not really enough, I want to be assured of the delivery process, I want to be confident about how well it will be delivered. Thus the relationship itself becomes as important, perhaps even more important, than the terms of the deal.

The example of elder care is obviously founded in compassion, which is less significant in technological innovation. However, we argue the similarity lies in uncertainty. All innovations lie in the realm of uncertainty (Sainio et al. 2015, Verdu et al. 2012). As Burns and Stalker (1961) pointed out long ago, we don't know if they will work, how well they will work or if we can make them work. Uncertainty is heightened when working with new people, the mechanics, the working out of the process are all uncertain. Hence we want to be confident that our partner will deliver as well as being reassured that they are capable of delivering. This is a behavioural problem rather than a technical issue. It seems that this confidence represents a level of trust that is achieved by getting to know about the individuals outside the business and "getting to know" each other. Bstieler et al. (2015) describe this is "closeness" and see it as an antecedent to relationship governance.

Coupling phase

This mature stage in the relationship is where innovations are founded.

> *"We have a lot of innovative products generated within the collaboration …" (A, Ht)*

It became clear that the strength of the relationship contributed to forming innovative ideas

> *"… we built up a relationship between business development people but also the scientists … got to know each other, then came up with concrete proposal …" (J, CL)*

By this stage, having discovered what the entrepreneurs are capable of doing and discussed the proposed solutions, commitment begins. In this phase we see confidence in each other,

and the durability of the relationship emerges,

> *"… It's a bit more long term ……" (C, BT)*
> *"… quite a long time and so much effort …" (A, Ht)*

A sense of direction for the collaboration has been established,

> *"This is what is going to take place, this is how it will break down."* (I, AI)

Problems become mutual problems; each party in the collaboration becomes dependent on the other and getting along with each other in the conditions of uncertainty.

> *"What you need to do … because this paper has already been published, because this … sorts of thing, so, don't spend your money" (G, CR)*

Knowledge and experience become the shared currency in the collaboration, with innovation as the end result,

> *"… think of solutions … a big step, that's where innovation comes up … the whole solution of the problem." (G, CR)*

Trust in the judgement of the other seems important too,

> *"Sometimes we say no. They come and say 'we want you to do this, and this …'*
> *- we question, 'why?', 'because we have got this problem … and this … we say 'no, you don't want to do this … it's a waste of time." (G, CR)*

This is the mature phase of the relationship. The collaborators have come to trust in each other's knowledge and expertise, and reliability creates an environment, a comfortable 'social' milieu where communication is easy and informal and where private and tacit knowledge can circulate freely. The milieu is based upon understanding each other, both from a technological and a personal position. Vulnerability to the uncertainties of both collaboration and innovation appears reduced because of the complementarity, the strength generated by sharing of problems and knowledge. Moreover, disagreement does not lead to discord. Consequently, the riskiness of innovation seems to become more tolerable because it has become mutual

and shared.

5. Discussion

Our analysis describes a process of dyadic exchanges in collaboration for open innovation, but importantly it also explains how the process works. It extends the literature on open innovation, to capture the dynamics in the nature of trusting relationships and to reveal dyadic network interactions in technology explorations and exploitations (Van De Vrande et al. 2009), as a socially embedded networking process. Figure 1 summarises how relationships developed, showing how the process moves from transactional to relational and eventually to an integration of both, indicated on the left-hand side. Trust grows as a consequence of knowledge, but the source of trust shifts from trust in capacity to a more personal form of trust, and eventually to an integrated trust, being an augmented relational entity. These are as a result of technical as well as social engagement, with the shifts in networking patterns, moving from objective communication at the beginning of the relationships to some intertwined network interactions, shown on the right-hand side of Figure 1. We argue that vulnerability (the exposure to risk in commitment in the connecting phase) increases as the collaborators become closer, but that uncertainty is reduced by having confidence in the other.

Knowledge plays different roles at different phases. In the discovering phase, knowledge is first placed in the 'shop window'. If buyers like what they see, they enter the shop to begin to learn about the terms of the deal. They want to know what can be delivered and how it will be delivered as well as the costs. This can be understood as developing professional trust in this phase. Such trust is useful for demarcation of the professional and technical aspects of the collaboration, the capacity and competence complementarity. However, it leaves considerable uncertainty about the compatibility of the collaborators and how deeply they will be committed. It is at this point, learning shifts to learning about each other. Once this is established, the relationship changes to a personal and social relationship. Governance is no longer a professional matter, but is based on a closer person to person relationship, governed and embedded in trust in each other. Until the mature - the coupling phase, we see the interplay of knowledge and trust when trust in the other elevates the relationship to a level where tacit knowledge can flow freely and combine to form commitment and to actualize

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innovation.

Insert Figure 1.

We knew from the literature that trust was important, but wanted to see the role of trust in the technical and social dimensions of collaborations. What we found was that trust was analogous with confidence. First, confidence lay in the knowledge capability but moving towards confidence in compatibility, resulting in commitment. We identified phases in this progress towards innovating as a co-creation.

Conclusions

By examining the experiences of innovative collaborators we were able to describe how the processes evolved. Our analysis of these processes found that the interplay of types of knowledge led to different types of trust. Importantly, we found that the scope for collaboration was at its strongest when trust was based on an augmented trust with professional as well as personal relationships. We show how a social fabric of trust is woven from profession knowledge to support innovation.

We found that collaborative innovative relationships are primed by technological capability but are socially enabled. The relationship formation process changed from what was transactional to a more personalized and social, and ultimately an integrated form. Thus the scope and basis of the relationship changed as our respondents got to know each other. In the early and middle phases, we saw trust, but like relationship itself, the basis and type of trust changed. Early trust was professional and rooted in technical capability. As the relationship developed the trust became personalised and based on reliability. The type of knowledge shared and exchanged followed a similar pattern. In the early phases most knowledge seemed to codifiable, albeit very specialist. We saw this knowledge displayed as expertise, as a kind of shop window. But once inside the shop, the second phase, we saw knowledge of the other as a means of deepening and furthering the relationship. In this closer relationship private knowledge was exchanged to promote recombinant knowledge based innovation.

We believe that we contribute to the literature on open innovation by describing how trust shapes dyadic collaboration process. Our socialised view sheds some light on hitherto less well understood areas of collaborative practices. As in all research, there are limitations to our contribution. Our sample was purposeful and limited to one industry. Thus we cannot generalise to other sectors. We propose, nonetheless, that our findings may be conceptually generalizable and thus have some broader utility for innovation more generally. Our descriptive findings reflect collaborator's experiences but the analysis and interpretation is our own. Whilst we are convinced it offers explanation, others may see alternative explanations.

We propose that this developing of relationships might be conceived as becoming more open in the sense of sharing with one another. If so, we seem to have described and offered a social dimension of open innovation.

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