Trust formation processes in innovative collaborations: networking as knowledge building practices

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Introduction

Innovation plays a key role in maintaining competitive advantage. This is especially true for small firms in the biotechnology sector, the focus of this study. Schumpeter (1934) pointed out innovation requires new combinations; especially new combinations of knowledge to develop new products (McAdam, 2005). For most small firms this means they have to collaborate to acquire such information and most do this through their networking (Jack et al., 2010a). Customers can play a key role in this networked innovation, not least because they can help shape how the innovation develops (Antikainen et al., 2010, Chorev and Anderson, 2006). Accordingly, our study examines the networking processes of small biotech firms as they engage with customers to produce innovation.

Although the importance of biotech innovation is well recognised, much less is known about how productive collaborations emerge and how they are sustained (Ortt and Van der Duin, 2008, Taatila et al., 2006). Nonetheless, we note that many scholars allude to the importance of trust. For example, Camén et al. (2011) propose that trust plays a significant role in most business relationships; or as Batt and Purchase (2004) put it, trust is the critical determinant of a good relationship. But few studies actually explain the role played by trust. Indeed, at one level trust is employed to "explain" almost everything in relationships; but in detail explains very little. The trust literature is replete with descriptions of different types of trust, but lacks examples of how trust is formed, developed and maintained in collaborative innovation. This study attempts to address this research problem. We examine the processes of collaborations, what Bjerregaard (2009) calls the social practices of collaboration, between innovators and their customers. We pay close attention to what sort of trust is

invoked and how it is engaged in the innovation practices of our respondents. Small businesses are well suited to this enquiry because their small size makes processes more visible (Anderson, 2000, Varis and Littunen, 2010). We employ an inductive, qualitative approach to capture and analyse data about the collaborative practices for innovation of 11 small biotech firms.

The development of trust was seen by all of our respondents as crucial for collaboration, but especially for the exchange of tacit knowledge. Trust helps overcome the tension between knowledge sharing and protection (Bogers, 2011). We found that different types of trust were invoked at different stages of the collaboration, but we could readily distinguish between the dimensions of trust based upon technical capability and trust built from more personal dimensions. In networking terms, we saw how weak ties with their capacity for non redundant knowledge become strong ties (Bergenholtz, 2011). Moreover, trust was the mechanism for this development. Interestingly, we found that in the virtual networking environment, personal trust only emerged with closer, face to face contacts. However, trust was maintained through email when strong ties are built. We argue that trust works by creating a stable platform for collaboration. Confidence arises through trust by reducing perceptions of vulnerability risk. Importantly, the evolvement of trust determined the extent of tacit knowledge exchanged, which in turn shapes the success of collaborative innovation. We found that the use of virtual networks complements, rather than substituting for, face-to-face meetings.

Having set out our research problem, we next explore the literature to establish what is already known about the topics. The literature identifies that collaboration is indeed important for innovation, especially the sharing of tacit knowledge. Yet there is a research gap in our knowledge about the trust formation process that facilitates the transfer of knowledge. Our next section explains how our methodology addresses the research problem. We then present our findings; essentially that there are two different approaches. The technical approach is used to show competence whilst the social is employed to build confidence in capability. Finally we discuss the implications and limitations of the study.

1. Literature review

2.1 Innovation, networking and trust

Chiaroni et al (2009) argue that network, or open, innovation has replaced the old model of a closed internal system. Carlile (2004) explains that innovation happens when the boundaries of knowledge domains are crossed. Indeed, Taatila et al (2006) propose that networked knowledge has pushed aside labour and capital as sources of value. Ortt and van der Duin (2008) describe this fourth generation of innovation management where network innovation is the flexible incorporation of knowledge from inside and outside the firm; thus emphasising the importance of external relationships (Varis and Littunen, 2010). For Ojasalo (2008), innovation and business networks belong together. Thus (Taatila et al, 2006), the importance of networks for innovation is widely accepted because networking

extends competencies, capabilities and capacities (Anderson et al, 2007), produces information flows and reduces transaction costs (Kalantaridis, 1996).

Varis and Littunen (2010) propose that innovative firms collaborate to reduce the cost of technological development or market entry, to reduce risk in development or market entry, to achieve scale economies and to reduce the time taken to develop and commercialise new products. Consequently, collaboration is particularly useful for small firms lacking resources and facing high opportunity costs in committing scarce skills, knowledge and time (Beesley and Rothwell, 1987). Small firms appear increasingly dependent on external collaboration for idea generation and R&D activities (Hagedoorn, 2006, Hagedoorn and Schakenraad, 1992). Studies emphasise the importance of vertical network relationships with suppliers and customers as an important source of innovation (Gassmann et al., 2006). Indeed, Danneels (2002) argued that competence in customer-networks affects competence in generating product innovation.

Scholars (Athaide et al., 1996, Gassmann et al., 2006, Pittaway et al., 2004) hold that involving customers in developing new products reduces the risks of innovation, but collaborations can be costly in time and risk information loss (Harbi et al, 2011). Yet Bogers (2011) suggests that commitment and trust deals with uncertainty. Nonetheless, Taatila et al point out (2006: 313) "questions regarding the psychological and sociological realities that form the social networks underlying the innovation process have remained largely unasked". It is this question of trust that is our focus. Trust seems to offer governance for collaborations, but we recognise trust as complex with a number of dimensions. Moreover these different dimensions may be activated in different ways and change over time, a process (Jack et al, 2010). Although there are many definitions and descriptions of trust, none can claim a universal application (Anderson et al., 2010). Trust is increasingly recognised as multi-dimensional and exists at the individual, organisational and inter-organisational levels (Lewicki and Bunker, 1996). Trust has been studied within economics (Sako, 1992), sociology (Miller and Steinberg, 1975, Boissevain, 1974, Young, 1957), social psychology (Lewis and Weigert, 1985), organisational management (Ellonen et al., 2008), marketing (Schoder and Haenlein, 2004) and entrepreneurship (Jing and Hamilton, 2010). Trust has been used as an explanatory framework in transactional cost theory (Williamson, 1975), social exchange theory in social communities (Young, 1957), resource-based organisational theory (Eisenhardt and Schoonhoven, 1996), relationship marketing theory (Hunt and Morgan, 1994) and SMEs' growth theory (Dubini and Aldrich, 1991).

The literature thus presents a complicated picture of types of trust with a variety of labels. But we consider Sako's (1992) two basic forms of trust, goodwill (social based) and competence (technical based), as usefully describing the main characteristics of most trust types. Table 1 lists the most relevant trust types for collaboration, highlighting differences between competence and relationship based forms. The table demonstrates that although there are over a dozen different labels for types of

trust, a simpler, more parsimonious typology of either competence or social trust, captures the essences of the application and use of trust.

Table 1 Types of trust in business collaborations

Author(s)	Trust Type	Description of Trust	Social or Competence focus
Sako (1992), Blomqvist (1997), Moingeon and Edmondson (1998),	Competence trust	Expectations about the ability of a collaborator to conduct activities that fulfil its role.	Competence
Nooteboom (2003), Sengun (2010), Byoung-Chun et al (2011)	Goodwill/Intention trust	The extent to which one partner can rely on the other's honesty to look after its interests.	Social
Larson (1992)	Economic trust	Refers to skills and performance and capabilities to be relied upon for collaborative work.	Competence
	Personal trust	Whether they could work with a group, considered as individuals.	Social
Shapiro et al. (1992)	Knowledge-based trust	Knowledge-based trust concerns with an individual's predictability of his/her partner's cooperative behaviour.	Competence
	Deterrence-based trust	Based on the belief in which individuals' actions follow their words.	Social
	Identification-based trust	Refers to an individual's identity which gave a partner's confidence about predictable behaviour.	Social
McAllister (1995)	Cognition-based trust	An individual's beliefs about peer reliability and dependability.	Competence
	Affection-based trust	Reciprocated inter-personal care and concern.	Social
Hossain and Wingant (2004)	Cognitive trust	Competence and reliability, in accomplishing a task successfully.	Competence
	Emotional trust	The creation of an emotional bond which removes fears of exploitation, and creates a feeling of mutual support.	Social
Meyerson et al. (1996)	Swift trust	A fragile trust usually based upon temporary arrangement for collaboration with new exchange relations.	Competence

Hung et al. (2004)	Presumptive trust	Trust formed in temporary teams where members lack familiarity, shared experience, reciprocal disclosure, threats and deterrents and fulfilled past promises. Often found in a virtual context where ICT is the main interaction mode.	Competence

Although many studies have examined types of trust and relationships, they mainly examined collaborations of temporary teams (e.g. Meyerson et al., 1996; Larson, 1992; Byoung-Chun et al., 2011). Studies (e.g. Powell, 1990) have examined the role of trust, but few have examined the trust building process. Nooteboom (2003) investigated trust processes, but in a team work context. So there appears to be a gap about trust building processes.

2.2 Distance, innovation, trust and virtual networking

Mackinnon et al (2004) argue for the role of inter-firm networks as channels for innovation and learning within regions and localities (Kalantaridis and Bika, 2006). Moreover, Dodd et al (2002) propose that networking processes are particularly beneficial when the network partners are geographically close to each other. Yet Fontes (2007) found that biotechnology SMEs collaborate locally and globally (Gertler and Levitte, 2005, Gittelman, 2007, Hendry and Brown, 2006, Lorentzen, 2007, Moodysson and Jonsson, 2007, Rasmussan et al., 2001). Whilst it appears that proximity is important for innovative collaboration, the evidence suggests that networking extends well beyond the local.

One way that firms can extend beyond the constraints of the local is through virtual networking, "connecting" by using information communication technology. This mechanism seems to offer scope for overcoming many of the problems associated with distance (Irvine and Anderson, 2008) and for increasing efficiency (Wall, 2005, Oh et al., 2009) as electronic modes of interaction enable networking across time and locations (Crossman and Lee-Kelley, 2004). But although electronic modes carry benefits of speed and low cost, the channel is much less rich in content (Lengel and Daft, 1988, Handy, 1995) than personal meetings. The medium, especially email, lacks the visual cues of eye contact and body language (Daft and Lengel, 1984, Lengel and Daft, 1988). Hence there is a depersonalisation invoked by email. The narrower channel of virtual communication may even restrict the transfer of tacit knowledge. Dosi (1988) and Polanyi (1967) point out that tacit knowledge, vital for innovation (Harbi et al, 2011), is best shared in face-to-face interactions. So for us this issue becomes how is trust, conducive for collaboration, generated in virtual interactions?

2.3 Biotechnology as a collaborative context

Biotechnology offers a rich context for exploring collaboration for innovation (Chiaroni et al., 2009). The biotechnology sector is renowned for its innovativeness and vital for growth (BIS, 2010). UK

biotechnology is ranked as top in Europe for research and development, second worldwide to the US, and employs some 24,000 people (UK-Trade-and-Investment, 2011). Moreover, biotech products provide new technological solutions for other industries (BIS, 2008). The majority of biotech firms are SMEs, but feature biotech-based entrepreneurship (Ahn and Meeks, 2008), manifest as entrepreneurs' pursuit of innovation (Cooke, 2006).

Product innovation, the life-blood of biotech firms, has become increasingly reliant on collective efforts through collaboration. Powell et al (1996) explain how the generation of biotechnology innovation is dispersed in networks where new knowledge is created through access to complementary knowledge. Tolstoy and Agndal (2010) and Calia et al (2007) make similar arguments. This goes someway to explaining the existence of clusters of small biotech firms. Cook (2001) notes that much of the rise in commercialisation of biotechnology is at the hands of small start-up and spin-out companies originating in the U.K. science based. This link to the science base (Rosiello, 2007) relates the clustering of small biotech companies to University cities such as Dundee and Aberdeen (Cooke, 2007). Cooke (2001;54) explains there is strong science and spin-out firms also in Dundee and Edinburgh as well as near Aberdeen. The sector is thus seen as occupying a "biotechnology triangle" between Dundee, Edinburgh with Glasgow at its heart.

Scholars (Hellstrom, 2004, Nonaka and Takeuchi, 1996, Nonaka and Takeuchi, 1994) highlight the important role of network relationships in enabling innovation collaboration; but also emphasise how human interactions involve emotion. Interestingly, little of this research has been directed to understanding the processes of relationship building (Drakopoulou et al., 2002) or trust processes in the relationships (Jack et al., 2004) and how these change over time (Jack et al., 2008). This seems important in the biotechnology industry where product innovation involves high levels of uncertainty (De Jong and Woolthuis, 2008) and tacit knowledge exchanges (Hine and Kapeleris, 2006). Rosiello (2007) explains, some tasks, which require the undertaking of complementary activities, can be accomplished only by cooperation, in this sense that one person will do one thing only if assured that some other person will do another. We attempt to fill this gap by an improved understanding of trusting building processes in networked relationships.

2. Methodology

Our research objective was to find out what happens in innovative networks, especially trust process and virtual networks to develop some explanatory account of why they happen in this way. We aim to understand how entrepreneurs build, develop and maintain trust with customers in their innovation practices. We also want to know if and how, virtual interaction affects the processes. Given the importance of distance in collaborative relationships, we selected respondents whose customers did not share a location with our respondents. Our fieldwork was conducted in 2009 over several months and involved two stages. The initial stage was participant observation in a respondent's office, attempting to map how a collaborative network relationship operated (Van Manen, 1990). Participant

observation of networking activities combined with access to documents (emails) provided insights about interactions and behaviour in a real-life context (Waddington, 2004; Mason, 2002) Although time consuming, (Hussey and Hussey, 1997) this initial stage provided a grounded understanding for the next stage.

In-depth interviewing formed our next stage. One interviewer had previous involvement in new product development which helped establish rapport with the respondents (Patton, 2002) as connections were built through shared experiences (Liamputtong and Ezzy, 2005).

Sampling

We selected respondents from Aberdeen and Dundee, cities with a strong entrepreneurial biotechnology culture as we noted earlier. We purposefully sampled, selecting respondents with experiences appropriate for the study (Anderson and Smith, 2007). This was a purposeful sample and in that sense it is not intended to be representative, but one that is likely to have the characteristics that we want to examine. Such sampling does not allow the results to be generalisable to the wider population; but they may be generalisable at a conceptual level (Jack et al., 2008). Selected firms were; small, independent and producing customer led biotech innovation. Of our original sample frame of 14 firms, 11 agreed to participate.

Data collection

Among these firms, one entrepreneur, whom we already knew, generously offered us access to his firm (25 employees). We hoped that this participation would enable an understanding of processes and help design the interviews to collect relevant and explanatory data. One author conducted the observation over 7 days, but with subsequent calls.

Interviews

A total of 17 face-to-face interviews with 11 owner-managers and 6 marketing managers were completed. These respondents had boundary spanning roles with customers in collaborative innovation (Johannessen and Dolva, 1995, Larson and Starr, 1993). The interviews took an hour or two and were recorded and transcribed. Some follow-up telephone interviews were also carried out to clarify points that we missed in the first interviews (Taylor, 1984). The interviews focused on innovation, networking and virtual interactions. Data describing processes were supplemented by anecdotes and narratives about networking experiences.

The characteristics of the firms are shown in Table 3; all focused on biotech and all engaged in new product development. Interestingly, we noted that firm size did not seem to affect the number of innovations. Most of the firms had been founded on quite radical innovations. As one respondent reported, *"the original was radical, it came from our university laboratory"*. Nonetheless, typically, current innovations were incremental.

Table 3. Characteristics of the Biotech SMEs

Firm	Established	Business	No. of staff	Number of Product Innovations
BiT	1985	Biotech manufacturing	25	240 plus several in progress
CML	1985	Biotech production	38	No accurate history, but extensive with 4 in progress
Cyp	1989	Biotech manufacturing	7	50 plus several in progress
Cly	1996	Biotech manufacturing	63	90 plus several in progress
Rmd	1999	Biotech manufacturing	8	2 plus several in progress
Alb	2000	Biotech manufacturing	5	2 plus 2 in progress
CR	2001	Biotech production	30	2 plus several in progress
KinS	2002	Biotech products	2	40 plus several in progress
Hptg	2002	Bio-pharmacy product manufacturing	20	12 plus 3 in progress
PK	2002	Biotech manufacturing	5	1 plus 7 in progress

Analysis Technique

Our analysis sought patterns in the networking practices by the constant comparison method (Glaser, 1978, Anderson, 2000). Each transcribed interview was read several times and the text categorised and coded as emerging themes. We looked for themes within individual units and also connections between parts and the whole. Coding and links were completed by shifting backwards and forwards across each transcript and the entire set (Mason, 2002). NVivo 2.0 assisted our analysis, enabling us to move around free nodes, tree nodes and within tree nodes. The process allowed us to reflect on the data in detail, but also more broadly (Golafshani, 2003, Hussey and Hussey, 1997).

3. Findings and analysis

A primary and consistent theme was the importance of innovation for these small firms. *G* provided a very typical comment,

> *"Innovation is important … we're looking at the problems within the industry and coming up with the solutions through those problems" (G, CR)*

This theme demonstrated the business philosophy, and helped explain what drove the entrepreneurs to actively engage with new product development. Indeed, *P* at Alb, sees innovation as the company's *raison d'être*.

> *"If there is a problem and there isn't a solution, let's invent the solution … that's why we set up." (P, Alb)*

All respondents expressed similar attitudes towards innovation. We saw a passion for proactively dealing with challenges and creating innovation. New product development defined the nature of their businesses. But the importance of innovation, especially in solving customers' problem, was prioritised in customer relationships.

> *"… in terms of the parties that facilitate innovation generation, customers I would say are the first," (I, CML)*

All, save one, explained how customers contributed most in generating ideas leading to incremental innovations. The exceptional respondent described how ideas generally originated in-house, but customers contributed. Thus we were fairly confident that our data were well suited to investigating the processes of innovation.

Our analysis then examined differences in the networking approaches. Two distinctive types were identified, the technical approach and the social approach to trust building. What distinguishes these strategies is the different emphasis. The technical is about demonstrating technical competencies and abilities, whilst the social is about building a social connection. Nonetheless, both approaches seem intended to promote trust as a linking mechanism for collaboration. We begin by looking at how connections commenced.

Initiating collaboration

Ten firms published their research in bioscience journals, but all had websites. These were a shop window for their capabilities,

> *"… so everything we have got … all of our intellectual property is all on the website, so we are sharing it with our customers, so you want to know what are global warming and coal efficiencies? It's there. Do you want to know … when you dilute it with water? It's there …" (D, Bit)*

This shared information demonstrated technological capabilities and performance, offering customers a basis for confidence and potential for collaboration. It could be construed as a marketing strategy. For example,

" in terms of new business … we go out and actively market, present the company, we present at scientific meetings, so it's a whole marketing push, to tell people what CR can do, so the customers who come to us ***know what we can do*** *..." (G, CR) our emphasis*

But note how the focus is on what they can do. As a marketing strategy, it works by demonstrating knowledge as a hook to "catch" prospective clients, knowledge is displayed. Cognitive legitimacy (Aldrich and Fiol, 1994) is offered as a basis for presumptive trust about what they can do. Note too, that the initial contact point can be virtual and relatively passive using a website; or proactive, as demonstrated in the last quote. Knowledge was used to attract customers into collaborations. In this preliminary stage, codifiable knowledge flows one way, from the shop window to potential customers. Knowledge is presented in terms of capability and expertise, so can be clearly described as offering a basis for competence based trust. But as the collaboration begins to form, we saw a shift towards more detailed, relevant and tacit knowledge exchange, the technical approach.

4.1 The technical approach to trust building

The technical approach concentrated on establishing credibility about the firm's technical ability, presenting technical reliability as a basis for trust. Seven of our respondents used this approach. The progressive focus is not so much knowledge exchange, but the capacity to use knowledge to frame the problem as a basis for the collaboration,

"They said (in an email) 'can you develop an acid that shows this compound is affecting … and 'yes, we can do that, but we don't know how to do that at the moment … normally we'd respond back 'yes, we can help you with that, but we need to know the technical details of the particular problem … "then I may phone to arrange a particular event, either a meeting or a conference call … so we get together that's basically to understand the problem, the detailed, the technical detail of the problem." (G, CR)

Here we see a shift towards using more tacit knowledge as the collaboration evolves. *G* explained how the process has become about the definition of the problem, the customer's needs; but in specific technical terms how their tacit or unique knowledge can be applied. The dialogues reflect technological competence and shape the directions of the collaboration. Customers develop expectations and confidence- trust- that moves collaboration forward. A pattern emerged across the data whereby entrepreneurs and customers went into more technical details establishing anticipation about potential new products:

"… they had two particular problems over there and couldn't deal with … we go back and say 'yes, this is what is going to happen, this is how it is going to break down, this is what is going to come out of it ..." (I, Alb)

Using technical terms and communicating by informed language, the entrepreneurs demonstrated their understanding, knowledge, experiences and capability for the collaboration. Their reliability was demonstrated as a basis for trust. Moreover, the proposals for solving customers' problems indicated to customers what they might expect from the collaboration. These interactions constituted a process of identifying common purpose for relationship development.

However, the extent of personal trust was limited. As *K* explained, *"… in the initial stage, everybody would be much more guarded …" (K, Alb).* Integrity was not established, so the early stage trust constrained the type of technical information exchanged and the degree of tacit knowledge transferred. Hence we argue that this type of presumptive, competence trust is relatively shallow. We now explore contrasts in social trust formation.

4.2 Social Approach to trust building

Five of our respondents used the social approach. Unlike the technical, in the social approach, the axis of collaboration is personal, emphasising social skills in building networks (Baron and Marksman, 2000).

> *"…people buy from people, they don't buy from a faceless person … it's about building good relationships." (C, Bit)*

For collaborations, where the product is yet to exist and the collaboration outcome presents an imagined future (Anderson, 2005), social interaction seems to build a different type of trust. What we saw was a process of getting to know about each other as people, trust was embedded in people.

> *"… they like to know about you. Before they discuss any work, they will talk about your family …" (I, CML)*
>
> *… we built up a relationship between business development people but also the scientists, we go to know each other …" (J, CML)*

Conversations about each others background, family and personal circumstances were used to judge attitudes, benevolence and honesty- an affective basis for trust. Affective trust developed through further interactions increasing inter-personal knowledge:

> *"Once you meet them, and become happy about how it is going, and phoning them up again or emailing ..." (M, Cyp).*

Moreover the social lubricates interaction: *"… As you become more familiar with the customer, you relax the tone, which is the process." (G, CR).* We noted how bonds were socially created:*"… we talk about their lives … we get to know each other … probably share something with them …" (D, Bit)*

> *"we talk about all sorts of things … state of nation … at that stage, you are really relaxed with each other." (G, CR)*

The process seems to work by providing reassurance, the trustability of individuals:

> "*… when they get to know you, they are much happier about the person …" (I, Alb)*

Affective trust was rooted in individual integrity and reliability, inter-personal friendships and simply liking each other.

> *"… you have got to get that relationship, the best friends …" (C, Bit)*

This sharing of private and social information built intimacy and a sense of mutuality. Personal friendships acted as a bond, an effective tie linking network partners and forming collaboration expectations. We saw the social approach constructing affective ties of personal reliability, emotional trusting ties. Technical discussions grew from these ties:

> *"social thing first, then business talk … discussion of work, going to technical aspects…" (I, CML)*

Technical discussions only began after affective trust building. In other words, close collaboration depended on the development of an affective atmosphere.

Of course, not all respondents relied entirely or completely on one approach or the other. We found that seven of our respondents combined a social and a technical approach. Much seemed to depend on the particular circumstances and contexts. Thus the categories of patterns of behaviour were not exclusive, but in certain circumstances were complementary. Nonetheless, as explanatory categories, the two distinctive approaches describe different behavioural patterns and shed light on collaborative practices. Importantly, the presence of cognitive and affective trust progressed collaboration, not only for reducing risks and uncertainties but also making network relationships "sticky" in the growth of inter-personal friendships.

3.3 The virtual in trust building

Email was used extensively for early stage connecting as a convenient way of initiating connections:

> *"so we would send an introductory message usually by email with an attachment … then you'd follow that up with a phone call …" (G, Cly)*

> *"… We started off with 2 or 3 emails, and then we started to do phone calls …" (G, CR)*

In other instances video conferencing was used to discuss technical problems and possible solutions in a greater depth,

> *"… Video-conference is better (than email) … on the video-conference you can see the body language, and that gives the way as much as what people say …"*

"… (after the video conferences) but we backup all these with visits with customers mostly ... our chairman will go and visit people …looked their eyes … to know exactly their problems …" (P, Alb)

But most respondents emphasised the importance of face to face meetings to get closer to the clients:

"… at that meeting technical experts will be there either around the phone or around the table. It'd better be around the table …(G, CR)

"… (Following up emails) we very quickly try to have a meeting, so we can understand the people … so very quickly we will travel to sit and look eye-to-eye with people, and understand who they are …" (P, Alb)

They pointed out constraints in the virtual:

"Trust, you can pick up the wrong feeling about an email, if you see somebody you can look in their eyes, …" (A, Hptg)

"… face-to-face is probably the best in terms of how you feel about other persons thinking and general negotiations … email tends to be short, sharp …" (G, Cly)

But respondents also told us how they continued to use email to "*stay in touch*". These accounts led us to believe that email and video conferencing were useful tools for initiating and maintaining contact, but they were less effective as a means of building trust. Certainly none of our respondents could envisage a collaboration that was entirely virtual. We conclude that the virtual aids trust building, but only as a parallel process to augment personal meetings.

4.4. Continuing trust use and maintenance

Trust was both deployed and developed through the relationships. For new problems: *"So the existing customers … if they have got a problem and not sure what do with, or maybe they don't even know if they have got a problem, they contact us ..." (G, CR)*

But also for new ideas and opportunities: *"… When we visit … we'll try to go and see them, because you pick up new ideas and business just because of having conversation …" (G, CR)*

Once trust was in place, there appeared to be more efficient information flow and knowledge exchange, often by email:

"… when the relationship is there, it avoids the need to spend 10 or 15 minutes chatting about non-essential things,

… You just send a quick message and get feedback. Most of those messages are only 2-3 lines rather than 150." (W, PK)

Generally, relationships were maintained in a lean interaction mode with less frequent face-to-face meetings:

> *"It takes a lot of personal visits initially, but once we get the relationship established, we then rely heavily on electronic communication … probably visit once or twice a year …" (G, Cly)*
>
> *"… within that relationship that has been established, then you should be able to use email to maintain relationships … however, that should only come from a relationship …" (R, CML)*

However email is not always enough *"… have to meet when they have problems, product problems, bad debts …" (D, Biot).* But also:

> *"… They will demand a certain amount of meetings each year, and if you don't do that, it's very much like out of sight … the relationship will decrease very rapidly if you try to do it only by email in the Middle-East …they like to see you …have fish meals in the restaurants … things like that …" (I, CML)*

Interestingly, more face-to-face meetings appeared to be required by Middle-Eastern customers. The reason seems to relate to their ways of maintaining affective trust, individuals needed reassurance and to refresh reliability and intimacy through personal visits.

4. Conclusions

Trust, in its varied dimensions provides an enabling mechanism for collaboration. Trust seems to build confidence in two distinct areas; the ability of the partner to deliver and the reliability of the partner to deliver. Although the extensive trust literature categorises trust in a number of ways, we found that trust behaviours in collaborative innovation practices follow a simpler dichotomy; a distinction between trust in the technical and trust in the person. The qualities of trust in this distinction help explain tie strengths in the networking strategies of our respondents. We saw how they build confidence in what they could do, albeit from different starting points, and how both types of trust are employed to demonstrate commitment in what they would do.

We contribute to the literature on trust in collaboration. This study helps fill gaps in the literature by explaining trust evolvement as process and by showing how trust enables different types of knowledge exchanges, in particular tacit knowledge, in innovation practices. From a starting point of codified and explicit knowledge, trust seemed to foster the exchange and development of more contextualised tacit knowledge that was employed to develop the innovation. We found an increasing level of tacit knowledge exchange in the innovation processes when trust grew between the respondents and their customers. In identifying two approaches to trust building as a means of facilitating and building collaboration for innovation, this study offers a more conceptually parsimonious typology of two different types of trust. Nonetheless, we conclude that trust is created by human interactions, and trust itself is a relational artefact

When we looked at how the virtual was used, we found that it did not replace face-to-face meetings. Rather it could be seen to extend the collaborative relationship and served as a complementary mode to face-to-face meeting. The study contributes by showing how the virtual mode provided an effective way of communicating when the platform of trust had become, or was becoming, established. Our findings also demonstrate that email social conversations facilitate the maintenance of trust. Existing studies (Daft and Lengel, 1984, Lengel and Daft, 1988) argued that email is a lean communication mode. But we show that it can become a rich mode if trust is in place and strong ties exist between network actors who have a prior stock of inter-personal knowledge.

There are some practical implications from our study. In showing how trust is developed in practices, we make apparent the strategies that collaborators can use. We show the relative strengths and weakness of each approach and indicate how sequences of trust types can be usefully deployed at different stages of collaboration. We also highlight the benefits and consequences of virtual communication. From a practical perspective it may be useful for prospective participants in a collaboration to recognise the importance of trust. Moreover, an awareness of how these processes operate may offer some guidance on how best to go about creating useful relationships. Finally we note the importance of face to face meetings, which should caution against a reliance on the virtual.

5.1 Limitations and future research

As in all studies, our findings are limited by our methodology. Although our qualitative approach allowed us understand processes, we cannot generalise beyond our limited sample. We can however, make some claims about this as a more general conceptual framework. Thus future research could extend from our limited sample to establish the explanatory power of our framework in different contexts.

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