

Network Structure and Network Commitment in Innovation Networks

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It is becoming increasingly common for networks of actors (universities, research institutes, enterprises and government organisations, etc.) to be formed in order to jointly develop innovations. The efficacy of these networks is, however, disputed when it comes to generating growth-related results. Several studies suggest that the structure of the network is an important factor enabling innovations to be created. However, these studies lack intermediate variables such as commitment. This explorative study therefore looks at the relationship between network structure and network commitment. The outcome indicates that closed networks have a positive impact on the focal actor's affective commitment and a negative effect on the focal actor's calculative commitment, while an open network indicates the converse situation.

Field of Research: Marketing and Management

1. Introduction

It is becoming increasingly common for networks of actors (universities, research institutes, enterprises and government organisations, etc.) to be formed in order to jointly develop innovations (Vinnova 2008). Such networks are often supported and financed by regional and national authorities and have become a common international, national and regional strategy for regional development. Significant sums are invested, and sponsors as well as official institutions have high expectations. The efficacy of these networks is, however, disputed when it comes to generating growth-related results (Andrésen, Lundberg & Roxenhall 2009; Chell & Baines 2000; Curran 2000; Huggins 2001; McDonald, Tsagdis & Huang 2006).

Several studies have suggested that the position of an actor in the network or the structure of the network affects the behaviour and results of the network (Powell, Koput & Smith-Doerr 1996; Walker, Kogut & Shan 1997). Many researchers have studied the relationship between network structure and innovations, but the majority of these studies focus on how innovations are disseminated (Ahuja 2000). However, a number of studies have analysed how innovations are generated in a network perspective. Podonjy and Stuart (1995) studied whether there is a risk of innovations going down technical blind-alleys or serving as springboards for the creation of new innovations. They found that the result of innovation depended on the relationship pattern and quality of the actors, but they did not examine whether the structure of the network affected the result of innovation or not. On the other hand, Shan, Walker & Kogut (1994) found that the number of collaborative relationships had a positive impact on the result of innovation. Ahuja (2000) found in his longitudinal study in the chemical industry that the number of structural holes that exist within networks has a negative impact on the result of innovation.

This research focuses completely on the structural prerequisites and results, but entirely omits the intermediate processes, which probably have a significant bearing on the result. Several

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studies suggest that failed network cooperation is generally due to the actors involved not having been sufficiently committed to their collaboration, which in turn would lead to products and innovations being created (Andrésen, Lundberg & Roxenhall 2009; Johanson & Roxenhall 2009; Pesämaa & Hair 2008). Similarly, Morgan & Hunt (1994) in their classic study of distribution relationships showed that commitment is a very significant intermediate variable which is influenced by the structure and which influences the result. To understand how innovations are created it is, in other words, important to understand how the network structure is related to the commitment of the network actors.

Definitions of commitment and its influencing factors are mainly based on studies of dyadic relations between individuals or firms. Innovation networks can, however, be regarded as sets of connected firms or as sets of connected relationships between firms (Anderson, Håkansson & Johanson 1994). There is a lack of studies dealing with commitment in network contexts, and the need for knowledge in order to support the processes and secure positive results among practitioners and grant providers is evident. This paper will therefore identify network structural factors that will develop commitment.

Commitment in dyadic relationships is influenced to a greater or lesser extent by a number of factors. Studies have pointed to the significance of the trust of parties in a relationship (Moorman, Zaltman & Deshpande 1992; Morgan & Hunt 1994; Smith Ring & Van de Ven 1994), and of having favourable experience of the relationship concerned (Garbarino & Johnson 1999), the design and contents of the communication (Duncan & Moriarty 1998) as well as the length of the relationship (Goodman & Dion 2001; Stanko, Bonner & Calantone 2006) and its emotional intensity. Structural factors influencing commitment formation in networks might be considered in line with the structural factors influencing trust formation in new product development teams identified by Dayan & Di Benedetto (2010). They argue that diversity in team composition, closeness between actors and longevity will impact the development of trust, a factor known to be vital to the development of commitment (Morgan & Hunt 1994).

Since no information has been systematically collected in this network context, I feel that there is a need for further empirical studies, and the purpose of this study is therefore to explore, and provide greater understanding of, the problematics described here through an analysis of network structure and network commitment in innovation networks.

The subsequent section further describes the theoretical basis of the network structure and the commitment concept. The methodological approach and empirical findings from one innovation network are then presented and discussed. Finally, conclusions and implications are presented.

2. Theoretical Framework

In this study I will focus on network structure as an antecedent to network commitment in terms of direct ties, indirect ties and structural holes, as Ahuja (2000) did in his study of chemical firms.

2.1 Network Structure

It is common to study the structure of a network on the basis of a central actor's perspective, for example the hub of the network. The problem with such a choice of perspective is that a picture is only obtained of how the network hangs together and is structured. A fairer picture is

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therefore to study the perspectives of several or all actors. Each individual network actor has different and unique ties, which can be regarded as meaning that each actor has his or her own private networks in the network. The cumulative picture of these private networks then shows the total picture of a network's structure.

Ahuja (2000) defines the structure of a network in three dimensions: 1) number of direct relationships, 2) number of indirect relationships and 3) the degree to which the partners of the focal actor have relationships with one another. The term relationship means the same as actors entering into and collaborating in a single project. An actor in other words can have relationships with actors in the network but at the same time have ordinary social and economic contacts with other actors in addition to those with whom there are collaborative relationships. The first dimension is concerned with a focal actor's number of direct collaborative relationships with other actors in a network. Such collaborative relationships contain two different types of exchanges. One exchange means that the actors interact, share and combine resources with one another. Such resources are both intangible and tangible in nature, such as knowledge, aptitude, proficiency and physical assets. When actors collaborate on technological development, the aggregate result becomes available to all the collaborating partners, and each individual partner in such collaboration can acquire greater knowledge and resources than would have been possible if any of them engaged in their own, independent development. The other type of exchange is concerned with dissemination of knowledge, i.e. practical knowledge in the form of lessons about new technology and experience of practical problems and failures is transferred from one actor to the other (Ahuja 2000). In direct relationships common values, trust, commitment and collaboration are created, which in turn can lead to the possibility of innovations being created (Ahuja 2000; Coleman 1988; Granovetter 1985; Portes & Sensenbrenner 1993).

The second dimension is concerned with a focal actor's number of indirect relationships with other actors in the network. The term indirect relationship means the same as an actor's partner's relationships with his partners, i.e. the focal actor has indirect relationships with his partner's partner. Only the second form of exchange – dissemination of knowledge – exists in indirect relationships, as a focal actor cannot interact, share and combine resources with an actor it has an indirect relationship with. Building networks with many indirect relationships can be an effective way of gaining access to extensive dissemination of knowledge without needing to pay the cost of resource-demanding direct relationships (Burt 1992).

The third dimension is concerned with a focal actor's partners' relationships with one another and the degree to which they are tied to one another, referred to as closed or open networks (Ahuja 2000; Andersson, Blankenburg Holm & Johanson 2005). Ahuja (2000) shows in his research that it is advantageous if the focal actor's partners have direct relationships with one another. Innovative capability is increased in this way. A network consisting of few direct relationships between a focal actor's partners gives the focal actor control over the partners (Brass & Burkhardt 1992; Cook & Emerson 1978), while a network with many direct relationships between its partners provides less control over them, but the benefit is that trust and cooperation between them are developed (Ahuja 2000; Coleman 1988; Granovetter 1985; Portes & Sensenbrenner 1993). In cases where relationships between the focal actor's partners are lacking, there arise what Burt (1992) calls structural holes. Ahuja (2000) found in his study that a quantity of structural holes adversely affects the innovative capability of the network.

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2.2 Network Commitment

It is common for the term commitment to be defined differently depending on the perspective from which the concept is studied. Examples of perspectives are social exchanges (Cook & Emerson 1978), marriage (Thompson & Spanier 1983), organisations (J. P. Meyer & Allen 1984; J. P. Meyer & Allen 1991) and business relationships (Morgan & Hunt 1994). The last of these means that the committed party considers a relationship to be worth working on to ensure that the relationship lasts. Commitment has also been defined slightly more generally as a lasting wish to retain a relationship which is considered valuable (Moorman, Zaltman & Deshpande 1992).

The definition thus means that commitment relates to a valuable relationship. Morgan & Hunt (1994) believe that it is a question of a party to a relationship thinking that the relationship is so important that one makes maximum efforts to preserve it indefinitely. Another definition is that commitment is an implicit or explicit agreement that the relationship has to continue between the parties to the relationship (Dwyer, Schurr & Oh 1987). These definitions demonstrate that a commitment is a willingness to make sacrifices in the short term in order to attain long-term benefits.

The dominant attitude in the literature of behavioural science is that commitment consists at least of an affective and calculative component (Meyer & Allen 1991). This breakdown of the concept also receives support in the literature of marketing (Fullerton 2005; Gilliland & Bello 2002; Harrison-Walker 2001). However, it is most common for the concept to be operationalised solely as affective commitment (Fullerton 2005). Morgan & Hunt (1994), for example, were inspired by Meyer & Allen's (Meyer & Allen 1991) operationalisation of affective commitment (Fullerton 2005). However, Meyer & Allen (1991) also believe that there is another component which should be adopted, namely the normative or obligation-related component. There are also several marketing studies that categorise the concept of commitment in the same ways as Meyer & Allen (1991) do (Gruen et al. 2000).

It is common to the three components (affective, calculative and normative) that they describe a psychological state that characterises the relationship of the committed person to someone else and is of significance to whether the committed person wishes to continue or break off the relationship. Despite these similarities there are quite great differences between the three components.

The affective component is strongly linked to the concepts of common values, trust, benevolence and relationships. Affective commitment arises when the committed person has feelings for, identifies himself or herself with and feels psychologically bound to the person he or she has a relationship with (Bansal, Irving & Taylor 2004; Fullerton 2005; Gruen, Summers & Acito 2000). In the literature of marketing the affective component is closely related to the concept of loyalty (Gilliland & Bello 2002). The committed person does not correctly see the economic and rational advantages of the relationship and finds it difficult to value its effects through economic calculations. However, the relationship feels right to become involved in. The person who has a strong affective commitment *wants*, for emotional reasons, to preserve the relationship concerned (J. P. Meyer & Allen 1991). For an affective commitment to arise, trust (Garbarino & Johnson 1999; Gilliland & Bello 2002; Morgan & Hunt 1994) in the party in the relationship is required and the committed person is required to have good experience of (satisfaction with) the relationship in question (Garbarino & Johnson 1999). Very strong correlations have been found for example in organisational research between job experience and affective component (Irving & Meyer 1994; Meyer, Stanley, Herscovitch & Topolnytski

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2002), and it has been found that trust has a strong impact on when affective commitment is to be developed (Meyer, Stanley, Herscovitch & Topolnytski 2002). Trust and good experience have been shown to be important in customer relations (Bansal, Irving & Taylor 2004).

The calculative component is based on the committed person feeling more or less compelled to continue the relationship in question. In older behavioural-science literature this component of commitment is usually called “continuance commitment”, which means that the committed person will continue to be employed in the organisation due to the costs (both economic and social) that arise in connection with the termination of employment. The committed person therefore in many cases has no other choice than to continue, and feels locked in (Meyer & Herscovitch 2001). The person who has a strong calculative commitment *must* in other words, for business (economic and social) reasons, try to preserve the relationship. The calculative component consists of two dimensions – negative and positive. The negative dimension means locked-in values, such as the committed person being aware that economic and social investment already made in time, effort, money etc. may be lost, new costs may arise and new economic and social investments must be made (“switching costs”) if the relationship in question is broken off. The positive dimension relates to future values, such as counting on future earnings in the form of time, effort, money, knowledge etc. (Bansal, Irving & Taylor 2004; Sharma, Young & Wilkinson 2006). Empirical studies suggest that if the committed person perceives that locked-in and future values exist or that there is a lack of alternative relationship partners, this leads to calculative commitment (Bansal, Irving & Taylor 2004).

The normative component is concerned with the committed person feeling a more or less moral duty and feeling a responsibility for the relationship to continue (Meyer & Smith 2000). The person who has a strong normative commitment feels that one *should* continue the relationship for moral or duty-related reasons (Bansal, Irving & Taylor 2004; Gruen, Summers & Acito 2000). The concept “should” refers to a common standard that an individual person cannot either change or influence. This is related to a sense of obligation and has its basis in formal and informal rules, regulations, social norms and customs. These rules are implicit and are rarely written down in contracts etc. The party to the relationship and the people around the committed person expect the committed person to follow these rules and norms (Sharma, Young & Wilkinson 2006). In other words, it is quite easy to break off a relationship for business reasons (the calculative component), but all the more difficult to break off a relationship based on social pressure (the normative component) (Gilliland & Bello 2002; Sharma, Young & Wilkinson 2006).

The three components should be regarded as components and not as different types of commitment (Anderson & Weitz 1992; Martín 2008; Rylander et al. 1997). One and the same person has elements of all the components at one and the same time of commitment. It is therefore not meaningful to regard them as separate forms, only as components. A committed person may, for example, have both an emotional (affective) and business (calculative) commitment to preserve a particular relationship, but at the same time not feel a particular moral duty (normatively) towards this. And another person may be less committed in terms of business, but all the more so emotionally and morally. Looking at commitment in this way also means that different variations of commitment affect the relationships in question in different ways (Meyer & Allen 1991).

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2.3 Network Structure and Network Commitment

Research results suggest that in long-term and lasting relationships the affective component is stronger and plays a more important role than the other two components (Meyer & Allen 1991; Sharma, Young & Wilkinson 2006). The affective component is closely linked to shared values, trust and relationships, and such values are created in direct relationships. Therefore it is reasonable to assume that there is a positive correlation between direct relationships and the affective component. Ahuja (2000) points out that the number of direct relationships may have a positive impact on the result of innovation, but it is doubtful whether an actor can become more affectively committed if his direct relationships increase in number. As direct relationships are highly demanding on resources, a large number of direct relationships ought rather to lead to the affective commitment being weakened. In other words, it is not the number of direct relationships that is of interest but rather their quality. I am thinking most immediately of the degree to which the focal actor's relationship partners have relationships with one another. It should probably be the case that the greater the degree to which they are involved in collaborative relationships with one another, the more strongly committed the focal actor should be. A high degree of relationships between the focal actor's partners can then be expressed in Burt's (1992) terms as few structural holes existing.

The starting-point for this study is that the majority of actors have the strategy of creating direct relationships and entering into close collaborative relationships with their partners. They assume that close collaborative relationships are an effective way of creating innovations. However, such close relations entail fairly high costs and investments over a long period. Such reasons may mean that some actors look for a different and perhaps more rational way of creating innovations, namely creating few direct relationships and as many indirect relationships as possible. Such an actor is, in other words, looking to obtain as great dissemination of knowledge as possible at low cost (Burt 1992). The calculative component is linked to costs and calculations of future values, and it is therefore reasonable to assume that a focal actor who has many indirect relationships and few direct relationships is strongly calculatively committed.

3. Methodology and Research Design

An innovation network has been studied in this explorative study. Both structured and unstructured interviews were conducted during the autumn of 2009 with five of the network's 55 actors. It would obviously have been desirable for it to be possible to study more actors, but they are very busy people and it is therefore difficult to find time for interviews with them. The result is nevertheless representative as those actors who have been interviewed represent different types of actors, both commercial enterprises and public enterprises. After in-depth interviews had been conducted, the respondents had to answer a questionnaire on how committed they are to the innovation network. The questionnaire consisted of set alternative responses on a six-point scale. The advantage of a six-point scale is that there is no "half-way between" answer, and respondents are instead forced to agree or disagree with the statement. The lowest value on the scale was "strongly disagree", and the highest value was "strongly agree". The results of the interviews and the questionnaire were interpreted by a qualitative method.

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4. Findings

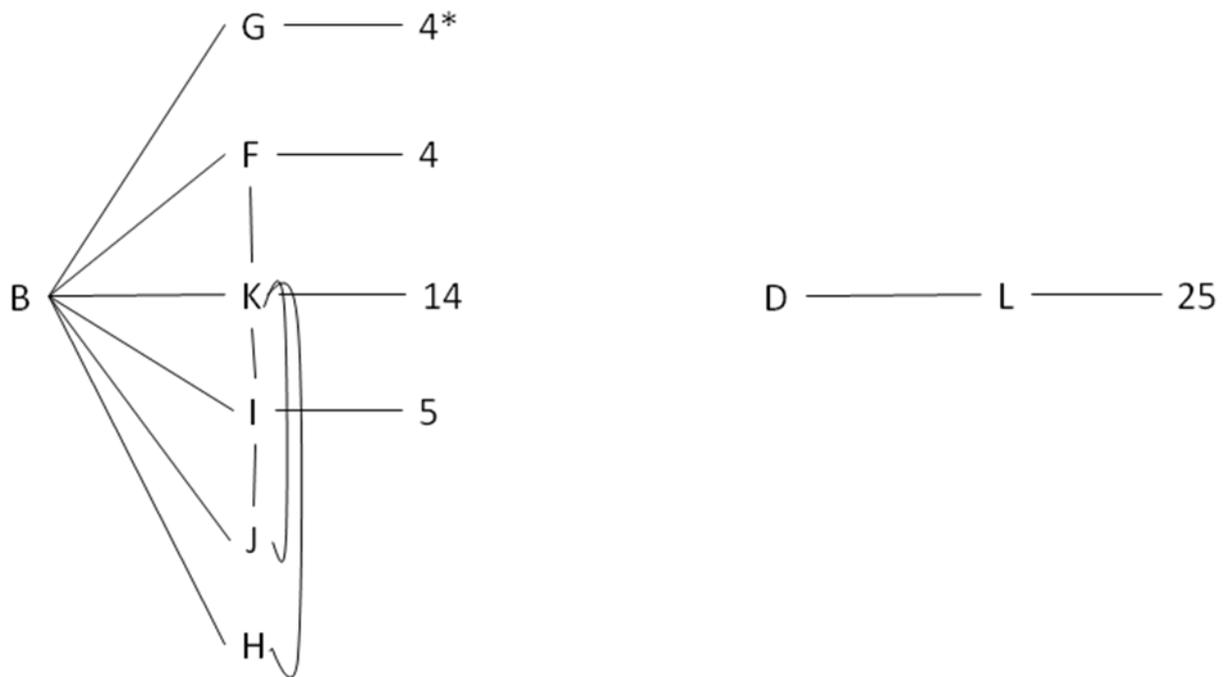
The innovation network is a long-term effort to develop a region in Central Sweden as a European centre for fibre optics. The network has been operating for five years and the investment is starting to bear fruit. The region has many areas of expertise in the network's profile nationally and internationally, particularly in the EU. The network's mission is to work, both strategically and operationally, to ensure that all the resources are in place and work together to establish the region as a fibre-optic centre of excellence. Its mission is to be a "possible successor". The network's main process is to generate growth through the establishment of new businesses and the development of existing businesses. At least 60 new businesses and 300 new jobs will be created in the region.

4.1 Network Structure

The network consists of 55 members of different sizes belonging to different industries. The largest company has several hundred thousand employees and the smallest has a few employees. Some member firms are pure technology companies, while others specialise in services. In addition, a university, a municipality and a technology park are members of the network. The network can thus be described as a meeting place for system suppliers, operators, service developers, innovators, researchers, users and potential customers. The network is coordinated and led by a hub. The hub is financed by public project funding. The hub is composed of twelve employees and is headed by a CEO who in turn answers to a corporate board and an association board.

Among the network actors studied (A, B, C, D, E), A, C, and E do not have any direct collaborative relationships with any other actor in the network. B has six direct relationships and D has one direct relationship. B has access to 27 actors through his six partners. In addition there are direct relationships between B's partners. Altogether there are five relationships out of 30 possible between B's partners, which is likely to mean that the degree of relationship is regarded as very low (17 %). In addition D, through his partner L, has access to 25 actors. As K and L have so many relationships with other network actors (14 and 25 respectively), they should be regarded as key actors in the network. B and D's direct and indirect relationships and their partners' relationships are illustrated in the figure below. Network actors A, C and E do not appear in the illustration as they lack relationships with other actors in the network.

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* = Number of actors

Figure 1: The direct and indirect relations of actors B and D, and B's partners' relationships with one another.

The networks of the studied actors in the network can be divided into two different groups. The first group is characterised by those who have direct collaborative relationships with other actors in the network, and the second group features those which do not have any relationships at all. The first group contains actors B and D and the second group contains actors A, C and E. In the first group, B differs from D in having six direct relationships, while D has one. It is common to the two actors, however, that they have approximately the same number of indirect relationships. The actors in the second group are relatively alike.

4.2 Network Structure and Network Commitment

With regard to the affective component, the result suggests that the majority are not particularly affectively committed to the innovation network. The affective component tends to be the strongest component, and research suggests that there is a strong correlation between trust and affective commitment, i.e. weak affective commitment is usually due to weak trust and vice-versa (Morgan & Hunt 1994). This correlation is also confirmed in the present study. The network actors studied do not have adequate trust in the innovation network. Trust here is synonymous with integrity and reliability. In the study it is principally the dimension of reliability that produces weak values. The network actors find that the innovation network does not always do what it says it will do. Research furthermore suggests that common values have a very strong impact on trust and commitment (Morgan & Hunt 1994). Common values are synonymous with agreeing about how to work together and having the same goals for the activity. Almost all network actors say that they do not agree with the innovation network about the way in which to work together and the goals for the activity. Actor B, for example says:

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“They have stuck with special fibres but have not made a commitment to service-providing firms. There should be much greater focus there. The growth is in service-providing firms. Less technology and labs!”

Table 1:

No	Affective Commitment	1 Strongly disagree	2	3	4	5	6 Strongly agree
i	It feels just right to continue the relationship with the innovation network				B, D*	A, C	E
ii	We feel strongly associated with the innovation network		B, C, D, E		A		
iii	We have positive feelings for the innovation network			B, C	A, E	D	
iv	The innovation network problems almost feels like our own problems	B, C	E		A, B		

* = Respondents who ticked each cell
 _ = Respondent B and D
 --- = Respondent A, C and E
 Source: Survey Data

The actors consider that it feels right to continue the relationship with the network, but they do not feel strongly associated with, or do not have particularly strong feelings for, the network. With regard to the affective commitment of the individual actors, the result shows that actor B, who has most direct and indirect relationships, is most weakly affectively committed among all the actors studied. In addition, it is found that actor D, who has one direct relationship, has the second-weakest affective commitment. The actors who do not have any relationships at all (A, C and E), on the other hand, are the most strongly affectively committed. An important underlying principle in this study is that it is not sufficient for an actor to have many direct or indirect relationships and that there must also be a high degree of relationship between this actor's partners. Although B has several direct relationships, B's partners have few relationships with one another (5/30), and D only has one partner who does not have relationships with any other partner of D. A well-composed partnership with good relationships probably contributes to the partners developing mutual trust and dependence, which has the effect that they strongly feel affiliation and develop positive feelings for what can be achieved together, which in turn leads to strongly affective commitment for all involved. On the other hand, if there are no such mutual relationships, this will probably lead to the converse result. In cases where there is a high degree of relationships between the partners there are, according to the reasoning of Burt (1992), few structural holes in the partnership and vice-versa. In B's partnership there are, in other words, a large number of structural holes. This leads to two propositions:

P1: The fewer structural holes there are in a focal actor's network, the more affectively committed the actor becomes

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P2: The more structural holes there are in a focal actor's network, the less affectively committed the actor becomes

With regard to the calculative component, the result suggests that the majority are clearly committed in the positive dimension, i.e. they calculate future values in terms of time, effort, money and knowledge which it is hoped will emerge from the network collaboration. Such future values are commonly a very strong and important factor which greatly increases the actors' commitment to the network. The result suggests, at the same time, that the majority of the actors studied are weakly committed in the negative dimension. This is probably due to several network actors not having devoted so much time or having created sufficiently strong social contacts which are lost if they terminate their membership, in other words there is not yet much locked-in value.

How does it come about that actors A, C and E are the most affectively committed among the actors studied? They feel closely tied to the innovation networks for reasons other than having established collaborative relationships. One explanation is probably that they have social and economic contacts with many actors in the network, which heightens future expectations for collaboration and simulates emotional commitment.

Table 2:

No	Calculative Commitment	1 Strongly disagree	2	3	4	5	6 Strongly agree
i	We want to continue the relationship with the Innovation network since it is good for our business		B*	E	C, D	A	
ii	We want to continue the relationship with the innovation network, because we expect future earnings / profits	D		E		A, B	
iii	We want to continue the relationship with the innovation network, as we have spent so much time and money on it	B, D	E			A, C	
iv	We want to continue the relationship with the innovation network, otherwise we lose the investment already made	B, D	E	C			A
v	We want to continue the relationship with the innovation network, as we have no other good options	A, D	E	B		C	

* = Respondents who ticked each cell
 ___ = Respondent B and D
 --- = Respondent A, C and E
 Source: Survey Data

There is a similar pattern in the calculative component, namely that the first group containing actors B and D is somewhat more weakly committed in the positive dimension and significantly weaker in the negative dimension than the second group containing actors, A, C and E is. A reasonable explanation is that B and D, through their direct collative relationships, have already

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made a business gain and experienced benefits from their network participation, which meets at least some of the expectations they had at the outset. This in turn leads to them becoming less inclined to calculate future earnings. The converse probably applies to the actors in the second group. They have presumably not obtained any business gain from their participation in the network but more likely have expectations of obtaining future profits. This in turn leads to them feeling compelled to recalculate what the network collaboration can give them in the future. This leads to the following propositions:

P3: If an actor has one or more direct relationships with other actors in the network, the actor becomes less calculatively committed with respect to future gain

P4: If an actor lacks direct relationships with other actors in the work, the actor becomes more strongly calculatively committed with respect to future gain

Similarly, there is a reasonable explanation for why the first group is less committed in the negative dimension than the second group. B and D, through their direct collaborative relationships, have achieved a business gain which probably matches or surpasses the investments of resources they have already made – there are, in other words, no locked-in values they need to recalculate. A, C and E lack such business gains as they do not have direct collaborative relationships, but they have certainly invested time, money and other resources to maintain their participation in the network – there are, in other words, locked-in values they have to calculate with in order to get something back. This leads to two propositions:

P5: If an actor has one or more relationships, the actor becomes less calculatively committed with respect to his locked-in values

P6: If an actor lacks direct relationships, the actor becomes more calculatively committed with respect to his locked-in values

The network actors are relatively strongly normatively committed. The explanation for this is probably related to them feeling that they participate in the development of the region through there being pressure from different regional actors to be involved in the great push for innovation in the region.

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Table 3:							
No	Normative Commitment	1 Strongly disagree	2	3	4	5	6 Strongly agree
i	We feel that we ought to continue the relationship with the innovation network	D*			B	A	C, E
ii	The innovation network expects that we will probably continue the relationship with them				D	A	B, C, E
iii	It is almost our duty to continue the relationship with the innovation network				C	A, D, E	B
iv	We want to continue the relationship with the innovation network because it sends the right signals to our customers, suppliers and other key business partners		A	B, D		C, E	
v	Since the innovation network supports us, it is no doubt that we should support them		A, B, C		D, E		

* = Respondents who ticked each cell
 — = Respondent B and D
 --- = Respondent A, C and E
 Source: Survey Data

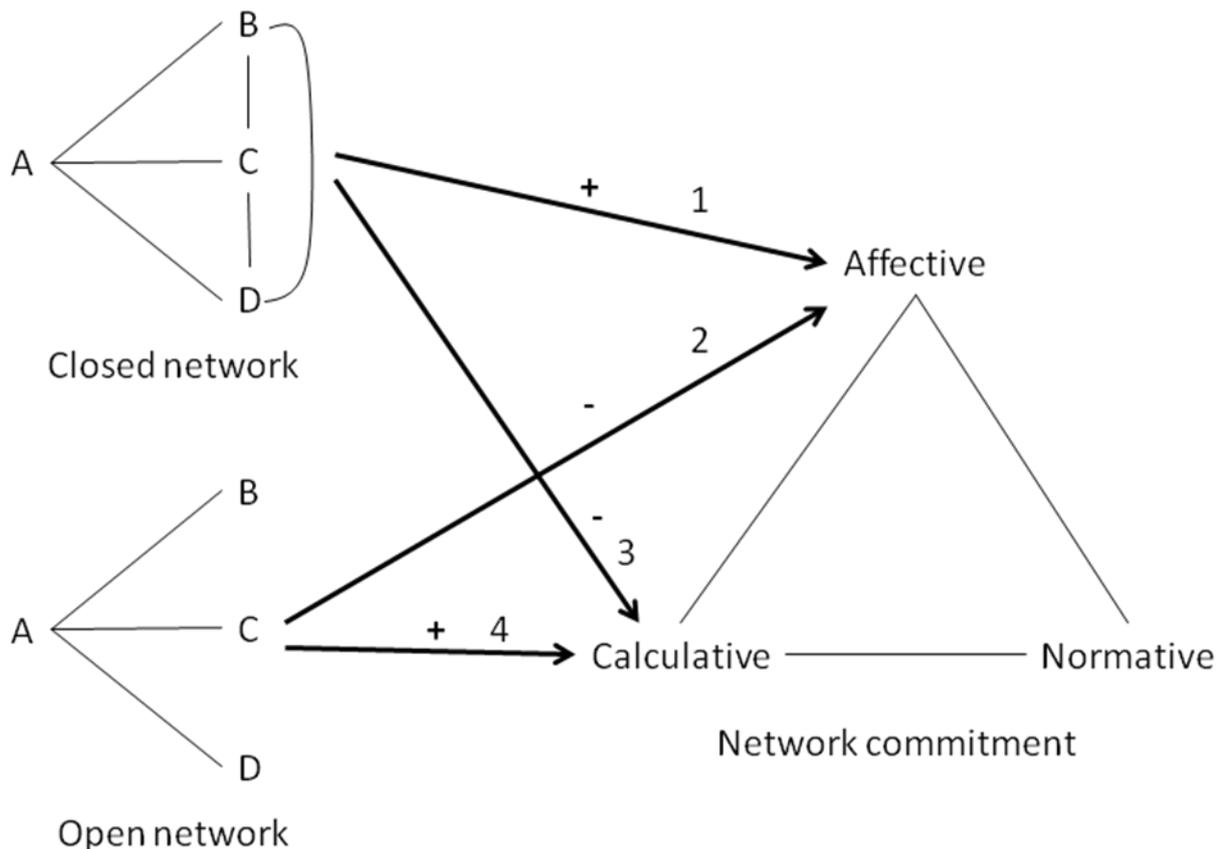
Unlike the other two components, all the actors are approximately equally committed. It does not appear to matter greatly whether the actors have direct and indirect relationships with other actors in the network or not.

5. Summary and Conclusions

As there is a lack of studies in the area, the purpose of this study was to try to contribute increased understanding of the relationship between network structure and network commitment. Network commitment is regarded in this explorative study as an intermediate process variable between structure variable (network structure) and result variable (innovations). The basic assumption was that strong network commitment leads to a positive innovation result. I took as my starting-point that a focal actor's direct and indirect collaborative relationships would be significant for his commitment. The study indicates, however, that the number of direct and indirect collaborative relationships is not of as great significance as I had assumed. Direct collaborative relationships are, of course, important; they make possible both dissemination of knowledge and integration and sharing of the actors' resources, which is essential if it is to be possible for innovations to arise and be developed (Ahuja 2000). These collaborative relationships are thus a necessity, but it is not the number of collaborative relationships that appear to decide whether the focal actor becomes strongly committed or not. This study rather indicates that those actors who have direct collaborative relationships are more weakly committed than those who do not have any collaborative relationships at all. The result suggests that it is the degree of relationship between the focal actor's partners that influences the focal partner's commitment. A network with a high degree of relationship or a closed network (Ahuja 2000; Andersson, Blankenburg Holm & Johanson 2005) – with a small proportion of structural holes (Burt 1992) – leads to the cooperation between the focal actor

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and his partners becoming tight and close-knit, which in turn means that the focal actor takes greater responsibility for what happens in the collaboration, leading to strong affective commitment (arrow 1 in Figure 2) and at the same time to weak calculative commitment (arrow 3). While a network with a low degree of relationship or an open network (Ahuja 2000; Andersson, Blankenburg Holm & Johanson 2005) – with a high proportion of structural holes – gives the focal actor good control over the flow of information and what happens in the collaboration, it probably inhibits close and trusting collaboration and rather creates suspicion and opportunistic behaviour, in turn leading to an expanded need for control and inhibiting the focal actor's taking of responsibility and affective commitment (arrow 2) and at the same time giving rise to a more transactional approach and thus stronger calculative commitment (arrow 4).



Network structure

Figure 2: Illustration of how the network structure affects network commitment

In other words it is not sufficient, as in the case in question, to have several direct relationships with partners, partners must also have intensive and close collaborative relationships – this produces affectively committed participants.

I additionally took as a starting-point that the more the actors are involved in close and long-term collaborative relationships the more important the affective component is than the other ones, which this study also indicates. Certain researchers also point out that the number of indirect relationships may be more effective (Burt 1992) and be significant for the result of innovation (Ahuja 2000), but I was in doubt as to whether such a relationship exists with regard to whether they have a positive impact on the affective component or not. This study very rightly suggests that there is no such correlation. On the other hand, I assumed that indirect relations could give rise to calculative component, but as the indirect relationships do

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not appear to have any major significance in this study it is difficult to either confirm or reject such a correlation.

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