

## **(In-)formal governance in agri-food open innovation projects**

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It is the aim of the present paper to analyse how the outcome of open innovation projects is affected by the governance. In contrast to previous research, this paper emphasizes how under different contextual situations, structural and relational governance mechanisms can be combined to strengthen each other. Results from comparison tests are combined with case-study analyses of four types of innovation networks. Data are collected through semi-structured interviews of project leaders of 18 sustainability-oriented open innovation projects in the agri-food industry. Triangulation of data from interviews is done by using project plans, meeting notes and evaluation papers. On the basis of the results, it is concluded that more homogeneous networks exhibit a higher level of trust at the start of the cooperation than more heterogeneous networks, allowing for more informal governance mechanisms. Commitment throughout the innovation process, and especially at the start of higher uncertainty innovation projects, is crucial. Formalisation assures commitment and alignment at the start, and in successful projects increases the level of clarity, mutual understanding and trust.

**Key Words:** Inter-firm collaboration, formal and relational governance, agri-food industry

### **1. Introduction**

More and more, companies realise that in order to remain competitive in an increasingly complex, uncertain and changing environment, they keep up innovating. Innovation is *complex, uncertain, disorderly, and subject to changes of many sorts* (Kline and Rosenberg, 1986). Key in this process is the ability to absorb and convert new knowledge from diverse sources into new products, services or processes. One of the challenges of innovation is uncertainty about the tasks to be undertaken to achieve the innovation goals, uncertainty about the outcomes and uncertainty about market potential of the innovations. Uncertainty decreases the possibility for ex ante planning, often pressing partners towards ex post negotiation of contracts and leaving room for conflict. For companies that invest a lot of time, effort and resources in innovation projects, it is essential to manage the uncertainties involved to increase the chance of profit generation from innovation investments.

*Consumer trends, such as the increased attention to health issues and sustainable ways of food production demand innovative food and production processes* (Dijkman, ABN Amro, 2009) and. In order to attain this, agri-food companies engage increasingly in open innovation projects with stakeholders from the sector in order to integrate sustainability-oriented practices into entire supply chains and regions. Such innovative undertakings require revision of existing practices and an integral approach, which encompasses coordination with the different chain partners, but also with stakeholders such as consumer-representatives and NGOs. While access to and use of the knowledge and skills from customers, suppliers, competitors, universities and other organisations through open innovation (Chesbrough, 2002), it brings along additional challenges to the innovation process. Though these external sources constitute a main strength of open innovation, this at the same time constitutes an a form of complexity, increasing the rate of failure of open innovation projects (Bleeke and Ernst, 1991; Omta and Van Rossum, 1999).

Therefore it is not surprising that there is a high scholarly and practical interest in the study of inter-organizational cooperation (Todeva, 2006; Grabher and Powell, 2005). One of the questions is how to align the different views, interests and priorities of all participants. Furthermore, concerns exist that (unintended) transfer of knowledge via a partner to competing companies may prevent the firm from contributing freely to a cooperative endeavor. The question is how to assure that knowledge mobility is supported and unintended information leakage is prevented. Another question is how to curb opportunistic behavior and assure that results of innovation are appropriated correctly (Dhanaraj and Parkhe, 2006), so as to prevent conflict situations. While heterogeneity of information and ideas is important for creativity and innovation, collaboration by many different firms and organizations in an innovation project may have a negative effect on innovation performance, e.g. due to coordination problems, limitations in absorptive capacity and different interests and priorities. It is the aim of this paper to point out how combination of formal and informal governance mechanisms may provide a sound solution to governance challenges of open innovation.

The objective is to follow up on the existing research on contracts and trust, combining insights from transaction cost theory (Williamson, 1991; Parkhe, 1993; Oxley, 1997) with views from relational theories, such as social capital and social exchange theories (Dyer and Singh, 1998; Granovetter, 1985; Coleman, 1988; Uzzi, 1997; Koka and Prescott, 2002; Burt, 2005; Ring and Van der Ven, 1992; Gulati, 2007). Governance is subject to circumstances of the inter-organisational collaboration. While previous research has touched upon the question of strength of combination of informal and formal governance mechanisms (Poppo and Zenger, 2002), it predominantly took place in the field of medium and high-tech industries and remained outside the domain of low-tech industries. Therefore, this study aims to explore governance in a low-tech field, analysing 18 innovation projects in the agri-food sector. It is argued that structural governance mechanisms, such as formal agreements, and relational mechanisms, such as trust and commitment, strengthen each other's valuable contribution to coordination. The relationship between innovation uncertainty and performance, and network heterogeneity and performance is studied by comparing projects with different levels of innovation uncertainty and network heterogeneity. However, because a combination of these conditions complicates governance in practice, the two dimensions are also combined generating four types of networks. Subsequently, the latter are studied in more depth by either comparing successful and failed projects or simply studying failures in less successful projects. This enables the singling out of governance success factors for different types of innovation network projects.

In the first section, the theoretical background to our conceptual framework is discussed. The following part elaborates on the research design, providing the reader with a closer overview of the research field and study population used in this research, as well as the research collection methods. Subsequently, the results from the quantitative and qualitative analyses are presented, while in the concluding part results from both are combined and discussed in the light of the existing research.

## **2. Theory**

### *2.1 Innovation*

Innovation can be defined as the process of creative destruction, where the quest for profits pushes to innovate constantly, by breaking old rules to establish new ones (Schumpeter, 1934). This broad definition of innovation encompasses the different dimensions of innovation. It may

entail introduction of new products, commercialisation of new combinations, the introduction of new processes, the opening of new markets or the introduction of new organisational forms. *'Innovation is not a single action but a total process of interrelated sub processes. It is not just the conception of a new idea, nor the invention of a new device, nor the development of a new market. The process is all of these things acting in an integrated fashion'* (Myers and Marquis, 1969). Process is the structure of activities and actions which an organisation undertakes in order to achieve its goals. Most companies attempt to bring organization into the innovation process through the development of plans and routes in terms of projects. Innovation projects can be defined as *"plans and routes of development and implementation with the aim to deliver a new product to the market, or new (manufacturing) processes to business"* (Fortuin, et al., 2007, p.4). Innovation projects differ because of the differences in industries and companies. Furthermore, not every project goes through all stages of the innovation process which range from idea generation phase, idea screening phase, concept development and testing, business analysis and beta (market) testing phase, followed by the commercialisation phase (Cooper and Kleinschmidt, 1999). While each of the stages in the innovation process might put different requirements on the partners and the project resources and activities, all innovation stages are marked by uncertainties about the activities to be undertaken and resources engaged.

## 2.2 Open innovation and networks

*"Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to the market, as they look to advance their technology. ... Open innovation paradigm treats R&D as an open system"* (Chesbrough, 2007). Open innovation often takes place in the context of a network. Broadly defined, *"a network is a system of actors and ties representing some relationship, or lack of relationship, between the nodes"* (Burt, 2005). In this study, we focus on a specific type of network. Innovation networks are distinguishable from other networks because of their specific nature characterized by *"conversion of information from diverse sources into useful knowledge about designing, making and selling new products and processes"* (Küppers and Pyka, 2002, p.3). Because networks can be of indefinite character, we have chosen to restrict the networks of actors who cooperate for purpose of innovation though the means of delineation of the network boundaries by goal oriented innovation projects.

Despite the major advantages of open innovation, there are also a lot of difficulties, inefficiencies, and hazards involved with cooperation and the necessary transfer of information across organizational boundaries. Networks which contain a highly diverse pool of participating organizations bring along different interests and views which need to be take into consideration in the coordination of cooperation. Omta and Van Rossum (1999) introduce the 'dark side of cooperation' which points to the fear of leakage of skills, experiences and competencies that form the basis of the competitiveness of a firm, leakage of information and insights about possible new markets and future possibilities, 'hidden' administering costs of setting up and monitoring of a collaboration, creation of a rival or creation of dependency on a key partner. In order to allocate mechanisms which can help companies to cope with the downside of cooperation, it needs to be studied how different interests, motivations, opportunistic behaviour, etc. can be governed so as to take away the barriers to a smooth and productive cooperation process. Enhancement of *"learning, alignment of views and actions, arrangement for the intellectual property rights*

*attribution and commercialisation of innovation outcomes*” (Batterink, 2009; Klerkx and Leeuwis, 2008) constitute important aspects in the governance of innovation processes. In addition, the question is how the changes which accompany the different stages of innovation and the developments in the relationships among the partners impinge on the equilibrium between the different governance mechanisms. “*For example, it is conceivable that explicit contracts may be more useful in the early stages of a relationship, whereas norms may become important in the later stages*”(Jap and Ganesan, 2000, p.228).

### 2.3 Structural and relational perspectives on governance in open innovation projects

The structural and relational perspectives have yielded insight into governance of inter-organisational cooperation. The structural perspective is grounded in transaction cost theory (Williamson, 1985) with the assumption that the higher the level of transactional attributes, such as asset specificity and uncertainty, the higher the risk that the partners behave opportunistically (Oxley, 1997; Williamson, 1991). Within the structural view it is also presumed that the performance of the inter-organisational cooperation is highly influenced by the initial design of the cooperative arrangement including the agreements and planning (Poppo and Zenger, 2002). Structure, organization and formal agreements constitute important elements for effective and efficient governance of cooperation within the structural perspective.

Despite the importance of structure as well as agreements, the explanatory power of the structural perspective is limited in settings of innovation, because of its roots in the transaction cost theory which puts emphasis on the design of single transactions, whereas innovation processes are characterised by repetitive interactions and exchanges under continuously changing circumstances. In the words of Van de Ven (1986), “*management of the innovation process can be viewed as managing increasing bundles of transactions over time*”. For this reason, we reach further than the transaction cost perspective. The open innovation literature enables us to extend the theoretical amalgam of issues which are relevant for deepening the understanding of formalisation of cooperation. Furthermore, the structural perspective has been criticised for not taking into account the power of social interaction and mechanisms in the governance of cooperation between groups or individuals. Additional practical considerations add support to this critique. The writing of an elaborate and complex contract involves large costs and because it is sometimes impossible to explicate all aspects in *uncertain* circumstances, parties in an inter-organisational setting often rely on relational governance.

Accordingly, the relational perspective, relational governance (Poppo and Zenger, 2002) or relational contract (MacNeil, 1980) emphasise the importance of relations and social mechanisms such as trust and commitment for effective and efficient governance in cooperative endeavours. From this perspective, the governance tools are of an informal nature, generating self-enforcing safeguards through social interaction and control (Dekker, 2004). The roots of the relational perspective on governance stem from a blend of theoretical backgrounds such as the social capital theory (Granovetter, 1985; Coleman, 1988; Uzzi, 1997; Koka and Prescott, 2002; Burt, 2005) and social exchange theory (Blau, 1964). This view posits that socialisation processes create trust and upsurge social mechanisms which take up the governance functions in a collaborative arrangement. As Wolff (1994) states, inter-firm collaboration cannot be managed over the telephone. Mutual exchange visits by partners to each other’s laboratories increases the level of understanding of each other’s situation, methods and approaches. The social interaction and information exchange which takes place at such a point is important for the building of trust

among the partners. Insight into each other's technical capabilities, management ability, the extent of matching aims, strategic position and cultural compatibilities are important for partners in a project to increase the level of trust. Relational governance emerges from the values and agreed processes generated through interactions and exchanges in social relationships (Granovetter, 1985; Poppo and Zenger, 2002), which promote norms of flexibility, commitment and further increase in exchange of knowledge and information (Poppo and Zenger, 2002). These aspects of relational governance regulate governance enforcement of obligations, promises and expectations.

#### 2.4 Integrating the structural and relational perspective

While both perspectives have their strengths, it is the combination of formal and informal governance tools which is the most powerful. Especially when uncertainty about the aims, activities and resources required for the project is high, it is important to establish a number of agreements. Besides, the heterogeneous character of inter-organisational cooperation requires a high level of mutual adjustment in order to attain common understanding and commitment. The process of making agreements provides the partners with the possibility to gain insight into the strategic position of their partners and seek agreement on differences. The information exchange which takes place during the formulation of agreements brings clarity, reduces the level of uncertainty and generates trust. The latter grows, because a sense of security emerges that when things go wrong a safety net is present. For example, confidentiality agreements can take away the fear that exchange of information within the project will lead to unintended knowledge spill-over or leakage of company specific information. Trust can enhance openness which motivates additional transparency, mutual knowledge transfer and increase in the scope of the relationship. In addition, formalisation of agreements at an early stage of cooperation assures that alignment of views and motivations takes place between upper-echelon management and operational staff within the partner organisation and in the inter-organisational setting. This process brings to light the level of commitment which is important to overcome difficult stages in the innovation process. Because the combination of structural and relational governance is key to successful inter-firm cooperation, both formal and informal governance mechanisms are integrated in the conceptual model of this study.

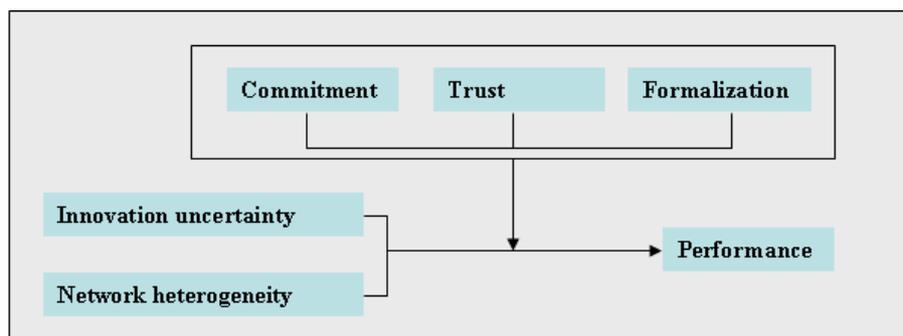


Figure 1 Conceptual model

### 3. Research design and measures

#### 3.1. Study population

The agri-food innovation projects studied in this paper are characterized by sustainability-oriented innovation goals which entail new combinations of agri-food businesses and activities

while at the same time introducing sustainability practices into these new combinations. The projects range from cooperation among chain partners who try to integrate sustainability practices into their business in a collective fashion and in this way bring innovation into their business, to projects which try to build a new network of partners from a particular region and establish a new arena for innovative ideas and cooperation. The number of participants per project range from 6 to 50 organisations and/or firms. The projects are characterised by a diversity of actors, ranging from companies, suppliers, knowledge institutes, intermediaries, governmental organization, societal organizations, etc. At the time of data collection, the projects were recently completed or in an advanced stage of the cooperation process.

### *3.2 Data collection*

Interviews were conducted with project leaders from 18 innovation projects in the agri-food sector, in the period from June to August 2009. The in-depth interviews, comprising 32 open questions, were complemented with 33 7-point Likert scale statements in order to enable a more systematic analysis of the concepts from our model. Due to the abstract level of the concepts which we study, the project leader was chosen as the most appropriate person to answer the questions, because the project leader has the best overview of the situation in the project. In those cases where we were not able to acquire sufficient information from the project leader, other participants were approached to complete the picture.

With the intention to improve the validity of the data collected from the projects, we triangulated the information collected through interviews with that collected from documents (Eisenhardt, 1989; Yin, 1984). We have investigated the initial agreements, made at the start of the cooperation, as well as the existing evaluation documents and meeting notes. The interviews enabled us to collect tacit information and verify and deepen the findings from the documents. The average duration of each interview was two hours. The interviews were recorded and transcribed. The information was stripped from all specific details to assure anonymity of the respondents.

### *3.3 Research measures*

The operationalisation of the governance measures and the measures which typify the different network projects used in this study, are presented in Annex I.

### *3.4 Data analysis*

In order to answer the 'how' questions and acquire understanding on complex relational processes, we have chosen for the multiple case-studies approach in our research. Herewith, we make use of the mixed methodology (Tashakkori and Teddlie, 1998; Creswell and Clark, 2006), combining quantitative and qualitative types of analysis. First of all, Spearman rank correlations tests have been performed in order to acquire an insight into the relationship between the different variables. The differences between several types of projects are analysed through the means of comparison tests, One-way ANOVA and the non-parametric Kruskal Wallis test. The groups of networks which are being compared are being differentiated along the lines of network heterogeneity, innovation uncertainty and the level of performance in terms of goal attainment. The information from the semi-structured interviews is used to analyse in-depth the differences between a number of successful and less successful projects which are representative of the four types of networks, which are introduced below.

#### 4. Results

In this section, we will first look at differences between projects with different levels of heterogeneity, different levels of uncertainty about the market potential of the innovation in the project and the differences between more and less successful projects. Subsequently, the comparison between successful and failed projects will be extended to four types of innovation networks, characterised by a combination of different levels of heterogeneity and uncertainty.

	Network Heterogeneity		Innovation Uncertainty		Performance goals		F
	Low 0-8 types N = 10	High 9 + types N = 8	Low (1-3) N = 12	High (5-7) N = 5	Low (1-3) N = 6	High (5-7) N = 7	
Innovation uncertainty					4.2 (1.5) **	1.9 (.7) **	4.4
Trust proportion previous cooperation	4.1 (2.0)*	2.5 (1.2)*	3.8	3.6 (1.7)	3.2 (2.4)	2.7 (2.0)	3.9 (1.9)
Trust (competence) previous cooperation			5.0 (1.9)**	2.8 (1.3)**	3.0		
Trust (competence) contribute significant value			6.4 (.5) *	4.8 (2.0) *	4.3	4.8 (1.7)**	6.4 (.5)**
Commitment (affective) attach value to cooperation	3.8 (1.5) *	5.1 (1.5) *	3.6			3.8 (1.5)**	5.6 (1.3)**
Commitment (affective) continue cooperation self-evident			5.2 (1.5) **	2.8 (.8) **	6.2	3.0 (1.3)**	6.0 (1.0)**
Commitment (affective) loyalty						3.2 (1.3) **	5.7 (1.8) **
Formalisation						7.6 (4.0)	9.3 (4.1)
Performance goals			4.8 (2.0) *	3.2 (.8)*	1.8		
Performance skills						3.7 (1.5) **	5.9 (1.3) **

Table 1 Comparison tests

mean (standard deviation); Kruskal Wallis Sig.\* p< 0.10; \*\* p< 0.05

##### 4.1 Network heterogeneity

The results from table 1 show that the networks with a low level of heterogeneity exhibit a higher level of trust competence, in terms of the proportion of partners with whom previous cooperation has taken place. Remarkably, it are the networks with a high level of heterogeneity which display a higher level of affective commitment, in the sense of higher value attachment to cooperation with the specific partners.

##### 4.2 Level of innovation uncertainty

In the comparison of projects with low and high levels of uncertainty, one project which has a medium score (a 4 on the scale 1 to 7) has been left out from the analysis. In case of projects with a low level of innovation uncertainty, the level of trust and commitment is significantly higher than in the case of projects with a higher level of innovation uncertainty (see table 1). Also the performance of the project is higher when the level of uncertainty is low. It is viable to assume that due to relatively low level of task uncertainty the trust in the competencies of the project partners to fulfil these tasks successfully is higher in successful projects.

##### 4.3 Performance

In the comparison of projects with low and high levels of performance, five projects which have a middle score (a 4 on the scale 1 to 7) are left out from the analysis. In the comparison of the most successful and the least successful projects, it is being confirmed that performance is higher when

uncertainty about the market potential of the innovation is low (see table 1). Furthermore, we find that competence trust and affective commitment are significantly higher in the case of the more successful projects (see table 1). The respondents have indicated that the increase in knowledge, skills and capacities due to the participation in the project is significantly higher when the project is more successful in terms of goal attainment.

The comparison of projects, along the four types of networks (see Table 2), does not show a significant difference in terms of performance. However, we do observe that performance is higher when uncertainty about the market potential of the innovation is low. This is in line with the result from the test where the effect of innovation uncertainty is tested separately.

	Type 1	Type 2	Type 3	Type 4	F	Kruskal Wallis
	low uncertainty low heterogeneity N = 6	low uncertainty high heterogeneity N = 6	high uncertainty low heterogeneity N = 3	high uncertainty high heterogeneity N = 2		
Trust	5.2 (.4)†	2.2 (.8)†	3.0 (3.0)	3.5 (2.1)	4.0	*
Proportion previous cooperation						
Commitment (affective)	5.0 (1.9)	5.3 (1.0)†	2.7 (.6)†	3.0 (1.4)	3.4	*
continuation cooperation self-evident						
Formalisation	9.1 (3.6)	9.3 (4.6)	8.3 (3.1)	7.0 (.7)		
Performance goal attainment	5.0 (2.3)	4.2 (1.7)	3.3 (1.2)	3.0 (.0)		

Table 2 Comparison tests types of networks mean (standard deviation); † Games-Howell sig. 0.05; Kruskal Wallis sig.\* p< 0.10; \*\* p< 0.05

#### 4.4 Trust

The Games Howell post-hoc test shows that the significant difference in the level of competence trust, in terms of the proportion of partners with whom previous cooperation has taken place, is to be found between the group with low level of innovation uncertainty/low network heterogeneity and the group with low level of innovation uncertainty/high network heterogeneity (see table 2). This would indicate that this difference in the level of trust is mainly due to the difference in the level of network heterogeneity. From the previous ANOVA test on differences between projects with a low (0 to 8 types of organizations) and a high (more than 9 types of organizations) level of network heterogeneity (see table 1), we learn that competence trust in terms of proportion of partners with whom previous cooperation has taken place is higher in the case of the projects with a low level of heterogeneity.

#### 4.5 Commitment

The Games Howell post-hoc test shows that the significant difference in the level of affective commitment, in terms of self-evident continuation of cooperation with the partners from the project, is to be found between the group with low innovation uncertainty/high network heterogeneity and the group with high innovation uncertainty/low network heterogeneity (see table 2). This indicates that it is the combination of the level of innovation uncertainty and network heterogeneity which cause the difference in the level of affective commitment. The ANOVA-test on the separate effect of innovation uncertainty shows that under low levels of innovation uncertainty, the level of affective commitment is higher (see table 1). Surprisingly, the ANOVA-test on the differences between the low and high heterogeneity groups shows that a different measure of the level of commitment, in terms of attachment of value to cooperation, is significantly higher in the case of projects with a high level of heterogeneity(see table 1). All in all, on the basis of the absence of a large or significant difference between type 3 (low

heterogeneity) and type 4 networks (high heterogeneity) in the post-hoc test, the preliminary conclusion would be that the differences in the level of commitment are mainly related to the level of uncertainty and less to the level of heterogeneity.

#### 4.6 Formalisation

While no significant differences in the level of formalization were found between the different types of networks, we find that overall the level of formalisation is highest when uncertainty about the market potential of the innovation is low (see table 2). When we compare the level of formalisation between the less successful and highly successful projects (see table 1), we see that the higher performing innovation projects have a higher level of formalisation.

#### 4.7 Interplay governance mechanisms

In the following section, the interplay among the governance mechanisms will be discussed and analysed on the basis of a number of cases which typify the four different types of networks. For type 1 and type 2 network, a comparison is made between a successful and less successful project in order to illuminate the differences and the elements which are key to attain successful innovation projects. Unfortunately, there are no successful projects in our sample with high level of uncertainty about the market potential of the innovation. Because we can learn from mistakes and failures, we will discuss and draw lessons from the less successful projects in the case of type 3 and type 4 network.

Governance	Type	Successful		Less successful	
		Start project	During project	Start project	During project
Trust	1	+++	+++	+	+
	2	++	+++	++	-
	3			++	+
	4			+/-	+/-
Commitment	1	+++	+++	++	+
	2	+	++	++	++
	3			-	-
	4			+/-	+/-
Formalisation	1	++	++	+	+
	2	+++	+++	+	+
	3			++	-
	4			+	1½ +

Table 3 Development of trust, commitment and formalisation during the project; +++ high; ++ medium; + low; - absent

#### Type 1 Network – Low uncertainty and low heterogeneity

In the successful project, mutual knowledge and understanding developed during previous cooperation and the continued adaptation to one another led the relationship to develop towards more trust, giving more space to informal governance mechanisms. As the project leader said: *The partners acknowledged each other's valuable contribution. The increased contact and communication resulted in turning their differences into an advantage. Trust is an important complementary to the agreements made..* The combination of formal agreements and high level of compliance and competence trust at the start of the project which has been upheld during the entire process of cooperation and innovation, combined with a high level of commitment, led to the successful outcome of the project. The importance of commitment is stressed by the project leader: *It is important to work with partners who are not only motivated by financial gains but are also*

*passionate about the work to be done, the goals and the success to be achieved.* The project leader points out that commitment and a smooth transition from one phase to the other was safeguarded by involvement of partners who would be needed in the later stages of the process, assuring co-ownership of the project ideas and activities.

In the less successful project, no transition from formalisation to more informal governance mechanisms was made, because of the low strength of social mechanisms to take over governance functions. In absence of previous cooperation, the continuous questioning of each other's commitment obstructed the development of relationships. As the project leader said: *In this project there was no doubt about the competencies among the partners, but there was a lot of doubt concerning hidden agendas and commitment. There is always one party which initiates the idea and starts to search partners who possess the necessary competencies for the project. However, there must be a clear gain present, which assures commitment for each of the partners involved. Especially at the start of the project, it is important to find out what the strategy of the other partners is, acquainting oneself with the ambitions of the partners and learning what one can expect from the other.* Therefore, it is important to assure commitment of the upper echelon management. *Even when you are dealing with a company/organization with a very good track-record and a high commitment at face value, in reality the commitment can be very low because there is no support from the management in the company.* Absence of increase in trust in this project was due to the low level of alignment of interests and motivations, and the absence of clarity of commitment on the level of upper echelon management. Furthermore, a re-organisation at the lead company led to a decrease in the energy level of the project activities. In addition, the change in the direction of the objectives led to decrease in commitment by some of the partners. Due to the enduring commitment of the initiator-entrepreneur, some of the goals were achieved, but not as intended.

In conclusion, the successful project was marked by a high level of compliance and competence trust, as well as affective and calculative commitment. A medium level of formalisation was maintained throughout the project. The less successful project manifested a lower level of formalisation, and in the absence of growth of trust, it was not possible to rely on informal governance either. The re-organisation within the lead company and continued questioning of partners' commitment thwarted the progress of the project.

#### *Type 2 Network – Low uncertainty and high heterogeneity*

In the successful project, partners were carefully selected and considerable attention was given to formalisation of objectives, tasks, etc. Although commitment and growth of trust gave room to informal governance, planning and agreements retained an important governance function. This was exemplified by the increased attention to formalisation of terms of access to the network. During the concept development and technical implementation phases, adjustments to the initial agreements were made, indicating that planning and structuring remained an important aspect of governance throughout the entire project. Despite the trust-building activities, such as visits to each other's organisations, three partners left the project because they were not sufficiently convinced of the potential of the innovation goal. Their departure only raised the overall level of trust, because only the committed partners remained. The level of commitment grew as the direction of the objectives was becoming more clear. The time and effort spent by the project leader in the coordination and assurance of progress, contributed to the necessary information exchange, mutual understanding and problem-solving.

In the less successful project, partners were selected on the basis of their expertise or track record in the specific field, from the network of the project initiators. Similar backgrounds were considered during the selection in order *to put people together where dynamics emerges to come to something new*. All parties were involved from start of the project in order to assure co-ownership of the project. Presence of commitment was evident because all entrepreneurs *were looking for new opportunities and willing to undertake something new*. The idea screening, concept development and business analysis phases were marked by a low level of formal agreements. The gross of the agreements were of an informal nature based on trust, friendship or social relations. According to the project leader, formal agreements do not congruence with innovation processes, but a lesson learned is that the investment (whether it is in the form of money, working hours or knowledge) needs to be clearly defined at the start of cooperation. When it was supposed to enter the technical implementation phase, the project stagnated due to deterioration in trust and commitment. The project leader said: *If you want to attain communal interest, you have to keep in mind the separate interests of all the parties and remain honouring them. The carefully built and developed cohesion on which the partners have been working to increase the level of trust, has been destroyed when the stake of one another was not recognized any more. That is what has happened in this project*". While the project leader indicates that more formalisation was not possible and necessary, it might be the case that formalization could have influenced the outcome in a positive way.

In contrast to the successful project, the less successful project was marked by a low level of formalisation throughout the innovation process which deprived the partners from profound discussion on mutual expectations and interests. Omitting formalization at the start, might lead to conflict situations later on in the project because of lack of clarity or disagreements. Secondly, while the successful project was marked by increasing levels of trust and commitment, the latter were destroyed in the less successful.

#### *Type 3 Network – High uncertainty and low heterogeneity*

In the less successful project, only two parties, which did not cooperate previously, assumed an active and committed role in the project. The relationship among the rest of the partners stagnated, despite their common participation in a platform where they were able to communicate and gain knowledge about one another. This project demonstrates that previous relations do not necessarily lead to better results in terms of cooperation. Compliance trust and competence trust became very low, because most of the partners did not fulfil their promises and did not exhibit the specialized competencies which they were expected to possess and deliver. Only the small entrepreneur and one of the knowledge institutes demonstrated a high level of commitment to the project activities. The other partners did not assign priority to the project, because of small gains involved for these parties. Their low commitment was reflected by absence of any assistance during very difficult and crucial times for the progress of the project. The project demonstrates how important calculative, but also affective commitment is for an innovation project. At the start of the project very little agreement were made. Only rough aims and plans were agreed upon and as the project progressed, the agreements were given with even less attention. The two active partners managed the project in an organic way, dealing with circumstances as they came along. The low level of formalisation omitted the partners from sufficient negotiation, discussion and alignment, at the start of the project, depriving them of assurance of commitment which would have induced effort to relationship development and trust building.

#### *Type 4 Network – High uncertainty and high heterogeneity*

In this less successful project, where the integral community approach was supposed to have a central role, path-dependency obstructed the progress because the partners could not leave the established roles. Previous cooperation between governmental agencies, societal organizations and entrepreneurs, as well as between the countryside and urban areas, was limited. The established ways of informal communication, hierarchy and power-balances impeded the development of competence trust in the unconventional roles and tasks the partners were supposed to assume. The rhetorical question by the project leader *how to force people to comply to the agreements made*, indicates that the level of compliance trust was also low in this project. The idea generation and screening phases in this project, which included a lot of brainstorming and compiling of ideas for practical projects between unconventional partners, did not allow for financial commitment at the start. However, the problem is that even after three years of the project, actual commitment in terms of financial investment by the entrepreneurs remained very limited. Furthermore, the financial problems of one of the main partners and the change in project leadership did not contribute to continuance and coherence in project activities. The project did not result in success, despite the increase in specificity of agreements, with more tangible objectives and increased clarity for practice-oriented partners. The main reason for little success was the low level of trust and commitment.

### **5. Discussion and conclusions**

In conclusion, the research question how the balance between formal and informal governance mechanisms leads to successful open innovation projects in different types of networks, will be answered. First the combined results, on the governance differences between the different types of networks, from the comparison tests and the case-study analysis will be discussed. In Appendix II a summary of the results is presented in a schematic overview. Secondly, it will be concluded on the balance of formal and informal governance mechanisms.

#### *Trust*

The result from the performance comparison test (Table 1) and the four-group comparison test (Table 2), indicating that trust is higher in case of lower network heterogeneity, is confirmed by the case-study results. While trust building was taking place in the high heterogeneity project, the level of trust was the highest in the low heterogeneity network. The project leader substantiates our conclusion by saying that the two main parties *started to complement each other in the project activities in an organic way*. However, the comparison between the less successful type 1 and type 2 projects, does not show any remarkable difference in the level of trust. The partners in the high heterogeneity, less successful project were on the way of building trust but it was destroyed due to *loss of respect for the interests, position and point of view of one another*. In the lower heterogeneity network, increase in trust remained absent because of continued *suspicion about hidden agendas and commitment of certain partners*. While the innovation uncertainty comparison test (Table 1) shows that trust is significantly higher when innovation uncertainty is low, we still compare the trust levels between homogeneous and heterogeneous network under high innovation uncertainty. Although there are no successful projects in this category, the comparison between the less successful project leads to the conclusion that the level of trust was slightly higher in the case of the low heterogeneity network. The path dependent roles and the deep-rooted *distrust about competencies of partners in new, unconventional roles* reflects a lower level of trust in the heterogeneous network.

### *Commitment*

The heterogeneity comparison test (Table 1) shows a higher level of affective commitment in heterogeneous network projects. It is not strange that greater attachment of value to cooperation with the partners in the project is found in heterogeneous network, because it is especially in this type of projects that parties take part because an important company from the industry or a party which is considered visionary in the sector is participating. The case-studies show similar patterns in the level of commitment as in the level trust. In the successful project with low heterogeneity, commitment was high, while in the more heterogeneous successful project commitment was increasing. In the less successful project homogeneous project, commitment was questioned while in the heterogeneous project commitment was destroyed. The result from the performance comparison test (Table 1) confirms that commitment is significantly higher in the more successful projects. The result from the innovation uncertainty comparison test (Table 1) and the four-group comparison test (Table 2), lead to the conclusion that a higher level of commitment is present when there is a lower level of innovation uncertainty in a project, at least in the more successful projects. Case-study analysis of commitment in the less successful projects demonstrates the lowest levels of commitment in the heterogeneous network. In type 3, low heterogeneity, network at least two partners carried out the project, while in the type 4 heterogeneous network, absence of commitment to the integrated community concept, which was at the heart of the project, impeded the entire progress.

### *Formalisation*

The mean scores and the case-study analysis indicate that formalisation is the highest in the most successful projects. Furthermore, as the four-group comparison test (Table 2) demonstrates, formalization is higher in case of low innovation uncertainty. This can be explained by the fact that in case of large uncertainty about the market potential of the innovation, the parties do not want to commit themselves in a highly formalised way. They prefer to be able to step out of the cooperation without any legal procedures or pecuniary sanctions, whenever circumstances change or whenever they lose confidence in the objectives of the project. The test results (see Table 2) do not show a difference in formalisation between homogeneous and heterogeneous networks. The case study analysis indicates slightly higher formalisation in heterogeneous networks. There is slightly more emphasis on the organic approach, dealing with circumstances as they came along, in the homogeneous networks. Greater effort was attributed to attempts toward formalisation in the more heterogeneous networks.

### *Interplay formal and informal governance mechanisms*

In general, in low and high heterogeneity networks, development of relationships is necessary to allow trust and commitment to increase. Commitment to a relationship grows when all partners experience a rising or satisfactory level of benefits from the cooperation. In low heterogeneity networks a higher level of trust could assume a part of the governance tasks, admitting a somewhat lower level of formalisation. In contrast, a formalisation ought to remain important in heterogeneous networks where the level of trust is generally somewhat lower. If partners have built a certain level of trust within their group, the individual partners will be very careful not to damage this trust through, unacceptable behaviour, such as free-ridership or opportunism. The social governance mechanisms emerge in conditions of high level of trust which can involve a certain level of delegation of governance functions away from formal governance.

A high level of commitment throughout the entire innovation process is important for successful projects. The process of formalisation at the start of the project is crucial for assurance of commitment. The results from the analysis confirm that more successful projects exhibit higher levels of formalisation. Through the process of deliberation and negotiation, a lot of information on the interests, expectations and commitment to the project ideas is being exchanged. This avoids conflicts, misunderstandings and delays later on in the project. It creates stability of the network, reducing the amount of time and effort needed to select new partners, in case of attrition of participants. Especially in high innovation uncertainty projects, formalisation at the start is important because it provides the opportunity to determine the extent of willingness of the potential partners to take risk, reflecting its level of commitment. Formalisation is not a guarantee for success but it is beneficial in terms of creation of structure, assurance of commitment and clarity, and it functions as a mean for alignment of views and expectations.

In networks with a low level of innovation uncertainty, formalisation, and at the same time commitment, is usually higher in the more successful projects because the partners are more confident about the success of the project and are more willing to take risk. Also the level of trust is higher in the more successful, low innovation projects. In those cases where the level of trust is very high at the start of the project, formalisation can be lower in low innovation uncertainty projects. However, in the successful projects formalisation is relatively high throughout the innovation process, demonstrating commitment, and strengthening trust that the essential issues are discussed and coordinated, reducing the level of insecurities. For example, the arrangement of property rights increases confidence about appropriation of gains from cooperation, and at the same time increases confidence in positive future relations with the project partners. Also, confidentiality agreements increase the level of trust among the partners that information and knowledge exchange can take place freely, reducing the fear of opportunistic behaviour. Furthermore, maturity of relationships is also important for the successful, low innovation uncertainty projects. Key to successful low innovation uncertainty projects are a high level of trust and commitment, and a medium to high level of formalisation, throughout the innovation and cooperation process.

In sum, despite the possibilities of informal governance, the value of binding agreements, planning and monitoring should not be underestimated, throughout the cooperation process. Results from the empirical analysis confirm the argument that the combination of strengths of structural/formal and relational/informal governance leads to most successful open innovation projects in the agri-food sector.

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## Appendix I

In the case of the 7-points Likert scale questions, the respondents have been asked to indicate to which extent they completely agree or completely disagree with the statement.

Concept	Operational definition
Network Heterogeneity	Types of organisations have been classified according to the categories of the International Standard Industrial Classification (ISIC) list. The economic activities in the list are subdivided in a hierarchical, four-level structure of mutually exclusive categories. The number of types of organisations have been counted and used as measure of heterogeneity. (Monge, Fulk, Kalman, Flanagan, Parnassa, and Rumsey, 1998)
Innovation Uncertainty Task  Market 7-points Likert scale	The partners knew at the start of the project which activities specifically they need to undertake to achieve the goals of the project. (Lippman & Rumelt, 1982; Sapienza and Gupta, 1994; Zaltman, Duncan and Holbeck, 1973) Certainty is high that there will be a market for the outcome/innovation of the project.
Commitment (calculative) 7-points Likert scale Semi-structured questions  Commitment (affective) 7-points Likert scale	Willing to make additional investments in the project, if needed. General commitment in the project established on the basis of indicators such as support from to management to participate in the project and the financial or time investment in the project per partner. (Cullen et al., 2000) We would drop the current partners if we would come across parties with better project ideas. There is a strong sense of loyalty among the partners. Continuation of cooperation with the current partners is more or less self-evident. (Ring and Van de Ven 1992; Muthusamy and White, 2005)
Formalization	aims, task division, time planning, organisational structure (such as foundation of a steering committee), decision-making rights and progress assessment criteria, investment of resources, extension clauses, punitive sanctions on non-compliance, conflict resolution, procedures for termination of the cooperation and criteria for entrance of new members, (intellectual) property rights and confidentiality agreements (see Table xx) (Gulati, 2007; Omta and Van Rossum, 1999; Parkhe, 1993; Vlaar, Bosch and Van den Volberda, 2007)
Trust  Trust (compliance) Trust (competence) 7-points Likert scale  Semi-structured interviews	Indication per partners whether previous cooperation in any kind of project has taken place. (Heide and John, 1992; Klein Woolthuis, 1999; Claro, 2004) The three key partners always fulfil their promises. On the basis of previous cooperation with key partners, we know that they are well-qualified for this project. The key partners have specialized capabilities that add value to the project. Information about trust on the project level is explained on the basis of examples provided by the project leader and explanations about the development of trust over time. (Golden and Powell, 2000; Claro, 2004; Heide and John, 1992; Cullen et al., 2000)
Performance Semi-structured interviews 7 point Likert scale	The percentage of initial aims achieved. We expect to benefit from skills, capabilities or knowledge acquired during the project to a great extent. The cost/benefit ratio of time and money invested in the project is satisfactory. Continuation of cooperation with a number of partners will follow-up this project. (Kumar, Scheer and Steenkamp, 1995; Zollo, Reuer and Singh, 2002; Kogut 1991; Straub, Rai and Klein, 2004)

Table 4 Concepts and operational definitions

## Formalisation

A. Aims	a. goals (aims) (1 point)
	b. objectives (2 points)
	c. deliverables (3 points)
B. How clear were the deliverables for the partners when they started (on basis of the interview)	
	a. not clear (0)
	b. not clear, not unclear (1/2 point)
	c. clear (1 point)
C. Task division	
	a. annually (1 point)
	b. bi-annually (2 points)
	c. each month (3 points)
D. Time planning (1 point)	
E. Organizational structure	
	a. no coordination (even though a project leader was appointed) (0 points)
	b. mainly coordination by the project leader (1 point)
	c. organizational structure developed and actually used (2 points)
F. Decision making rights	
	a. integrated in the organisational structure (1 point)
	b. allocated to each individual organisation on the basis of proportional financial investment (2 points)
G. List of assessment criteria (1 point)	
H. Investment of resources (1 point)	
I. Extension clauses (2 points)	
J. Sanctions non-compliance agreements (2 points)	
K. Conflict resolution procedures (2 points)	
L. Determination of cooperation / formal or strict criteria for entrance of new members (2 points)	
M. Property rights (including IPR) (2 points)	
N. Confidentiality agreements (2 points)	

Table 5 Quantification of formalisation

## Appendix II

Low innovation uncertainty			
Type 1 low network heterogeneity		Type 2 high network heterogeneity	
Successful	High trust	Successful	Increasing trust
	High commitment		Increasing commitment
	Medium formalisation throughout		High formalisation
Less successful	Absence growth of trust	Less successful	Trust destroyed
	Questioning partners' commitment		Commitment destroyed
	Lower formalisation		Low formalisation throughout
High innovation uncertainty			
Type 3 low network heterogeneity		Type 4 high network heterogeneity	
Less successful	Low trust	Less successful	<i>Distrust competencies in unconventional roles</i>
	Low commitment		Absence commitment
	Decreasing formalisation		Increase in specificity of agreements

Table 6 Summary comparison results case-studies

**Biography first author paper “(In-)formal governance in agri-food open innovation projects”**

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