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The process of value realization in asymmetric new venture development alliances: Governing the transition from exploration to exploitation

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ABSTRACT

Based on a case study of three asymmetric new venture development (ANVD) alliances, we examine the governance of transitions from exploration to exploitation. We propose that role deficiencies, technological asymmetry, and the presence of a separate venture unit at established firms constitute important initial conditions influencing value realization in ANVD alliances. We further show that role-specific investments act as more appropriate mechanisms than contractual incentives to govern transitions from exploration to exploitation. Jointly, these findings provide new insights into the impact of structural and relational governance mechanisms on value creation in interfirm relationships.

Introduction

In high-tech settings, formal collaboration between entrepreneurial firms (i.e., high-tech start-ups, university spin-offs) and more established organizations has become increasingly popular for the development of new venture activities (Bajeux-Besnainou et al., 2010; Dunne et al., 2009; Hagedoorn, 2002; Schildt et al., 2005). Following its widespread dispersion in practice, academic research on asymmetric new venture development (ANVD) alliances has been proliferating (e.g., Kalaignanam et al., 2007; Narula, 2004; Slowinski et al., 1996). Whereas these studies provide evidence for the

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potential value of ANVD alliances, they have remained relatively silent on how this value can be actually *realized*.

In order to successfully launch a new venture into the market, a transition needs to be made from explorative activities such as experimentation, fundamental research and prototyping, to exploitative activities such as fine-tuning, upscaling and leveraging (Kazanjian and Drazin, 1990; Rothaermel and Deeds, 2004). Such transition is not evident, since previous studies (i.e., Dodgson, 1993; Doz, 1988; Doz and Williamson, 2002) suggest that (i) the entrepreneurial partner might lack motivation to shift from explorative to exploitative activities and (ii) the established partner might lack the motivation to invest time and resources in supporting such a shift. Although these studies identify obstacles to the realization of value in ANVD alliance, they provide limited insights in how these problems can be addressed effectively.

In the broader alliance governance literature, scholars have relied on two different perspectives to identify governance strategies that facilitate adjusting and steering partner behavior in interfirm settings. Whereas structural alliance governance scholars (e.g., Hennart, 2006; Oxley, 1997) rely on transaction cost theory to emphasize the importance of contracts, relational governance scholars (e.g., Dyer and Singh, 1998; Madhok, 1995) point to the relevance of relational-specific investments. Previous studies on ANVD alliances (i.e., Alvarez and Barney, 2001; Sawers et al., 2008) have underlined the relevance of both structural and relational governance mechanisms in terms of risk mitigation, yet they have remained relatively silent on their implications for value realization.

The main objective of this study is therefore to examine how partner organizations can actually create value in ANVD alliances. In particular, we assess the impact of structural and relational governance mechanisms on partners' ability to transition from exploration to exploitation activities. In order to address this research objective, we have conducted a comparative case study of three ANVD alliances. Each case rests on the analysis of a wide variety of documents as well as interviews with managers and engineers of both partner companies. Based on an iterative process of within-case and between-case analysis, we subsequently build propositions on how firms govern the transition from exploration to exploitation activities in ANVD alliances. Our propositions point to (i) role deficiencies, (ii) the level of technological asymmetry, and (iii) the presence of a separate venture unit at the established firm as important initial conditions influencing the motivation and ability of partners to shift from exploration to exploitation activities. In addition, they suggest that relational investments are more proficient governance mechanism than contractual incentives when it comes to stimulating such a transition process.

The paper theoretically contributes to both structural and relational governance perspectives. Whereas existing structural alliance scholars have mainly focused on the design of interfirm transactions between partners, we observe that particular intrafirm structures (i.e., dedicated venture unit) can also substantially influence the ability to create value within the interfirm relationship. At the same time, our data point to the inherent limitations of contracts in motivating partners to change their behavior in alliances. Whereas relational governance scholars (e.g., Dyer, 1997; Kang et al., 2009) have mainly focused on the impact of physical relation-specific investments such as site-specific investment and customized equipment on value realization, our data point to the relevance of role-specific investments to enact synergies from complementary resources. In contrast to existing relational governance research, we question the role of goodwill trust as a sufficient social glue to keep partners together after value realization has taken place successfully. Instead, we emphasize the importance of balanced interdependence and intra-organizational changes for the continuation of interfirm relationships after value realization has occurred.

The remainder of this paper is organized in six sections. First, we provide an overview of existing literature on the phenomenon of ANVD alliances. Based on this literature, we identify two obstacles to value realization in ANVD alliances. Relying on structural and relational alliance governance perspectives, we subsequently identify two potential strategies to address these obstacles. We then discuss the methodology of our study, after which we provide an in-depth description of the three cases, focusing on the process of value realization. In the fourth section, we discuss our main findings and develop propositions on the process of value realization in ANVD alliances. To conclude, we reflect on the theoretical and managerial implications of our study, its main limitations and opportunities for future research.

ANVD alliances: state-of-the-art

Potential value of ANVD alliances

Following Doz and Williamson (2002), we define asymmetric new venture development (ANVD) alliances as formal arrangements between established and entrepreneurial partners that pool their capabilities for the purpose of launching a new venture activity into the market. On a technological level, the objective of ANVD alliances is to develop industrial prototypes of a product/technology. On a commercial level, the aim is to attract first paying customers (Doz and Williamson, 2002).

In high-tech settings, the potential value attainable through ANVD alliances can be substantial. Because of learning traps (Levinthal and March, 1993) and core rigidities (Leonard-Barton, 1992), established organizations often experience huge difficulties in internally creating inventions (Ahuja and Lampert, 2001). Yet, through ANVD alliances, established partners can gain access to pioneering technologies, invented by their entrepreneurial counterparts (Dodgson, 1993; Doz and Williamson, 2002). At the same time, entrepreneurial organizations may benefit from ANVD alliances as these can provide them access to complementary assets (Teece, 1986) such as distribution, manufacturing, marketing, and financial capabilities that are necessary to successfully launch a venture activity into the market (Alvarez and Barney, 2001; Kalaignanam et al., 2007). In addition, formal collaboration with established organizations may offer entrepreneurial firms the necessary social legitimacy in the market (Alvarez and Barney, 2001; Stuart et al., 1999).

Obstacles to value realization in ANVD alliances

Madhok and Tallman (1998) stress the distinction between the *potential* value attainable through an alliance and the *realization* of such value. The former aspect 'refers to the theoretical synergies arising from the ideal combination of complementary resources, while the latter aspect reflects the realities on the ground and has more to do with the effectiveness of the actual management of the alliance' (Madhok and Tallman, 1998:328). Applying this distinction between potential and realized value, several scholars (e.g., Agarwal et al., 2010; Bell et al., 2006) argue that most of the existing research focuses on issues influencing the potential value inherent in interfirm relationships (i.e., selection of partners, initial structural conditions), largely ignoring the conditions and processes that affect the actual realization of such value. This also holds for the specific setting of ANVD alliances. Whereas numerous alliance scholars have emphasized the potential value of ANVD alliances, empirical studies examining the process of realizing such value are relatively rare. The few studies that do so (Dodgson, 1993; Doz, 1988; Doz and Williamson, 2002) point to two major obstacles for the realization of value in ANVD alliances: (1) a lack of motivation to focus on exploitative activities at the entrepreneurial partner and (2) a lack of commitment to the new venture activity at the established partner.

Lack of motivation and ability to focus on exploitative activities

Corporate venturing scholars (e.g., Bierly and Coombs, 2004; Kazanjian and Drazin, 1990; Vanhaverbeke and Peeters, 2005) argue that the successful launch of a venture activity requires the development of industrial prototypes that can be handed over to potential customers. This involves the execution of exploitative activities such as refinement, standardization and upscaling (Burgelman and Sayles, 1986; March, 1991). Several studies on ANVD alliances, however, suggest that the motivation of entrepreneurial partners to carry out such exploitative activities is likely to be limited. Examining multiple technology partnerships between large and smaller firms, Doz (1988) argues that, because of their preference for creativity and originality, entrepreneurial partners often favor continuing explorative activities (i.e., experimentation and testing; March, 1991) to investigate all options of their technology, instead of focusing all attention on exploitative activities, necessary to swiftly industrialize the technology. In a similar vein, Minshall et al. (2010:56) argue that 'start-ups may be run by individuals impatient for progress but unwilling to be governed by schedule and discipline dictated by the larger firm.' In addition, entrepreneurial partners often do not have the necessary financial, operational and human resources to conduct activities such as upscaling and standardization (Doz, 1988). In other words, their ability to shift to exploitation is also limited.

At the same time, Doz (1988) notices that active interventions of established firms to move the entrepreneurial organization toward exploitative action are often perceived by members of entrepreneurial partners as attempts to stifle their creativity and innovativeness, which in turn motivates key technologists to leave the entrepreneurial organization. As a result, valuable technological knowledge disappears, hampering successful realization of value in the alliance.

Lack of commitment to the new venture activity

Whereas the ANVD alliance is often a matter of life and death for the entrepreneurial company, the established partner often considers it as one of the available options in a much wider portfolio (Bajeux-Besnainou et al., 2010; Dodgson, 1993; Vassolo et al., 2004). As a consequence, the commitment of the established partner to turn the new venture into a success may be limited. In addition, the successful launch of new venture activities may lead to the cannibalization of existing commercial activities at the established partner (Doz, 1988). Consequently, managers of such existing business activities may see new venture activities as a potential threat instead of a future opportunity. As a result, ANVD alliances may fall prey to internal politics of established organizations, negatively influencing the process of value creation within alliances (Doz and Williamson, 2002).

Structural and relational governance perspectives

Whereas previous studies of ANVD alliances point to potential obstacles to value realization, they have remained relatively silent on how these obstacles can be addressed effectively. Examining the broader alliance governance literature, we can nonetheless identify two different perspectives, suggesting distinct governance strategies to address these obstacles to value realization.

Relying on transaction cost theory (e.g., Williamson, 1991), the structural governance perspective emphasizes the possibility that alliance partners might act opportunistically. The higher the level of transactional attributes such as asset-specificity and uncertainty, the higher the risk that one or both partners engage in opportunistic actions (Oxley, 1997; Williamson, 1991). This perspective assumes that the initial structural design of the alliance transaction is the most crucial factor in explaining alliance performance (Hennart, 2006). The relational governance perspective relies on insights from transaction value theory (e.g., Dyer and Singh, 1998; Madhok and Tallman, 1998; Zajac and Olsen, 1993) to stress the opportunity of trust building within alliances. It therefore focuses on the ongoing relational management of the interfirm relationship (i.e., fostering communication and trust) when explaining alliance performance (Bell et al., 2006; Salk, 2005).

Grounded in these assumptions, each perspective points to different mechanisms to govern alliances. The structural perspective identifies the alliance contract as an effective governance mechanism. In particular, it suggests that alliance contracts contribute to align partner's behavior with alliance objectives through stipulating incentives for compliant actions and/or inflicting penalties for violating actions (Anderson and Dekker, 2005; Parkhe, 1993a; Reuer and Ariño, 2007), which in-turn fosters value realization. In contrast, the relational perspective promotes relational investments or partner-specific 'expenditures dedicated toward the relationship' (Madhok and Tallman, 1998:331) as viable governance mechanisms. Examples of such relational investments are site-specific plants (Dyer, 1997) and customized equipment (Chang and Gotcher, 2007; Faems et al., 2007). Relational governance scholars (Collins and Hitt, 2006; Dyer and Singh, 1998; Madhok and Tallman, 1998) argue that these investments facilitate the emergence of goodwill trust between partners, which subsequently facilitates value creation and even reduces transaction costs in the long term.[1]

Some empirical studies (Alvarez and Barney, 2001; Sawers et al., 2008) have examined the impact of contracts and relational investments on *risk mitigation* in ANVD alliances. These studies point to the relevance of both contractual and relational governance mechanisms in minimizing the risk of unintended knowledge spillovers from the entrepreneurial to the established partner. However, these

[1] Relational governance scholars acknowledge that, in the short term, when high levels of trust have not yet been established, relational investment can increase transaction costs (Dyer, 1997).

studies remain silent on the impact of such governance mechanisms on the actual process of *value realization* taking place in such collaborative settings. In this paper, we address this gap by focusing on how contractual and relational governance mechanisms influence the transition from exploitation to exploration in ANVD alliances.

Methodology

Research design

In this study we adopt a multiple, longitudinal case study approach (Eisenhardt, 1989; Yin, 1984), examining retrospectively the evolution of three different ANVD alliances. Such case study research allows answering 'how' questions about a contemporary set of events over which the investigator has little or no control (Yin, 1984) and mobilizing multiple observations on complex processes (Eisenhardt and Graebner, 2007; Parkhe, 1993b; Pettigrew, 1990). As we wanted to inductively build theory on the process of value realization, our objective was to study a small number of ANVD alliances in great detail (Birkinshaw et al., 2000).

We considered several factors in selecting the cases. First, we limited our study to ANVD alliances in high-tech settings (i.e., advanced material industry) to minimize extraneous variation (Eisenhardt, 1989) that might be derived from differences between technology intensive settings and settings where technology is less dominant. Second, we selected ANVD alliances in which partners eventually succeeded in realizing value, meaning that, in each case, partners managed to jointly launch a new venture activity into the market. This allowed us to generate insights in how partners overcome obstacles to value realization in ANVD alliances. In the end, we managed to get full access to three ANVD alliances. Table 1 summarizes some important characteristics of the selected cases. The names of companies, products, and individuals are disguised to ensure confidentiality.

Data collection and analysis

We collected our data retrospectively between June 2003 and June 2005. Retrospective data collection allows for a much more focused data gathering process (Leonard-Barton, 1990; Poole et al., 2000). At the same time, we recognized the danger of unconsciously accepting respondent bias in retrospective studies, leading to confusion about cause and effect relationships (Leonard-Barton,

Table 1
Overview of selected cases.

Characteristics	Diamond alliance	OGT alliance	Industrial Printhead alliance
Start of ANVD alliance	December 1997	May 1998	March 2002
Governance structure of ANVD alliance	Joint venture structure	Minority equity structure	Contractual structure
Technological objective of alliance	Production of industrial samples of diamond-like coating technology for jobcoating applications	Production of industrial prototypes of optical glass technology (OGT) for large-scale optical applications	Production of industrial prototypes of end shooter head (ESH) inkjet technology for digital printing systems
Established partner	**MAT**: International group specialized in metal transformation and advanced coatings	**GCOMP**: International metals and materials group	**GRAPH**: International imaging group
Entrepreneurial partner	**USCOAT**: Small high-tech company specialized in advanced coatings	**OPTICS**: University spin-off specialized in optical glass technology	**JET**: Small high-tech company specialized in inkjet technology
Dynamics of collaborative relationship after successful value creation	August 2000: Dissolution of collaborative relationship: MAT buys USCOAT out of the JV	July 2001: Integration of collaborative relationship: GCOMP acquires OPTICS	March 2004: Continuation of collaborative relationship between GRAPH and JET: Partners sign a new contractual agreement, representing the start of business growth alliance

Table 2
Overview of collected data.

ANVD alliance	Interviews	Documents
Diamond alliance	- MAT: 6 interviewees - USCOAT: 4 interviewees	- Publicly available information - Contracts - Reports of board meetings - Reports of technological meetings
OGT alliance	- GCOMP: 7 interviewees - OGT: 2 interviewees	- Publicly available information - Contracts - Reports of board meetings - Print outs of fax and correspondence
Industrial Printhead alliance	- GRAPH: 6 interviewees - JET: 4 interviewees	- Publicly available information - Contracts - Reports of steering meetings - Reports of technological meetings

1990). We therefore triangulated our data, applying multiple data collection techniques, including interviews and a review of archival documents (see Table 2). Applying the suggestions of Pettigrew (1990) and Pentland (1999), we made an explicit distinction between three different stages in our theory building process, representing an evolution of surface levels to deeper levels of data collection and analysis.

For each ANVD alliance, we first conducted unstructured interviews with two key informants (i.e., senior managers) and studied relevant documents (i.e., contracts, reports of managerial and operational meetings, and publicly available data). Based on this information we constructed a graphical representation of the chronology of major events within each ANVD alliance.

In the second stage, we conducted semi-structured interviews (Kvale, 1996) for each case, both with managers and engineers of the organizations involved. In total, we interviewed 34 persons (see Table 2). Interviews were conducted individually, face-to-face, and in the native language of the interviewee to maximize the informant's ability to express his or her thoughts, feelings and opinions. The interviews were structured along the chronology of major events, asking the respondents to describe these events and the kind of interactions they triggered between the partners. The average length of the interviews was between one and two hours. The transcribed interviews were sent back to the interviewees to give them the opportunity to hand over additional comments. At this stage, we also reexamined the available documents to verify whether the content of the interviews was consistent with the content of the documents. When discrepancies between these two data sources were observed, we again contacted respondents to ask for additional information.

After the semi-structured interviews were completed, a case study report was written for each ANVD alliance. In these reports, we made extensive use of citations from interviews as well as documents, achieving a high level of accuracy (Langley, 1999). We discussed these case study reports with managers of the involved firms in order to assure that they provided a realistic representation of the alliance history. These discussions provided additional data, which allowed us to fine-tune the case study reports.

The purpose of the third stage was to interpret the narrative, developed in the previous stage in order to answer our research questions. In this stage, we used an inductive approach, relying on an iterative process coupling within-case and between-case analyses (Eisenhardt, 1989; Yin, 1984). We started with conducting a within-case analysis for each observed ANVD alliance. We re-assessed each case, focusing on the process of value realization. Specifically, we searched for indications of obstacles to value realization as well as governance strategies allowing parties to overcome such obstacles. Following insights from the existing alliance governance literature, we paid special attention to contracts and relational investments as potential governance mechanisms, while remaining sensitive to other conditions affecting processes of value realization. After the completion of these within-case analyses, we compared findings across the three cases. Based on the identification of similarities and differences across cases, new iterations of within-case and across-case analysis were initiated. This procedure was repeated until dominant findings emerged.

Results

In this section, a description of the three cases is presented. For each alliance, we provide a brief introduction of its initiation, followed by a discussion of the subsequent alliance dynamics.

Industrial Printhead alliance between GRAPH and JET

At the beginning of 2002, GRAPH and JET initiated the Industrial Printhead alliance. The purpose of this alliance was to initiate a new venture activity based on JET's end shooter head (ESH) technology. GRAPH and JET already knew each other from a previous collaboration in which they had successfully explored the feasibility of the ESH technology on laboratory scale. At the start of the Industrial Printhead alliance, it was agreed that JET applied its technological skills and expertise in order to develop a large number of industrial printhead prototypes, which GRAPH could apply for the commercialization of several printing systems. According to interviewees, JET had to be in charge of exploiting the technology because GRAPH, despite their history of prior collaboration, did not have the necessary equipment, technological expertise and human skills to take the lead. At the same time, GRAPH was expected to support JET's technological efforts by continuously testing and evaluating the industrial prototype printheads and providing technological feedback. Finally, a number of contractual milestones were defined, stipulating when JET had to deliver printheads to GRAPH. These deadlines were linked to financial payments from GRAPH to JET. In this way, GRAPH wanted to stimulate JET to focus on exploitation of its technology.

Start of the alliance (March 2002–November 2002).
During the first 6 months of the Industrial Printhead alliance, the engineering team of JET experienced huge difficulties in producing industrial prototype printheads:

> 'The purpose was: 'we got to make 10, 20 printheads a day.' When we started, we had problems in doing that. We had problems building the parts; we had problems assembling the parts. (JET engineer)'

To explain JET's limited progress in developing and producing industrial printheads, both GRAPH and JET interviewees stressed that, despite the presence of contractual milestones aimed at encouraging JET to focus on the exploitation of its technology, the motivation and ability of JET's engineering team to shift its focus from explorative to exploitative activities remained quite limited:

> 'The research mentality was very dominant at JET. They liked to play with the technology without keeping in mind applications and valorization of the applications. (GRAPH engineer)'

> 'What we [=JET] tended to do was fire fight . . . There was an awful lot of energy at JET, but not very well directed or focused. (JET engineer)'

Whereas JET's engineers were not used to conduct exploitative activities such as upscaling and standardization, GRAPH's engineers had much more experience in this field. In addition, the GRAPH team responsible for the venture was highly committed to turn this collaborative project into a success. In this team, dedicated resources (i.e., engineers and testing equipment) were present that provided the opportunity to make valuable contributions to the exploitation of the ESH technology. One GRAPH engineer mentioned that being part of a separate research unit within GRAPH made it easier to contribute such resources to the collaborative project:

> 'We had the advantage of being part of a small research division. We could spend some time and resources without attracting much attention in such a large company. (GRAPH engineer)'

Despite GRAPH's experience and commitment, the involvement of GRAPH's team in solving the technological problems remained limited. Interviewees pointed to the original inventor of the ESH technology, who was the project leader of this project, as a hampering factor in addressing the technological problems. In particular, it was stressed that this original inventor applied a quite defensive communication strategy toward GRAPH, hampering GRAPH's ability to contribute to solving particular problems:

> 'It really was a mess at a certain moment in time. He [= original inventor of the technology] did not tell what exactly happened ... This was very annoying. In this way, we found it difficult to get a grip on it. (GRAPH engineer)'

> 'He [= original inventor of the technology] was very cautious in communicating these problems to GRAPH ... Communication very much was: 'things are going well, there are no problems, I will deliver.' At that moment, GRAPH had a very second hand view on what was happening. (JET manager)'

Adjustment of collaborative dynamics (November 2002–August 2003).

Six months after the initiation of the Industrial Printhead alliance, an alliance steering meeting was held during which GRAPH's management explicitly questioned JET's process engineering capabilities. GRAPH also insisted that their project manager would stay at JET on a part-time basis in order to closely monitor and support JET's activities. Within JET, some doubts were present regarding this decision. As one JET interviewee expressed, 'some people feared that GRAPH's project manager would act like a spy, stealing valuable knowledge.' Through intensively communicating with JET's engineers, without abusing the knowledge received, GRAPH's project manager was able to establish a trustful relationship with the engineers of JET. As a consequence, collaboration became more informal, allowing GRAPH's project manager to have a larger influence on the technological activities at JET:

> 'Another mode of collaboration emerges. It becomes less formal; you also get informal information ... You have a detailed sense of what is happening, how things are going, and what could be adjusted. Based on this information, you can immediately anticipate. (GRAPH project manager)'

At the beginning of 2003, JET became much more successful in exploiting the ESH technology, and it started delivering qualitative industrial prototype printheads to GRAPH on a more regular basis. Both GRAPH and JET interviewees stressed the importance of the part-time presence of GRAPH's project manager in this respect, while also referring to the significance of internal changes within JET. At the end of 2002, a new CEO had been appointed in order to transform JET from a technology licensing company into a printhead manufacturing company. One of the first actions of this CEO was to hire a new project leader for the alliance project. This new project leader was a process engineer, who had been working in an established production company for years. According to both GRAPH and JET interviewees, this change of personnel had a huge impact:

> 'The disappearance of the initial inventor had a huge impact. He was a very stubborn person, who took ill-founded decisions ... The newly appointed manager improved the verve at JET ... He had the same vision as us. Things had to proceed quickly for him. (GRAPH engineer)'

> 'He [= new R&D manager] very much believed in formal planning and action lists. (JET project manager)'

From the first day, the new project leader stressed the importance of a structured development approach. Within JET's engineering team, formal planning systems and action lists were introduced, facilitating the exploitation of the ESH technology.

Moving toward large-scale manufacturing (August 2003–March 2004)

After JET started delivering industrial prototype printheads, commercial business units within GRAPH started expressing their interest in applying these ESH printheads for different digital printing applications. However, substantial additional investments were necessary to really use these in commercial applications. For instance, whereas JET had been using a production line that required numerous manual interventions, GRAPH stressed the need for a fully-automated production line.

As discussions about the financing of these additional investments were initiated, partners started thinking about the future of their collaborative relationship. Different scenario's were discussed, including (i) the signing of a licensing agreement, which would allow GRAPH to produce printheads by itself, (ii) the acquisition of JET by GRAPH, and (iii) the signing of a new contractual alliance agreement by which JET would become a long-term manufacturer and supplier of commercial ESH printheads for GRAPH. Finally, the latter option was chosen. GRAPH and JET decided to draft a new alliance agreement, stipulating that GRAPH would financially fund all necessary investments to install a new production line at JET's existing production facility and that JET would use this new production line to manufacture and supply ESH printheads to GRAPH. In the interviews, two reasons for this decision were mentioned. First, GRAPH did not possess the necessary equipment and technological competencies to start producing these printheads by itself. Continuing the relationship therefore seemed to be the most cost-effective option for GRAPH:

> 'The benefit to GRAPH was that they did not have to buy a new building, that they did not have to buy a clean room, and that they did not have to employ lots of people who knew how to build printheads. (JET engineer)'

Second, interviewees stressed that GRAPH's confidence in JET's capabilities to effectively conduct large-scale manufacturing had substantially increased during the last year:

> 'The new CEO has drastically improved their manufacturing ... Our confidence [in JET's manufacturing capabilities] drastically improved. (GRAPH manager)'

> 'From my perspective, that decision was based upon the confidence level improving within GRAPH. We had been able to demonstrate the fact that we now had a viable production facility capable of delivering quality products. (JET technical manager)'

As already mentioned, JET's new management had initiated huge efforts to transform JET into a production oriented firm. Skilled process engineers were hired and disciplined project management systems were introduced. As a result of these efforts, the manufacturing quality of JET's existing commercial products substantially increased during 2003. GRAPH consequently became convinced that JET would be capable to perform high-quality ESH printheads for GRAPH on a large scale.

OGT alliance between GCOMP and OPTICS

In 1996, GCOMP noticed the existence of OPTICS, a small university spin-off that had developed a pioneering optical glass technology. GCOMP, applying more traditional technologies for optical applications in high-tech industries (i.e., defense and space travel), identified OPTICS' optical glass technology as an opportunity to expand GCOMP's existing optical application portfolio into civil markets (i.e., automotive and civil protection). GCOMP therefore wanted to participate in OPTICS' activities. In 1998, OPTICS' shareholders agreed to give GCOMP a minority participation of 40%. As in the Industrial Printhead alliance, it was the entrepreneurial partner that was in charge of the exploitation activities. In particular, it was agreed that the OPTICS team, consisting of three people (i.e., CEO and two engineers), was responsible for developing industrial prototypes of the optical glass technology that could be used for large-scale optical applications in the future. GCOMP, having no technological experience with the OGT technology, was responsible for the worldwide promotion of OPTICS' optical glass technology. In addition, it was agreed that GCOMP provided financial and operational support when the OPTICS team faced problems in exploiting the technology. In 1998, a confidential agreement was signed between GCOMP and the CEO of OPTICS. This confidential agreement contained a number of technological milestones for the next six years. For each milestone that the CEO of OPTICS managed to achieve, he individually received a considerable financial bonus. In this way, 'he [= CEO of OPTICS] was financially stimulated to focus his development activities on large-volume applications for the automotive industry' (OPTICS manager).

Start of the alliance (May 1998–January 1999).
As in the previous case, the team of the entrepreneurial partner (i.e., OPTICS) initially made limited progress in developing industrial prototypes. Also here, interviewees referred to the limited

motivation and ability of the entrepreneurial partner as important factors explaining the limited success in exploiting the technology:

> 'The people at OGT really were still R&D people . . . They were not used to do process engineering. Their reasoning was: 'let's try something; if it works we have a process. (GCOMP engineer)'

> 'GCOMP wanted to commercialize as quickly as possible . . . [However], we were specialists. We first wanted to achieve perfect quality before initiating production. (OPTICS engineer)'

In addition, GCOMP interviewees stressed that the financial incentives, which had been defined in the confidential agreement with the CEO of OPTICS, were not sufficient to motivate him to fully focus on the industrialization of the technology:

> 'The purpose of this [confidential] contract was to increase his resistance against further experimenting with the technology. However, this contract was not a dominating force on him. The temptation to experiment remained present. (GCOMP manager)'

As in the previous case, the established partner experienced difficulties in influencing the progress of the technological activities at the entrepreneurial partner during the initial months of the alliance. Despite the fact that GCOMP engineers, being part of a separate venture unit within GCOMP, were highly motivated to provide support, the OPTICS team did not ask for such assistance. Again, the original inventor of the technology was identified as an impeding factor:

> 'His [= original inventor of OPTICS] expectations were that we would provide financial support and that he could autonomously continue what he intended to do . . . From the start, we had stressed that we were not solely a financial partner, but that we also would play a more guiding role. However, I think that he did not understand what this guiding role towards exploitation exactly implied. (GCOMP manager)'

Adjustment of the collaborative dynamics (January 1999–September 2000)

Whereas OPTICS was struggling in developing industrial prototypes, GCOMP made progress in marketing the optical glass technology on an international scale. At the beginning of 1999, GCOMP succeeded in attracting the interest of several potential customers. However, as OPTICS had achieved little progress in exploiting its technology for large-scale applications, it was impossible to hand over industrial prototypes of optical lenses to these potential customers. GCOMP therefore decided that more active interventions were necessary. As in the previous case, GCOMP sent a process engineer to OPTICS on a regular basis in order to find out which operational problems were encountered at OPTICS and how GCOMP could contribute to solving these problems. During his visits, this process engineer tried to make interventions that 'could make the life of the OPTICS engineers easier' (GCOMP engineer). For instance, he arranged that OPTICS' engineers got free access to equipment of GCOMP, which could be used for improving OPTICS' existing production process. In addition, he invited engineers of OPTICS to GCOMP to show them how GCOMP addressed some of the operational problems that OPTICS was facing.

In the interviews, OPTICS' engineers acknowledged that this kind of support turned out to be very valuable, as it helped them to optimize the quality of their production process. At the same time, the process manager of GCOMP stressed that 'as I visited them, I gradually obtained their trust.' Also the engineers of OPTICS stressed that the contact with this process engineer went 'smoothly', triggering an 'excellent relationship'. As a result, OPTICS' engineers started providing more detailed technical information to GCOMP's process engineer, allowing him to expand its supportive role at OPTICS. Gradually, this process engineer became a liaison person who helped OPTICS' engineers contacting other GCOMP engineers for the solution of specific operational problems that were faced by OPTICS' engineers. The support of GCOMP started to pay off. In 2000, the first industrial prototypes of optical glass lenses for large-scale applications were delivered to interested customers.

Moving toward large-scale manufacturing (September 2000–July 2001).

After industrial prototypes of the optical glass technology were delivered to potential customers, a number of companies announced their intention to use OPTICS' lenses for commercial applications.

Such large-scale production of optical lenses for commercial customers required additional investments in production equipment and facilities. OPTICS, however, did not have the financial and organizational resources to support such investments. OPTICS' CEO therefore asked GCOMP whether it was willing to acquire 100% of OPTICS' shares:

> 'OPTICS had to change into a higher gear to address the emerging market opportunities. The CEO of OPTICS realized that he would not be able to achieve this acceleration in growth by itself, neither from a financial perspective nor from an organizational point of view. He therefore asked GCOMP to take over 100% of the OPTICS shares. (GCOMP manager)'

GCOMP's managers were willing to consider the option of an acquisition for two reasons. First, they realized that dissolving the relationship and moving forward independently was not an option because most critical knowledge was still held by OPTICS:

> 'We were dependent on three specific people, possessing critical knowledge that was not codified. (GCOMP project manager)'

At the same time, GCOMP was not eager to leave OPTICS in charge of the production activities. In contrast to JET in the Industrial Printhead alliance, OPTICS had not made substantial organizational changes to improve its manufacturing skills and capabilities. GCOMP's confidence in the production capabilities of OPTICS was therefore quite low:

> 'When first industrial prototypes were ready, they already started thinking: 'what can we add to it in order to further optimize the performance of our technology.' They did not have the maturity to say: 'let us first further stabilize the technology to make sure that it can be commercialized on a large scale. (GCOMP manager)'

GCOMP managers recognized that, through acquiring OPTICS, their ability to steer and monitor the operational activities at OPTICS would increase substantially:

> 'Before we could only give them advice about how we would do it. They were free to use our advice or not . . . Now we wanted another kind of relationship. We wanted to be in charge now. (GCOMP manager)'

In July 2001, the OGT alliance was transformed into a fully owned venture of GCOMP. A new CEO was installed at OPTICS, and the former CEO became CTO. Instructed by GCOMP, the new CEO immediately focused on transforming OPTICS from a technology oriented into a production oriented company. However, the former CEO and founder of OPTICS resisted this transformation; three months after the acquisition, he left the company, followed by a period in which swift progress was made in transforming OPTICS into a production oriented company.

Diamond alliance between MAT and USCOAT

In 1997, MAT, an established metals and materials organization, wanted to initiate a new venture activity to commercialize diamond-like coatings in Europe. MAT asked USCOAT, an entrepreneurial organization with which it had collaborated in the past to explore the feasibility of USCOAT's DLX technology, to actively support the initiation of this new venture activity by becoming partner in a joint venture (JV). The technological skills and expertise of this entrepreneurial company as well as the opportunity for future expansion of the venture activity to the US were the two main reasons to select USCOAT as an alliance partner. USCOAT was interested in MAT's proposition as this JV provided an opportunity to get access to and learn about the European market.[2]

[2] We need to remark that, in this joint venture, a third partner was present. Besides USCOAT, MAT also invited RES, a public research institute, to become a partner in the joint venture. Although RES was part of the JV, they only had a collaborative relationship with MAT. Apart from the JV board meetings, interaction between USCOAT and RES remained absent. As we explore the process of value realization in collaborative relationships between entrepreneurial and established firms, we here focus on the relationship between MAT and USCOAT.

In contrast to the two previous cases, it was agreed that, from the start of the alliance, the established partner (i.e., MAT) was not only responsible for the commercial activities of the JV, but that it should also take a leading role in the technological, exploitation oriented activities of the joint venture. In specific, a team of MAT employees became responsible for developing industrial prototypes that could be delivered to interested customers. According to our interviewees, MAT was able to take this leading role in the Joint Venture, as MAT's engineers already had gained extensive expertise in working with diamond-like coatings during their joint explorative efforts with USCOAT in a previous alliance. Moreover, during this prior alliance, MAT had invested in specific coating equipment, allowing it to take charge of exploitative activities. The entrepreneurial partner (i.e., USCOAT) played a more supportive role. It was agreed that, if the MAT team experienced problems, USCOAT would put its knowledge, expertise and equipment at MAT's disposal.

Start of the alliance (December 1997–December 1998)

Compared to the two previous cases, industrialization of the technology proceeded smoothly in the Diamond alliance. The MAT team, in charge of the technological and commercial activities within the JV, made swift progress in developing industrial prototypes for potential customers. Through combining USCOAT's DLX technology with more traditional DLC technologies, it managed to produce industrial samples that satisfied the needs of interested customers. One USCOAT interviewee stressed that the smooth development of industrial prototypes was due to MAT's motivation and ability to focus attention toward production:

> 'MAT was very production focused ... MAT was very strong in taking it into the next step. (USCOAT engineer)'

At the same time, MAT interviewees emphasized that, during the first year of the alliance, USCOAT played an important supportive role. On a regular basis, technological meetings were held between MAT and USCOAT engineers. For MAT's engineers, these meeting provided the opportunity to discuss technological problems and challenges regarding the use of USCOAT's DLX technology on a more industrial level.

Another difference compared to the previous two cases was the absence of the original inventor of the core technology in the alliance. The DLX technology had been invented by a Russian scientist who had sold the technology to USCOAT. After selling the technology, this inventor had not been involved in further developing the DLX technology.

Moving toward large-scale manufacturing (December 1998–May 2002).

One year after the Diamond alliance was initiated, customers started ordering jobcoating applications that were based on the DLC/DLX coating. Subsequently, the MAT team started preparing for large-scale production of DLC/DLX coatings. MAT engineers developed new systems, allowing for upscaled production of DLX/DLC coatings. In addition, a new production facility was realised in which all diamond-like production activities could be concentrated.

At the same time, MAT became less dependent on USCOAT's technological and operational support. During the first year of the JV, MAT engineers had been able to absorb all relevant technological knowledge of the entrepreneurial partner. According to MAT's interviewees, the added value of USCOAT to the joint venture therefore became limited:

> 'USCOAT has played an important role at the initiation of the JV. However, when the activities became more and more oriented toward commercialization, we were of the opinion that they could provide limited added value. (MAT manager)'

As the amount of interested customers continued to increase, MAT's management started feeling the need for international expansion of the diamond-like coating activities. In 2000, first steps were taken in this respect. The joint venture took a minority participation in a start-up company, located in Asia, in order to enter this geographical market. At the same time, plans were made to build a new production facility in Germany. However, these expansion plans required substantial additional investments. USCOAT, possessing limited financial resources, was not able to financially support these investments. According to MAT's interviewees, the participation of the entrepreneurial partner therefore started to become a serious disadvantage:

> 'When the need for expansion became clear, the JV structure became a disadvantage rather than an advantage ... As activities started growing and MAT was able to commercialize the technology by itself, it was time to buy the other partners out to the JV (MAT manager)'

In 2000, USCOAT faced substantial financial problems. At that moment, MAT proposed to buy USCOAT's shares in the Diamond alliance as well as take over USCOAT's diamond-like coating equipment and a number of employees that had been working on this technology. At the end of 2000, USCOAT's JV shares were officially transferred to MAT, representing the dissolution of the collaborative relationship between USCOAT and MAT.[3]

Discussion

Based on a comparative analysis of the three cases, we now develop a framework on the process of value realization in ANVD alliances, illuminating how a transition from exploitation to exploration can be achieved in this particular collaborative setting (see Fig. 1). First, we identify three initial conditions that influence the ability to realize a transition from exploration to exploitation activities in ANVD alliances. Second, we develop propositions on the impact of contractual and relational governance mechanisms on this transition process.

Initial conditions

Previous studies (Doz, 1988; Minshall et al., 2010) already observed that, in ANVD alliances, the motivation and ability of the entrepreneurial partner to shift from explorative to exploitative activities tends to be limited. Based on our data, we argue that this is particularly problematic in cases for which the technological asymmetry between the entrepreneurial and established partner is initially large. In both the Industrial Printhead alliance and the OGT alliance, the asymmetry in technological skills and resources between the partners was considerable. In both cases, established partners did not have the necessary equipment, technological experience and human capital to take a leading role in the technological activities (see Table 3). As a result, it was the entrepreneurial partner that had to be in charge of exploiting the technology. However, as the entrepreneurial partner lacked the willingness and ability to conduct activities such as refinement, standardization and up-scaling, limited progress in value creation was made at the initial stages of these two ANVD alliances.

In contrast, technological asymmetry was relatively low in the Diamond alliance. In this case, not only the entrepreneurial partner but also the established partner already possessed significant technological expertise, equipment and specialists needed for developing diamond-like coatings, allowing the established partner to take a more prominent role in the technological activities. As the ability and motivation of this partner to move from exploration to exploitation was much higher, value creation proceeded much more smoothly in this case.

Proposition 1. Greater initial technological asymmetry is likely to complicate the transition from exploration to exploitation activities in ANVD alliances.

Previous research (Dodgson, 1993; Doz, 1988) has identified a lack of commitment at the established partner as a second important obstacle to value creation in ANVD alliances. In our cases, however, the engineering teams of the established partner turned out to be highly motivated to contribute to the alliance and they appeared unrestricted in their actions by other organizational units. The internal structuring of the collaborative activities at the established partners seems to explain the absence of this particular obstacle to value creation. In each case, the established partner's engineering team was part of a dedicated venture unit that was clearly separated from the established partner's more traditional activities. Whereas corporate venturing research (e.g., Burgers et al., 2009;

[3] In May 2002, after long and difficult negotiations, also RES was bought out of the JV, turning the Diamond Alliance into a fully owned activity of MAT.

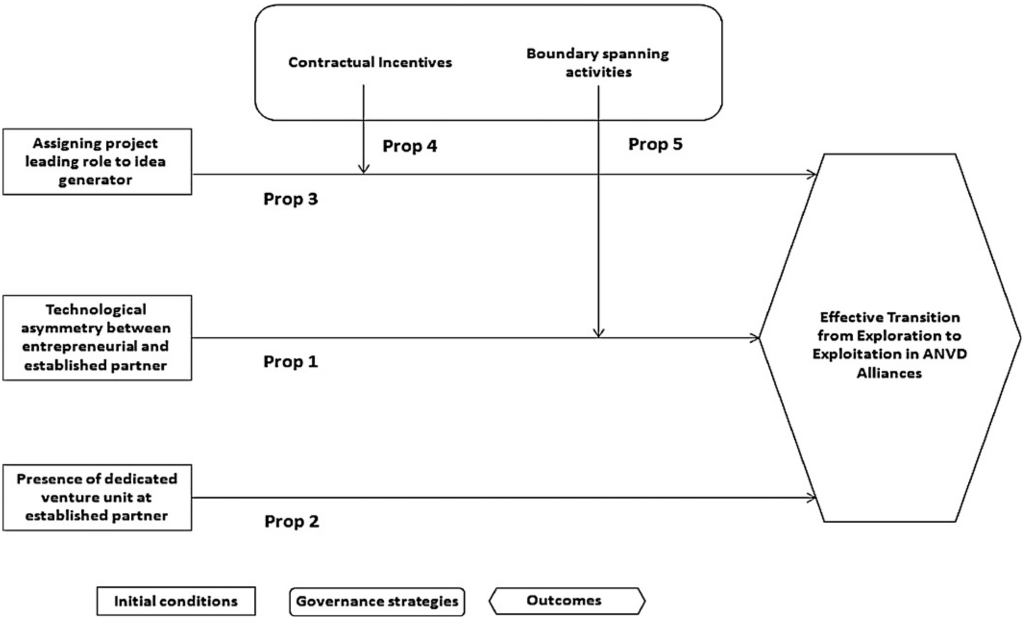

Fig. 1. Propositions on transition from exploration to exploitation in ANVD alliances.

Table 3
Technological asymmetry in different cases.

	Industrial Printhead alliance	OGT alliance	Diamond alliance
Technological equipment at established partner	Only testing equipment	No relevant equipment	Similar coating equipment
Technological experience at established partner	Experience limited to testing ESH research prototypes and providing feedback	No relevant experience with OGT technology	Extensive experience in producing research prototypes of DLX technology
Technological human resources at established partner	Absence of engineers specialized in printhead technology	Absence of engineers specialized in OGT technology	Presence of engineers specialized in DLX coating technology
Technological asymmetry	High	High	Low

Christensen and Overdorf, 2000; Hill and Birkinshaw, 2008) has emphasized the advantages of such separate venture units for intrafirm corporate venturing projects, our data indicate that they are also instrumental for inter-firm venturing projects. In particular we observed that this particular mode of internal structuring allows established partner's engineering teams to invest in dedicated resources that could contribute to value creation in the ANVD alliance without experiencing political interference from other organizational units.

Proposition 2. The presence of a dedicated venture unit at the established partner is likely to facilitate the transition from exploration to exploitation activities in ANVD alliances.

A third initial condition influencing the ability to transition from exploration to exploitation activities relates to role deficiencies concerning the project leader of the ANVD alliance. In their seminal work, Roberts and Fusfeld (1982) emphasized that, while the idea generating role and project leading role are both essential for successfully executing venturing projects, these roles differ considerably in terms of required skills, competencies and organizational activities (see Table 4). As

Table 4
Idea generating versus project leading roles in innovation projects (based on Roberts and Fusfeld, 1982).

	Idea generating role	Project leading role
Personal characteristics	Is expert in one or two fields Enjoys conceptualization, comfortable with abstractions Enjoys doing innovative work Usually is an individual contributor, often will work alone	Focus for the decision making, information, and questions Sensitive to accommodating to the needs of others Recognizes how to use the organizational structure to get things done Interested in a broad range of disciplines and how they fit together
Organizational activities	Generates new ideas and tests their feasibility Good at problem solving Sees new and different ways of viewing things Searches for breakthroughs	Provides the team leadership and motivation Plans and organizes the project Ensures administrative requirements are met Provides necessary coordination among team members Sees that the project moves forward effectively Balances the project goals and organizational needs

such, both roles more often than not, will imply different types of people. In both the Industrial Printhead alliance and the OGT alliance, the original inventor of the technology also enacted the role of project leader of the ANVD alliance, implying that idea generating and project leading roles were embodied in one single person. In both cases, this situation frustrated the transition from exploration to exploitation. Although interviewees stressed the intellectual and technological capabilities of the original inventor, they also acknowledged that this particular person did not have the appropriate managerial mindset and skills to take charge of the transition from exploration to exploitation. Moreover, this situation turned out to be an important obstacle for the established partner to fully mobilize its exploitation capabilities. In both cases, interviewees stressed that the original inventor wanted to be 'fully in charge of the technological activities' and 'did not want to give away his pretty little baby child', making him very reluctant to involve engineers of the established partner in solving the technological problems at hand. As a result, it was difficult for the engineering team of the established partner to provide technological support despite their high motivation and commitment to do so.

After replacing the original inventor by another manager, who possessed strong project leading skills, exploitation proceeded much more smoothly in the Industrial Printhead alliance. In the Diamond alliance, the original scientist that invented the technology was not involved in the ANVD alliance. In this way, he could not frustrate the required transition process from exploration to exploitation.

Proposition 3. Assigning the project leading role to an idea generator is likely to complicate the transition from exploration to exploitation activities in ANVD alliances.

Governance strategies

Whereas structural alliance governance scholars (e.g., Hennart, 2006; Parkhe, 1993a) emphasize that alliance contracts may help fostering compliant behavior in collaborative relationship, our data indicate that relying solely on contractual mechanisms to stimulate the entrepreneurial partner toward shifting from exploration to exploitation activities might be insufficient.[4] At the start of both alliances, contractual mechanisms were implemented, providing substantial financial incentives for the entrepreneurial firms to shift from explorative to exploitative activities. However, such contractual pressure turned out to be insufficient to achieve the expected behavioral changes. In both cases the intrinsic drive of the entrepreneurial partner in general and the original inventor in

[4] It is not our intention to argue that contracts do not have a function in governing ANVD alliances. In line with the arguments of other scholars (Alvarez and Barney, 2001; Sawers et al., 2008), several interviewees explicitly referred to the importance of contracts in mitigating risks such as unintended knowledge spillovers or the occurrence of unexpected contingencies.

particular to continue experimenting with the technology seemed to be stronger than the extrinsic impetus to focus attention on exploiting the technology.

Proposition 4. When the project leading role is assigned to an idea generator contractual incentive mechanisms are likely to be insufficient to facilitate a transition from exploration to exploitation activities in ANVD alliances.

Relational governance scholars (Dyer and Singh, 1998; Madhok and Tallman, 1998) have argued that relational investments might help to bridge organizational differences between partners. In particular, they argue that such investments stimulate the creation of knowledge-sharing routines, which facilitate the combination of resources that are embedded in different organizational backgrounds. In line with these arguments, we found strong indications that, in case of high initial technological asymmetry, the part-time presence of an engineer of the established partner at the premises of the entrepreneurial partner contributed significantly to realizing a transition from exploration to exploitation. In both the Industrial Printhead alliance and the OGT alliance, such 'boundary-spanning activities' (Ancona and Caldwell, 1992; Ferguson et al., 2005; Van Looy et al., 2001) contributed to establishing a trustful relationship on an operational level, which subsequently increased interaction about pending technological problems between engineers of different partners. As a result, it became possible to bridge initial technological asymmetry by connecting different engineering realms, allowing for an effective transition from exploration to exploitation:

Proposition 5. When initial technological asymmetry is high, boundary-spanning activities are likely to facilitate the transition from exploration to exploitation activities in ANVD alliances.

Conclusion

Contribution to structural governance perspective

Relying on transaction cost theory, structural governance scholars have provided important insights into how structural aspects of the transaction such as contract complexity (Reuer and Ariño, 2007), presence of shared equity (Sampson, 2004) and presence of interfirm control mechanism (Dekker, 2004) influence alliance outcomes. Our findings, however, suggest that not only the initial structural design of the transaction *between* firms but also the presence of specific structural elements *within* partner organizations can influence interfirm value creation processes. In particular, we observed that the presence of a dedicated venture unit within the established partner contributed to a high motivation of its members to contribute to turning the ANVD alliance into a success. This finding suggests that, in order to better understand interfirm value creation processes, structural alliance governance research should not only consider interfirm structural elements, but also intrafirm structural characteristics.

Prior studies (e.g., Alvarez and Barney, 2001; Sawers et al., 2008) have provided evidence that contracts can contribute to mitigating opportunistic behavior in ANVD alliances. Whereas these prior findings suggest that contracts might reduce transaction costs in ANVD alliances, our findings indicate that contracts are less effective in terms of stimulating joint value realization in this particular type of alliances. In particular, we observed that the presence of specific contractual clauses, providing strong financial incentives to the entrepreneurial partner to shift focus from exploration to exploitation, were insufficient to actually induce this necessary shift in behavior.

Contribution to relational governance perspective

Whereas relational governance scholars (e.g., Dyer, 1997; Faems et al., 2007) have focused on the impact of physical relation-specific investments such as site-specific investment and customized equipment on value realization, our data point to the relevance of role-specific investments to synergistically combine complementary resources. In particular, we observed that, both in the Industrial Printhead alliance and the OGT alliance, sending over engineers to the facilities of the entrepreneurial partner functioned as necessary 'educational efforts' (Madhok, 2000) to realize a transition from exploration to exploitation activities. At the same time, we found first indications that physical and role-specific investments are interrelated. In the Diamond alliance, the initial presence of similar coating equipment resulted in low technological asymmetry, which reduced the need for investing in boundary spanning roles. In contrast, we observed that, in the OGT and Industrial Printhead alliance, where such physical relation-specific investments were initially absent, role-specific investments were necessary to stimulate the transition from exploration to exploitation activities. This latter observation points to the importance of making an explicit distinction between different kinds of relation-specific investments and exploring their connections in future research on value realization in interfirm settings.

Whereas relational governance scholars have emphasized the importance of trust building and knowledge sharing between individuals, they have remained surprisingly silent on the roles that these individuals represent. Our findings, point to the importance of introducing boundary-spanning roles for successfully transitioning from exploration to exploitation in case of technological asymmetry. In addition, we clearly show that role deficiencies might substantially hamper value realization processes in interfirm relationships. In particular, we observed that assigning project leading roles to idea generators is likely to hamper the transition from exploration to exploitation in ANVD alliances. We therefore encourage future relational governance research to explicitly look at the presence/absence of particular roles and role deficiencies when assessing joint value creation in interfirm relationships.

Relational governance scholars typically presume that, after partners have succeeded in value realization, the incentives to sustain the interfirm relationship are strong (Doz, 1996; Dyer and Singh, 1998; Kang et al., 2009; Sadowski and Duysters, 2008). They argue that, as partners successfully realize value, the associated cycles of exchange, risk taking and successful fulfillment of expectation are likely to trigger positive goodwill trust dynamics. Such increasing faith in the moral integrity of the partner (Ring and Van De Ven, 1994) subsequently motivates the continuation and expansion of interfirm relationships. Our findings, however, indicate that the presence of goodwill trust is not a sufficient condition for the continuation of collaborative relationships after value is successfully created in ANVD alliances. In the interviews, MAT managers explicitly referred to the existence of a trustful relationship between the CEO of USCOAT and the management of MAT. However, despite this trustful relationship, MAT's management decided to dissolve the relationship when additional investments to move to large-scale manufacturing became necessary. MAT interviewees explicitly referred to this imbalanced interdependence to explain the decision to dissolve the collaborative relationship with USCOAT. This latter finding corresponds with the theoretical argument of Madhok (1995) that, when changes in interdependence trigger a long-term structural disequilibrium in contributions between collaborating partners, the bonding properties of the social dimension (i.e., goodwill trust) become irrelevant.

In the two other cases (i.e., Industrial Printhead alliance and OGT alliance) interdependence remained balanced. In these cases, the established partner remained dependent on the technological expertise and resources of the entrepreneurial partners, whereas the entrepreneurial partner remained dependent on the financial and commercial resources of the established partner. Nevertheless, we observed that the impact of successful value realization on the stability of the interfirm relationship was different in both cases. Whereas partners in the Industrial Printhead alliance decided to negotiate a new alliance to jointly move toward large scale manufacturing, a transition from alliance to acquisition was observed in the OGT case. Our data indicate that, in order to explain this difference, it is important to look at the internal organizational changes at the entrepreneurial partner during the ANVD alliance. In the Industrial Printhead alliance, the management of the entrepreneurial partner had managed to transform the company from a technology-based to a manufacturing-oriented company, allowing the firm to keep up with increasing requirements confronting the alliance (i.e., large-scale manufacturing of printheads). Consequently, the management teams of both partners were willing to continue the interfirm relationship, resulting into a new alliance agreement. In the OGT alliance, in contrast, such internal organizational changes had remained absent at the entrepreneurial partner. As a result, both partners agreed that transitioning from an alliance to an acquisition was the best option to move toward large-scale manufacturing. These latter findings suggest that, in order to better predict the stability of interfirm relationships, it is not sufficient to look at the level of trust between partners, but it is also necessary to consider changes in interdependence as well as intra-organizational changes.

Managerial implications

Established firms increasingly rely on collaboration with entrepreneurial firms to initiate new venture activities. Based on our findings, we provide managers of established firms three specific guidelines to optimize the probability of successfully realizing value in such relationships. First, we point to the relevance of situating the collaborative venture development activities in a separate unit within the established organization, which presides over resources and people that can be fully committed to the focal alliance. Second, we emphasize the limitations of contractual strategies to stimulate value realization in ANVD alliances. Whereas we acknowledge the importance of contracts in mitigating risks, we argue that contractual incentives are unlikely to stimulate a transition from exploration to exploitation activities at the entrepreneurial partner, especially when the project leading role is assigned to the original inventor of the technology. Finally, we point to boundary-spanning activities as an alternative to realize a shift from exploration to exploitation activities in ANVD alliances. Such human relation-specific investments are particularly relevant when initial technological asymmetry is high.

Studying 128 alliances between established and entrepreneurial firms, Alvarez and Barney (2001:139–140) found that 'in almost 80% of these alliances, managers of entrepreneurial firms felt unfairly exploited by their large firm partners.' Our data on the Diamond alliance confirm that alliances with established firms might be a very risky endeavor for entrepreneurial firms. Despite the presence of goodwill trust, the established partner decided to dissolve the relationship after the venture activity was successfully launched into the market. At the same time, the Industrial Printhead indicates that it is possible for entrepreneurial firms to develop a long-term collaborative relationship with established partners oriented. The presence of balanced interdependence seems to be a necessary condition in this respect. In addition, it appears important for the entrepreneurial partner to adjust its internal organization to the changing demands of the alliance. JET's internal reorientation from a technology-oriented company to a manufacturing-oriented company during the Industrial Prototype alliance is a nice example in this respect.

Limitations and future research

As a final reflection, we point to the main limitation of this study. Our findings are based on an in-depth examination of a limited number of cases in one particular setting. Although this research design has allowed us to compare the three cases with a minimum influence of extraneous variation, its findings are contextualized. We do not know if the results generalize to a larger and more diverse population. For instance, we focused on alliances that were situated in the new venture development stage of the entrepreneurial process, where exploitative activities such as standardization and fine-tuning become increasingly important. It might be the case that value realization processes are quite different in alliances that are situated in other stages. For instance, we expect that the original inventor of the technology might play a much more vital role in realizing value in alliances that are situated in the experimental stage of the entrepreneurial process, where explorative activities such as fundamental research and testing are dominant (Faems et al., 2006, 2008). We consequently encourage additional case studies in other contexts to fully understand the process of value realization in different kinds of interfirm settings.

We believe that this study contributes to enriching our insights into processes of value realization in interfirm settings. We trust that they stimulate other scholars to study how alliance partners combine their complementary resources in a wide variety of collaborative settings and that they help practitioners in optimizing their collaborative new venture development activities.

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References

Agarwal, R., Croson, R., Mahoney, J.T., 2010. The role of incentives and communication in strategic alliances: an experimental investigation. Strategic Management Journal 31 (4), 413–437.
Ahuja, G., Lampert, C.M., 2001. Entrepreneurship in the large corporation: a longitudinal study of how established firms create breakthrough inventions. Strategic Management Journal 22, 521–543.
Alvarez, S.A., Barney, J.B., 2001. How entrepreneurial firms can benefit from alliances with large partners. Academy of Management Executive 15, 139–148.
Ancona, D.G., Caldwell, D.F., 1992. Bridging the boundary: external activity and performance in organizational teams. Administrative Science Quarterly 37, 634–655.
Anderson, S.W., Dekker, H.C., 2005. Management control for market transactions: the relation between transaction characteristics, incomplete contract design, and subsequent performance. Management Science 51, 1734–1752.
Bajeux-Besnainou, I., Joshi, S., Vonortas, N., 2010. Uncertainty, networks and real options. Journal of Economic Behavior & Organization 75 (3), 523–541.
Bell, J., den Ouden, B., Ziggers, G.W., 2006. Dynamics of cooperation: at the brink of irrelevance. Journal of Management Studies 43, 1607–1619.
Bierly III, P.E., Coombs, J.E., 2004. Equity alliances, stages of product development, and alliance instability. Journal of Engineering and Technology Management 21, 191–214.
Birkinshaw, J., Bresman, H., Hakanson, L., 2000. Managing the post-acquisition integration process: how the human integration and task integration processes interact to foster value creation. Journal of Management Studies 37, 395–425.
Burgelman, R.A., Sayles, L.R., 1986. Inside Corporate Innovation. The Free Press, New York.
Burgers, J.H., Jansen, J.J.P., Van den Bosch, F.A.J., Volberda, H.W., 2009. Structural differentiation and corporate venturing: the moderating role of formal and informal integration mechanisms. Journal of Business Venturing 24, 206–220.
Chang, K., Gotcher, D.F., 2007. Safeguarding investments and creation of transaction value in asymmetric international subcontracting relationships: the role of relationship learning and relational capital. Journal of World Business 42, 477–488.
Christensen, C.M., Overdorf, M., 2000. Meeting the challenge of disruptive change. Harvard Business Review 78, 66–76.
Collins, J.D., Hitt, M.A., 2006. Leveraging tacit knowledge in alliances: the importance of using relational capabilities to build and leverage relational capital. Journal of Engineering and Technology Management 23, 147–167.
Dekker, H.C., 2004. Control of inter-organizational relationships: evidence on appropriation concerns and coordination requirements. Accounting Organizations and Society 29, 27–49.
Dodgson, M., 1993. Technological Collaboration in Industry: Strategy, Policy and Internationalization in Innovation. Routledge, London.
Doz, Y.L., 1996. The evolution of cooperation in strategic alliances: initial conditions or learning processes? Strategic Management Journal 17, 55–83.
Doz, Y.L., 1988. Technology partnerships between larger and smaller firms: some critical issues. In: Contractor, F.J., Lorange, P. (Eds.), Cooperative Strategies in International Business. Lexington Books, New York.
Doz, Y., Williamson, P., 2002. Alliances as entrepreneurship accelerators. In: Contractor, F.J., Lorange, P. (Eds.), Cooperative Strategies and Alliances. Pergamon, Amsterdam.
Dunne, D.D., Gopalakrishnan, S., Scillitoe, J.L., 2009. An empirical study of the impact of firm resources on alliance governance structures. Journal of Engineering and Technology Management 26, 181–195.
Dyer, J., 1997. Effective interfirm collaboration: how firms minimize transaction costs and maximize transaction value. Strategic Management Journal 17, 535–556.
Dyer, J.H., Singh, H., 1998. The relational view: cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review 23 (4), 660–679.
Eisenhardt, K.M., 1989. Building theories from case study research. Academy of Management Review 14, 532–550.
Eisenhardt, K.M., Graebner, M.E., 2007. Theory building from cases: opportunities and challenges. Academy of Management Journal 50, 25–32.
Faems, D., Janssens, M., Bouwen, R., Van Looy, B., 2006. Governing explorative R&D alliances: searching for effective strategies. Management Revue 17, 9–29.
Faems, D., Janssens, M., Madhok, A., Van Looy, B., 2008. Toward an integrative perspective on alliance governance: connecting contract design, trust dynamics, and contract application. Academy of Management Journal 51 (6), 1053–1078.
Faems, D., Janssens, M., van Looy, B., 2007. The initiation and evolution of interfirm knowledge transfer in R&D relationships. Organization Studies 28 (11), 1699–1728.
Ferguson, R.J., Paulin, M., Bergeron, J., 2005. Contractual governance, relational governance, and the performance of interfirm service exchanges: the influence of boundary-spanner closeness. Journal of the Academy of Marketing Science 33, 217–234.
Hagedoorn, J., 2002. Inter-firm R&D partnerships: an overview of major trends and patterns since 1960. Research Policy 31, 477–492.
Hennart, J-F., 2006. Alliance research: less is more. Journal of Management Studies 43, 1621–1628.
Hill, S.A., Birkinshaw, J., 2008. Strategy-organization configurations in corporate venture units: impact on performance and survival. Journal of Business Venturing 23, 423–444.
Kalaignanam, K., Shankar, V., Varadarajan, R., 2007. Asymmetric new product development alliances: win–win or win–lose partnerships? Management Science 53, 357–374.
Kang, M., Mahoney, J.T., Tan, D., 2009. Why firms make unilateral investments specific to other firms: the case of OEM suppliers. Strategic Management Journal 30, 117–135.
Kazanjian, R.K., Drazin, R., 1990. A stage-contingent model of design and growth for technology based new ventures. Journal of Business Venturing 5, 137–150.
Kvale, S., 1996. InterViews: An Introduction to Qualitative Research Interviewing. Sage Publications, London.
Langley, A., 1999. Strategies for theorizing from process data. Academy of Management Review 24, 691–710.

Leonard-Barton, D., 1990. A dual methodology for case studies: synergistic use of a longitudinal single site with replicated multiple studies. Organization Science 1, 248–266.
Leonard-Barton, D., 1992. Core capabilities and core rigidities: a paradox in managing new product development. Strategic Management Journal 13, 111–125.
Levinthal, D.A., March, J.G., 1993. The myopia of learning. Strategic Management Journal 14, 95–112.
Madhok, A., 1995. Revisiting multinational firms' tolerance for joint ventures: a trust-based approach. Journal of International Business Studies 26, 117–137.
Madhok, A., 2000. Interfirm collaboration: contractual and capabilities-based perspectives. In: Foss, N., Mahnke, V. (Eds.), Governance, Competence and Entrepreneurship. OUP, Oxford.
Madhok, A., Tallman, S.B., 1998. Resources, transactions and rents: managing value through interfirm collaborative relationships. Organization Science 9, 326–339.
March, J.G., 1991. Exploration and exploitation in organizational learning. Organization Science 2, 71–88.
Minshall, T., Mortara, L., Valli, R., Probert, D., 2010. Making asymmetric partnerships work. Research-Technology Management 53, 53–63.
Narula, R., 2004. R&D collaboration by SMEs: new opportunities and limitations in the face of globalisation. Technovation 24, 153–161.
Oxley, J.E., 1997. Appropriability hazards and governance in strategic alliances: a transaction cost approach. Journal of Law, Economics, and Organization 13, 387–409.
Parkhe, A., 1993a. Strategic alliances structuring: a game theoretic and transaction cost examination of interfirm cooperation. Academy of Management Journal 36, 794–829.
Parkhe, A., 1993b. Messy research, methodological predispositions, and theory development in international joint ventures. Academy of Management Review 18, 227–268.
Pentland, B.T., 1999. Building process theory with narrative: from description to explanation. Academy of Management Review 24, 711–724.
Pettigrew, A.M., 1990. Longitudinal field research on change: theory and practice. Organization Science 1, 267–292.
Poole, M.S., Van De Ven, A.H., Dooley, K., Holmes, M.E., 2000. Organizational Change and Innovation Processes: Theory and Methods for Research. Oxford University Press, Oxford.
Reuer, J.J., Ariño, A., 2007. Strategic alliance contracts: dimensions and determinants of contractual complexity. Strategic Management Journal 28, 313–330.
Ring, P.S., Van De Ven, A.H., 1994. Developmental processes of cooperative interorganizational relationships. Academy of Management Review 19, 90–118.
Roberts, E., Fusfeld, A., 1982. Critical functions: needed roles in the innovation process. In: Katz, R. (Ed.), Career Issues in Human Resource Management. Prentice-Hall, Englewood Cliffs, NJ, pp. 182–207.
Rothaermel, F.T., Deeds, D.L., 2004. Exploration and exploitation alliances in biotechnology: a system of new product development. Strategic Management Journal 25, 201–221.
Sadowski, B., Duysters, G., 2008. Strategic technology alliance termination: an empirical investigation. Journal of Engineering and Technology Management 25, 305–320.
Salk, J.E., 2005. Often called for but rarely chosen: alliance research that directly studies process. European Management Reveiw 2, 117–122.
Sampson, R.C., 2004. Organizational choice in R&D alliances: knowledge-based and transaction cost perspectives. Managerial and Decision Economics 25, 421–436.
Sawers, J.L., Pretorius, M.W., Oerlemans, L.A.G., 2008. Safeguarding SMEs dynamic capabilities in technology innovative SME-large company partnerships in South Africa. Technovation 28, 171–182.
Schildt, H.A., Maula, M.V.J., Keil, T., 2005. Explorative and exploitative learning from external coporate ventures. Entrepreneurship Theory and Practise 29, 493–515.
Slowinski, G., Seelig, G., Hull, F., 1996. Managing technology-based strategic alliances between large and small firms. SAM Advanced Management Journal (Spring), 42–47.
Stuart, T.E., Hoang, H., Hybels, R.C., 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. Administrative Science Quarterly 44, 315–349.
Teece, D.J., 1986. Profiting from technological innovation: implications for integration, collaboration, licensing and public policy. Research Policy 15, 285–305.
Van Looy, B., Debackere, K., Bouwen, R., 2001. Innovation as a community-spanning process. In: Garud, R., Karnoe, P. (Eds.), Path Dependence and Creation. LEA Publishers, NJ.
Vanhaverbeke, W., Peeters, N., 2005. Embracing innovation as strategy: corporate venturing, competence building and corporate strategy making. Creativity and Innovation Management 14, 246–257.
Vassolo, R., Anand, J., Folta, T., 2004. Non-additivity in portfolios of exploration activities: a real options-based analysis of equity alliances in biotechnology. Strategic Management Journal 25 (11), 1045–1061.
Williamson, O.E., 1991. Comparative economic organization: the analysis of discrete structural alternatives. Administrative Science Quarterly 36, 269–296.
Yin, R.K., 1984. Case Study Research: Designs and Methods. Sage, London.
Zajac, E.J., Olsen, C.P., 1993. From transaction cost to transactional value analysis: implications for the study of interorganizational strategies. Journal of Management Studies 30, 131–145.