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Failure sources in R&D consortia: the case of mobile service development

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Abstract: This study reveals the processes through which firms can cope with sources of failure in R&D consortia in emerging high-tech markets. We use a single case design, focusing on mobile service development to investigate the value-creating and value-dissipating activities in a R&D consortium. We collected longitudinal data on the collaborative processes in the alliance through semi-structured interviews, observations and archival researches for over 24 months. The findings suggest that R&D consortia increase the chances of success, when diverging interest can be mitigated, cognition can be aligned and agreement on time preferences can be reached. We also find that if attempts to manage such challenges are ill-timed in the process phases of strategic imagination, common ground development, coordinating contributions and performance, the success of R&D consortia is called into question, because the participants maximise their private benefits at the expense of the common ones. We conclude with managerial implications, which suggest a simple, yet integrative framework for managing R&D consortia in the context of service development, and offer fruitful future research avenues.

Keywords: alliance process; innovation; R&D consortia.

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1   Introduction

In emerging high-tech markets, such as mobile telecommunication services, a single firm strategy might be unfeasible due to the lack of technological capabilities, market power

and limited willingness to bear service development risks. When NTT-DoCoMo, a leading Japanese telecommunication operator introduced its I-mode services, it benefited from financial backing and a large market share as an incumbent player in the Japanese market. Both factors eased the process to synchronise the alliance partners' efforts in terms of timing, incentives and capabilities to deliver the required service components including appropriate handsets, media content and software applications. Today, most of the European telecommunication operators are not in such a comfortable position. Many mobile operators have relatively low market power. They are burdened with debts from acquisitions of UMTS licences[1], and they face intense competition due to de-regulation. When attempting to develop and introduce mobile services, they cannot simply force the suppliers of mobile handsets and media content to deliver according to their strategic specification. Thus, R&D consortia are increasingly common in managing innovation in emerging markets for mobile telecommunication services.

Firms participate in such alliances to speed up learning, co-develop services and prepare strategic responses to the changing market conditions and technologies (Powell, 1990). In particular, when pursuing radical innovation (e.g. where new services fit easily neither to current processes nor to firm values) firms seek to tap into partner networks to mobilise complementary capabilities and co-develop new capabilities (Christensen, Verlinden and Westerman, 2002). However, managing R&D consortia require a close attention to collective-action problems, such as the alignment of interests, developing common understanding and synchronisation of time preferences. Unless those problems are addressed in the management of the alliance process, participating in them might compromise the learning speed and strategic prospects of partners (Eisenhardt and Schoonhoven, 1996), and accordingly, lead to dissatisfaction with alliance outcomes (Bleek and Ernst, 1991; Kogut, 1988; Park and Ungson, 2001).

While the literature on strategic alliances is large, only a few studies have focused on the understanding of:

1   The processes by which R&D consortia are build and preserved (Larson, 1992).

2   The influence of repeated interaction between partners in this process (Ring and Van de Ven, 1994).

3   The conditions fostering and blocking inter-firm learning and cooperation for service development (Doz, 1996).

Although these contributions have advanced our understanding of various aspects of the alliance development process, current knowledge about how to manage the alliance process remains limited in three important respects, which are as follows:

1   There is still little empirical evidence on the dynamic aspects of collaboration in general and failure sources in particular (Yan and Gray, 1994; Ariño and de la Torre, 1998). Research on alliances is dominated by deductive theory testing studies, based on secondary data, providing few inductive theory generating studies to elucidate collaborative dynamics (Bettis, 1991; Parkhe, 1993a). This leaves questions concerning when and how to deal with collaborative challenges, which are relatively unexplored.

2   Most of the alliance process researches have been generated in stable and mature environments (Oliver, 1990; Reuer and Koza, 2000; Santos and Eisenhardt, 2002). Yet, much alliance activity takes place in dynamic high-tech settings (Hagedoorn,

1993), where alliances form for various reasons and operate under different conditions.

3   Extant qualitative empirical evidence has been largely confined to two partner alliances. However, R&D consortia exhibit particular complications and have increased in popularity and importance over the last decade (Doz and Hamel, 1998; Gomes-Casseres, 1994; Zeng and Chen, 2003).

Compared to the dyadic alliances, a partner in the multi-firm situation will feel less guilt towards any particular partner, when not cooperating (Alchian and Demsetz, 1972). Also, non-cooperative behaviour is more difficult to detect in R&D consortia and a firm's opportunities to shape the partner's behaviour through the choice of actions are diluted. As a result, firms in R&D consortia have a stronger incentive to defect (Parkhe, 1993b; Zeng and Chen, 2003).

This paper focuses on revealing *how* value is created and *why* value may dissipate in the process of managing innovation in R&D consortia in the emerging high-tech markets. Given the limited number of earlier studies on the dynamics of multi-firm allying, we conducted a single case study, focused on the value creating and dissipating processes in a six-partner alliance in the Danish mobile internet service market. We observed that the alliance had to deal with three crucial management challenges:

1   aligning cognitions

2   managing conflict of interest

3   managing timing of contributions.

The alliance also went through discernable phases, which we label as strategic visioning, common-ground development, coordinating-contribution and performing. In each of these phases, we identify key problems, and show when and how they need to be addressed.

The paper proceeds as follows:

1   We introduce our methodological approach and data sources.

2   We present our results focusing on the managerial challenges, which the participants in a R&D consortium have to deal with.

3   We link the challenges to the process phases and suggest when in the overall process the challenges are best addressed.

4   We develop managerial implications and based on the limitations of our study, we conclude with the beneficial paths for future research.

2   Methodology and data

We use a single case study as the research design. We followed a six-partner R&D consortium for 2 years (2003–2005) to develop insights on value creation and value dissipation processes of R&D consortia. The purpose of the alliance was to develop, analyse and offer practical guidelines on the design and implementation of location-, situation- and time-sensitive mobile services. Following a new service development alliance in the market for mobile services allowed us to focus on the inter-firm

collaboration in an emerging high-tech market, where service development is primal for firm performance (Brown and Eisenhardt, 1995). The mobile internet service market emerged in the late 1990s as technological developments in carrier technologies, which made the provision of advanced mobile data services possible. Carrier technologies have evolved through their first, second and third generations in many countries across the globe. While the first and second generations were mainly used for voice and simple data services, the 2.5G technology enabled provision of data-intensive services, and 3G increased the bandwidth and speed in service provisioning. These technological developments have generated significant inter-firm dependence as firms from hitherto separate industries, such as network operators, handset manufactures, content providers and infrastructure providers must be involved in service provisioning. As the competitive situation in mobile telecommunication is new and unique, we took an explorative approach (Yin, 1989) concentrating on the theory development in favour of theory testing (see Parkhe, 1993a). We applied the traditional Grounded Theory method, in which the researcher addresses the subject theoretically empty-handed (Glaser and Strauss, 1967).

Data was collected from several sources. First, we conducted a field study, using 12 semi-structured interviews for over 12 months with six managers from different partners in the consortium. These managers were the key responsible persons in the involved organisations and the ones that participated in the consortium meetings. The partners included each one in handset manufacture, infrastructure provider, network operation and three content providers varying in size and international scope (see Table 1). The managers interviewed, represented different divisions of their firms: the manager from the handset manufacturing firm represented a new venturing division, the manager from the network operator represented its external relations division, the manager from the infrastructure provider represented an international business development division and the managers from the content providing organisations represented an IT department, an IT and mobile initiatives project group and a content specific project group focused on new media platforms, respectively. The interviews were semi-structured and lasted for 60–90 minutes. The focus of the interviews was the person's own factual experience with the alliance, the rationale for their firm's participation, the evolution of their involvement and commitment and their perception of the interaction with the other partners.

Second, we attended company presentations of 120 minutes by each partner, set up at the initiation of the alliance to provide the partners a better understanding of the involved organisations.

Third, we participated in the monthly meetings with all the partners, lasting for 120–180 minutes. The general purpose of the meetings was to discuss relevant partner activities, the status of the alliance activities, in which direction the partners wished to proceed and how. Both the interviews and the monthly meetings were recorded on video and transcribed subsequently. In addition, we participated in informal socialising events organised by the alliance members.

Finally, we were added to the alliance mailing list and obtained access to all project documents. This triangulation of various data sources strengthens the robustness of our findings. Table 2 provides an overview of the primary data sources.

Three researchers participated in collecting and coding data, hence minimising subjective biases. As is typical in inductive research, we analysed the data by first synthesising the interviews, the alliance meeting transcripts and archival data, and constructing the individual case study (Eisenhardt, 1989). To further validate the interpretation, this was presented to the alliance partners allowing us to confirm our

results and discuss causal links between different collaborative processes and the widening or narrowing of the gap between the potential and realised value. In contrast to most of the other studies (e.g. Bleek and Ernst, 1991; Geringer and Herbert, 1991), we not only asked the alliance managers about their perception of the alliance development processes and the associated challenges after the alliance, but also investigated the issues while the processes were taking place. The combination of real time longitudinal data and multiple retrospective data sources allowed a stronger analysis and increased the internal and external validity (Leonard-Barton, 1990).

Table 1   Descriptions of the alliance partners

	Alfa	*Beta*	*Gamma*	*Delta*	*Epsilon*	*Zeta*
Line of business	Mobile terminals, telecom networks,	IT infrastructure, hardware	Telecom network operator	Radio, TV, internet content	Newspaper content	Consumer information
Number of employees	51.000	141.000	18.000	3.500	100	100
International diversity	Worldwide	Worldwide	Europe	Denmark	Denmark	Denmark
Impact of the Mobile Internet Services (MIS)	Facilitating use of MIS requires new capabilities	Supporting and developing MIS requires new capabilities	Providing MIS constitutes a new sub-segment	Offering MIS constitutes a new market	Offering MIS constitutes a new market	Offering MIS constitutes a new market
Competitive position	Market leader globally	Market leader globally	Market leader locally	Market leader locally	Market leader locally	Market leader locally
Division of involved manager in alliance and interviews	New ventures division	International business development division	External relations division	New media platforms group	IT and mobile initiatives group	IT department
Number of interviews	2	2	2	2	2	2

Table 2   Primary data sources

Data type	Number	Total time	Dates
Interviews	12	720–1080 minutes	April 2003–April 2004
Partner company presentations	6	720 minutes	February 2003–April 2003
Project meetings	20	3000 minutes	February 2003–February 2005
Presentations by potential partners	4	360–480 minutes	July 2003–November 2004

3   Managerial challenges in R&D consortia

Throughout the service development process we observed that the alliance had to deal with three crucial management challenges:

1   managing conflict of interest

2   alignment of cognition

3   managing timing of contributions.

3.1   Managing conflict of interest

The explicit goal of the R&D consortium we studied was broadly defined as "to develop, analyse and offer practical guidelines on the design and implementation of location-, situation- and time-sensitive services". Although this goal was generally supported by all the partners, each partner also had individual interests in joining the alliance. These varied from explorative interests, such as 'an opportunity to learn about content delivery and the market in general', 'develop our business through exploring opportunities' and 'trial for testing new product features' to more exploitative motivations 'identify a business model for commercialisation', 'serve our existing customers' and 'improve communication in the value chain'. While no partner had interests in conflict with the collective aim, there were collaborative challenges that made collective-action difficult. Some managers were concerned that they would carry the costs of interface specification and standardisation and that their competitors hereafter would simply be able to introduce their services at lower costs. Other partners did not share these concerns.

These differences in interests also reflected that the alliance activities represented different stages in the partners' core-industry life-cycles. The technology partners had been generally offering mobile voice services and basic data services for several years and although technological developments allowed for introducing novel services, they did not create a new market completely. For the content providers, the changes were more severe as mobile business constituted a separate technological sub-field and a new business area. As a consequence, the technology partners were most familiar with the mobile telecommunication market and had relatively specific interests. They shared a similar business understanding and vocabulary and could discuss the use of various technologies, the setup of interfaces and the technical specifications. In contrast, the content providers had limited experience with the activities of the alliance and expressed much broader interests. They had difficulties in internalising knowledge from the alliance activities, as they did not understand the technical specifications of the new technologies and their potential implications for their value propositions. Hence, despite the agreement on a common goal, the content partners were initially primarily interested in learning before doing, whereas the technology partners were interested in learning by doing.

3.2   Alignment of cognition

The partners expressed frustration with the low level of knowledge sharing in the alliance. The manager from Alfa explained: "When people participate in group discussions, they are sometimes outside their knowledge area and the discussion gets very confusing". The alliance was split into sub-groups to enable better communication.

All partners agreed that splitting up the alliance was helpful in bringing the project forward and expressed enthusiasm about the increased knowledge sharing in the sub-groups. Yet, firms grouping together were the firms that shared the same level of specification of objectives and operated in relatively related businesses, which created a false assurance of mutual understanding. Although the knowledge generated in the sub-groups was presented at the project meeting, differences in firms' relative absorptive capacity in the specific domain resulted in collaborative problems. It was implicitly assumed that a group could individually produce outputs and subsequently transfer these to the other group. Yet, both the complications of producing new knowledge and the ability to transfer knowledge across the groups were underestimated. The manager from Delta stated:

> "When you represent a content providing company you perceive content as very complex to work with, whereas working with technology appears rather easy. We show a lack of respect and understanding for the complexity of each partner's domain".

Similarly, the manager of Zeta mentioned that it appeared very abstract just to prepare and define services on a piece of paper and that he and his co-workers would benefit greatly if the technical partners helped them through the process. Yet, the technology firms had little appreciation for these perspectives. The manager from Alfa commented:

> "It is not the technical details that should be of interest to the content providers. Maybe they would like to know these, but the important thing is to design the services and them being aware of what it takes for them to deliver these services".

Likewise, the manager in Beta explained that he was hesitant to push the technology to the content providers, as it would interfere with what they should actually focus on.

On one hand, the technology firms felt that they had provided sufficient input to the content group among other things through presentations of the system architecture at project meetings, but that they did not get anything in return.

The content group, on the other hand, often felt like outsiders at project meetings, because they did not comprehend the technical terms and the implications for the development of their firm specific mobile services. The manager from Zeta noted:

> "I'm not updated on what the other partners are doing and it is difficult to see how the individual partners actually push this project forward and how they are sharing experiences from their own company with partners".

These issues led to frustration for all partners with implications for their individual input-output relations in knowledge sharing processes. While content providers felt sidelined in the discussions and withheld contributions, technology providers blamed them for their passive stance.

3.3   Managing timing of contributions

Even though market entry decisions for the new services were not of immediate concern for the alliance, the different timing preferences of the partners quickly surfaced. The partners differed substantially in their perceptions of the temporal dimensions both across and within the content and technology groups. Some firms wanted to follow late-mover strategies, as the statement from the manager in Delta illustrates:

> "Rich media services are very complex to deliver and you have to be sure about what will work and not. We do not have to be first-movers. We know how difficult it is to introduce new services and it is not very important to be first".

The manager further explained that Delta had not been first moving in the internet arena either but was able to catch up easily. Other partners wanted to be able to move fast. The manager from Epsilon stated:

> "We do not aim at being the leading company in this field, but we don't want competitors to move beyond us. So if a competitor launches a service we want to be able to move fast. We have tried to be the first to market but that did not pay off ".

Finally, others found it important to be in the forefront of their market. The manager of Zeta explained: "We are progressive in terms of delivering content to new media and we will be the first mover, when it comes to delivering consumer information through mobile services".

4 Managerial challenges across process phases

The alliance went through discernable phases, which we have retrospectively labelled as strategic visioning, common-ground development, coordinating contribution and performing. In each of these phases, key problems and challenges as described above occurred (see Table 3).

4.1 Strategic visioning

Strategic visioning took place in the first phase of the alliance process. Alliance partners were engaged in generating new ideas, creating awareness of possible futures and developing new intentions towards markets opportunities. Collective imagination was facilitated by brainstorming sessions, emphasising the role of energising diverse voices from the different partners with different knowledge and skills, to take part in idea generation for future value creation.

The differential interests described above, however, were not explicitly expressed *ex ante* and a common understanding of what each partner wanted to derive from the collaboration did not develop. The results were lengthy meetings, where partners often left uncertain about what they could expect from the others and what was expected from them before the next meeting. The general opinion was that there was "too much discussion around but not about where the collaboration was going and what needed to be done" as expressed by the manager from Epsilon. The different prioritisation of the partners created confusion about what would be the focus of the project and whether partners were actually working on the project to the extent that their official commitment signified. Manager from Delta stated:

> "I am unsure about what for instance Beta and Gamma are doing. We need to know whether we are moving in the same direction or not …I don't know if the other partners have changed their goals or if they are still interested in the same thing".

Table 3   Alliance development phases and the value creating and dissipating processes

	Phase 1 Strategic visioning	*Phase 2 Creating common ground*	*Phase 3 Coordinating contribution*	*Phase 4 Performing*
Value dissipating factors	Early interest specification and hidden conflict	Large knowledge gaps between partners	Heterogeneity in timing of entry preferences	Failure of a firm in delivering upon expectation
Antecedents for value dissipating factors	Different value appropriation opportunities; Different degree of initial market knowledge	Different knowledge bases of partners from unrelated industries	Different first-mover (dis)-advantages; Different time spans; Different risk preferences cannot be abridged	Interdependence among R&D outputs combined with reliance on single partners for central R&D
Resulting value dissipating processes	Communication problems and associated confusion; Commitment concerns due to distrust	Knowledge transfer and utilisation problems; Impact on initial input-output plans	Divergence in temporal resource commitments and associated frustration	Coordination problems and associated inefficient resource use and investments; exit of key player
Impact	Project delays because of lacking shared vision; conflicting interest dominated the discussions	Ineffective communication because of too large knowledge gaps; mis-understanding leads to conflict	Disagreements on sub-project milestones lead to delays; lacking clear responsibilities for sub-project integration leads to slow down of project progress	Players seek private benefits in dual setting and threaten the overall project success

Whereas partners obviously had different interests, none of them found that troubling prima facie. The manager from Gamma commented:

> "I think it is good that we have different motivations and bring different perspectives into the project. It just means that we have to spend more time addressing these and structuring the project".

Hence, the problem was not that interest conflicts led partners not to comply with the agreement or behave opportunistically. Rather, the lack of conflict prevented efficient collaboration towards reaching the specified goal. When the partners were not aware of each other's motivational differences, the associated problems were not confronted and eliminated, but continued to exist and sometimes grew in hidden form. As a result, imaginations about possible futures remained in the abstract and the direction for the consortium's strategic agenda and commitment for concrete contributions remained elusive.

4.2   Common ground development

Creating common ground was the aim of the second phase of the alliance process. This phase was signified by investments to share language and experience and to agree on an

agenda including a project portfolio of sub-projects. On a high level, the alliance was divided into a technology group and a content group with three firms in each to increase focus and facilitate the cognitive alignment. The alliance partners, however, lacked the common knowledge of each others' ability to contribute to various tasks, because the knowledge required to move towards the collaborative goal was dispersed and difficult to explicate. Manager from Alfa commented:

> "I think we still need to develop a better understanding of what skills each partner actually brings into the project. There may be skill gaps and we may have to bring in other partners but we need to learn about each other to identify such needs".

The problem was not that the partners were unwilling or generally unable to transfer knowledge across firm boundaries, as knowledge was successfully transferred across firm boundaries in both the content and the technology group. Manager in Delta stated:

> "In the content group we have been sharing our experiences in a free and friendly mode. That is more difficult with all the partners. I don't know what is going on in the technology group and what they are putting into the project now?".

On behalf of the technology group, the manager in Gamma similarly explained: "We have very open and intense meetings in the technology group and we all feel that now we can really do something". Even though the two sub-groups were progressing, most of the managers remained uncertain about what resources and capabilities, each alliance partner actually had and intended to bring into the service development efforts. However, the partners had been relatively clear on what tasks they regarded, as outside their scope of involvement, which led to a common understanding of two issues that needed to be addressed.

1 It was necessary to bridge the communication problems between the content and the technology firms.

2 Responsibility had to be allocated for necessary tasks, for which none of the partners planned to assume responsibility.

The interest differences combined with a lack of common understanding caused ineffective communication and collaboration. A manager from Delta stated:

> "I am unsure about what for instance firm Beta and Gamma are doing. We need to know whether we are moving in the same direction or not …. I don't know if the other partners have changed their goals or if they are still interested in the same thing".

This led the partners to arrange an extraordinary meeting to address the issue. As a result of this meeting, a project document was developed that should create common knowledge of the challenges for all sectors involved in mobile business and hereby improve the inter-partner understanding in the alliance. Also, in order to explicate short-term and long-term alliance objectives, the technology and content groups made explicit in a project definition, what they expected from the alliance, based on the level of resource commitments. These measures were successful in establishing a common understanding of the interest differences. While most managers considered the presence of various goals beneficial, they had joined the alliance with little understanding of the complications of entering a business development alliance with multiple partners.

Manager from Beta commented: "In hindsight we should have expected the difficulties. In other more typical projects we are only working with one partner and we have a predefined narrow aim. This is very different".

4.3   Coordinating contributions

To translate ideas into realities, the alliance engaged in action planning through defining concrete projects. The aim was to develop specific sub-project plans, timelines and responsibility. These plans were intended to cover aspects of required knowledge development, investment plans. Two of the most serious problems in building a coherent project portfolio were disagreement on the required timing of sub-project milestones and unclear responsibilities for integration tasks across project results.

The partly hidden variations in the strategic aspirations and timing preference turned out to be a severe process barrier. The partners' time preferences ranging from being first-movers and fast-follower to being a late entrant, had implications for the collaborative work processes. Quality and novelty of services was important to all partners, but some emphasised quality and reliability over novelty and innovative reputation. Others expressed concern that the market would surpass the otherwise timely alliance initiative, if they did not move ahead more quickly. The different temporal preferences resulted in some partners contributing more actively than others. This was reflected in the regularity of the project meeting participation, the propensity to send replacements if the key manager could not participate, the timely completion of agreed tasks, etc. In addition, the partners that did not perceive the need to be the first to market as vital often took most time for decision-making. Whether this was due to their entry timing preferences or other elements, such as a bureaucratic decision-making in parent organisation or lack of capabilities was difficult to assess but caused other partners to be dissatisfied with the work progress. Finally, the firms expressed different perceptions of what was needed to move forward. The managers from Epsilon and Zeta mentioned that sometimes the content partners felt ready to take the next step but then some technical system was missing. Similar, problems were advanced from technology managers, who often stated that all they needed to proceed was some content services. For the partners emphasising speed, this indicated that some were waiting for others to move because they could afford to do so rather than driving the progress themselves. All these difficulties of moving ahead caused frustration for the firms that saw novelty and speed to market as important. This created a negative feedback loop as the lack of progress was de-motivating for all partners. The manager from Epsilon noted: "Spending a lot of time on the project is a waste of time when you don't know where you are going and when".

4.4   Performing

To address the critical issues, the manager from Epsilon suggested bringing in a content aggregator as an additional partner. The rationale was that, such a firm would have experience working with both technology and content firms and therefore could reduce communication problems. Moreover, none of the partners had planned to take on the task of aggregating content from the content partners and preparing it in the appropriate technical formats. Hereafter a content aggregator was approached. Although the aggregator was not immediately offered inclusion in the alliance, primarily due to complexities around input and output requirements, an agreement was reached that a

close collaboration should be initiated. The aggregator's subsequent participation in the development efforts, allowed the discussions at the project meetings to be more concrete. For instance, the requirements put up by the content aggregator for interface specification and service functionalities enabled the partners to engage in very specific discussions about their contributions. The different preferences for the time pace caused much discussion and frustration. However, little concrete action was taken to reduce the problem. None of the partners could force the other partners to perform specific tasks at certain times. Interestingly, many partners suggested that the problem could be reduced through more hierarchical governance and leadership, but they all agreed that the costs of such a change would exceed the benefits. Manager from Beta argued:

> "This project is interesting because it is open and flat. Each partner can influence the agenda and that is an interesting and challenging way of working. It is up to the individual partners to put forth their agendas and we do not want to loose this element".

Other managers argued that introducing a more hierarchical structure could reduce the alliance's ability to benefit from the diversity of the partners.

Despite the differences in temporal preferences, the firms began to coordinate their development efforts. The content group began to meet more often, working on specifying what kind of services they intended to offer, which context-dependent variables they would emphasise and what kind of functionalities they would require. Likewise, the technology group increased the frequency of their meetings, where they addressed technological needs and potential complications related to the system architecture. While some work activities were conducted in collaboration, other inputs were to be delivered by individual partners. Some partners were simply expected to deliver existing technologies or assets and integrate these with technologies and assets of other partners, whereas others had significant development efforts ahead, in order to deliver their part. Most importantly the development efforts of some partners depended on the prior development efforts of other partners. Most important in this respect was the development of a standardised mobile platform for distribution of context dependent services and information on mobile terminals.

Alfa had assumed the sole responsibility of developing the platform, which was scheduled to be completed in six month, after the work process began. Yet, Alfa announced a three-month delay, but mentioned that new features would be added when the platform was ready. However, the development was delayed again by 3 months. The missing platform, delayed the development of other elements due to the projected web of inter-relations between the platform, potential future services and the technical infrastructure. The content partners were not able to develop services, because they had little understanding of the platform's characteristics as many elements remained undefined and they had very limited knowledge about mobile platform features in general. Beyond the difficulties of developing their services, the content partners also reduced their enthusiasm about the collaboration. Manager in Delta noted:

> "We lack some motivation due to the fact that we have been missing the technology a-ha experiences showing what we actually can do. We have been waiting a long time for the platform".

Alfa acknowledged that much depended on the development of the platform, but continued to underscore the strength of the platform when it would be ready and tried to introduce other issues that the alliance could work on until then. The manager commented:

> "I expect that the availability of the platform will spur a lot more activities. However, this means that we have to be specific about the analyses we will like to run".

Yet, partners began to be more reluctant to put in efforts before the platform could be seen and tested. Manager from Epsilon stated:

> "It is disappointing that we have not seen this platform yet. The launch of it has been announced again and again and again… And the whole project is based on this. There has not been an overall willingness to explicitly accept this in the project. I'm disappointed about what we concretely have accomplished".

After a number of announced delays Alfa at one point declared that it would suspend its development of the platform for financial reasons.

The announced delays of the platform were initially accepted by all partners as 'part of the game'. However, as the delays continued, partners began asking continuously about when it would be ready and complaining that the project could not move forward before. Still, the responsibility and development efforts remained exclusively with Alfa. The manager of Beta mentioned that when Beta cooperated with another firm, it was typically clear what each partner should produce in a specific time period and they would ensure that this was produced or they would be compensated accordingly. However, in this particular alliance "the opportunity and incentive to punish and reward is somehow diluted" as he expressed. When Alfa suspended the development efforts, it caused immediate disappointment but also a subsequent relief, as it allowed the partners to search for other opportunities. Some partners had already started looking for alternatives and found that the content aggregator, which the alliance collaborated with, had a mobile platform with different functionalities but it was running. The partners, including Alfa, quickly decided to proceed with the available platform. The content aggregator's platform was easy to install on the handset manufacture's terminals and it was likewise relatively uncomplicated to put the technical set-up in place. Hereafter, basic services could be offered on a test basis. This enabled the partners to engage in co-development that improved certain functionalities of the platform and allowed for more advanced services.

From the beginning, the platform was introduced as a unique and central element of the service development efforts and became deterministic by defining how the alliance should succeed and the sequence of carrying out tasks in the alliance. Yet, this deterministic reliance on a particular development effort slowed down the progress of the alliance. In addition, the strict confidence in a single partner's willingness and ability to produce a central element in the service development process proved to be costly for the alliance. It disabled the partners to coordinate the efforts, as it blocked further progress practically and cognitively. It also affected the confidence in the commitment of Alfa and the expectations and attitudes of the partners towards the alliance as a whole. Some partners lost interest in the alliance, whereas others frustrated with the development, began looking for alternative options. Nonetheless, several participants benefited from participating in the R&D consortium. Gamma developed mobile music business model, which was launched at the end of the consortia, Delta made an individual deal with

Gamma on music rights and co-developed download options for MP3 formats, and Epsilon benefited merely from the reputation effects of participating in the high-profile alliance.

5 Discussion: coping with managerial challenges

In this section we discuss how our findings regarding the R&D consortium process contribute to the literature. We offer contributions on three main accounts, which are as follows:

First, we contribute to the alliance process literature (Doz, 1996; Larson, 1992; Ring and van de Ven, 1994) by identifying three main challenges in multiple partner inter-firm collaboration (aligning cognition, mediating conflict of interest and managing timing preferences) and by showing when in the development process each challenge is most important to manage (see Table 4). While the challenges identified above have rich linkages to the literature, they have not earlier been integrated to enable assessment of their relative importance over time, as suggested above, in our process framework. Scholars have argued that alignment of cognition is important (Reuer, Zollo and Singh, 2002), particularly in alliances involving firms from unrelated industries as such arrangements often imply cognitive diversity (Perlmutter and Heenan, 1986). While firms from different industries typically ally to share knowledge (Sakakibara, 1997) transferring knowledge between firms with different knowledge endowments may be costly (Cohen and Levinthal, 1990; Kumar and Nti, 1998; Lane and Lubatkin, 1998). At the same time, studies have shown that positive returns to alliance announcements correlate with dissimilarity of businesses (Balakrishnan and Koza, 1993; Reuer and Koza, 2000). Our findings contribute by suggesting that aligning cognition in the strategic imagination phase is of crucial importance to avoid later delays in the alliance process and to gain promises of credible resource commitment to the joint R&D activities, earlier in the process. Since attempts at aligning conflict of interest surfaced too early in the mobile service development alliance, an effective strategic imagination process was prevented. As a result, common visions on value creation remained unclear, and participants withheld resource commitment. While distributed capabilities are important for value creation through innovation in R&D consortia, unless cognition is continuously aligned, misunderstandings and haggling will result. A fruitful avenue of future research is therefore to address the question how different capabilities of alliance members can be better combined without compromising specialisation gains. The greater the cognitive differences between participants in a R&D consortium, the harder knowledge combination will become. On the other hand, cognitive differences also contribute to develop new combination possibilities in the development of innovation.

Table 4   Coping with managerial challenges at the right time

	Phase 1 Strategic visioning	*Phase 2 Creating common ground*	*Phase 3 Coordinating contribution*	*Phase 4 Performing*
Antecedents for value creation	Utilise different motivations to explore value creation opportunities	Utilise capability complementarities to enable synergies	Make timing preferences explicit to facilitate cohesion and setting priorities	Sufficient motivation and capabilities to commercialise successful R&D
Master challenges	*Align cognition*	Align cognition	Align cognition	Align cognition
	Align interest	*Align interest*	Align interest	*Align interest*
	Align timing	Align timing	*Align timing*	Align timing
Success factors	Enable strategic visioning by sharing ideas on future value added, bracket conflicting interests; ensure commitment based on shared vision	Address conflicting interests openly and directly; separate individual firm interests from consortia interests by forming sub-groups	Initiate selection process on sub-projects to be scaled up; different time preferences will show up in the selection process; work explicitly on timing preferences	Decide on trade off between common and private benefits

Second, earlier literature has furthermore recognised the importance of managing conflicting interests (Hamel, 1991; Khanna, 1998; Khanna, Gulati and Nohria, 1998). Focus has been on interest conflicts due to tension between cooperation and competition, flexibility and rigidity and short-term versus long-term orientation (Das and Teng, 2000; Zeng and Chen, 2003). Interest conflicts may arise, when firms have individual goals that diverge from the collective goal of the alliance and firms find it advantageous to maximise individual gains at the expense of the alliance (Parkhe, 1993b; Ariño and Doz, 2000; Koza and Lewin, 2000; Park and Ungson, 2001). Since firms enter R&D consortium with different interests, it is of crucial importance to address them appropriately. What is less obvious in extant literature is *when* conflicting interest should be addressed in the overall process. Confronting the conflicting interests too early will impede strategic imagination, confronting them too late will create an atmosphere of distrust, leading firms to engage in power plays, which impedes progress, creates a climate of distrust and prevents much needed knowledge sharing, when coordinating activities across sub-projects. By implication, we submit that conflicting interests are best addressed early in the stage of creating common ground. Future research might beneficially focus on the forms of conflict mediation in different phases of the alliance process. Questions, such as how do formal agreements on eventually resulting intellectual property rights influence behaviour of participants in the service development process; and, how do informal mechanisms such as trust building exercises in the project teams influence the participants perception of conflicting interest, constitute interesting research agendas.

Third, the importance of managing the timing of contributions is also well-recognised. Some firms may have short-term and other long-term orientations (Das and Teng, 2000) or they may have general differences in their risk preference positions (Chiles and

McMackin, 1996). However, the dominant explanation for why managing timing of contributions is important is that preferences for timing of market entry decision differ. Some firms may seek to enjoy first-mover advantages, such as pre-empting the market for critical resources, partners or positions; acquiring a market leader reputation; shaping buyer preferences; creating customer switching costs; realising learning curve effects; or establishing technical standards (Carpenter and Nakamoto, 1989; Lieberman and Montgomery, 1988; Lieberman and Montgomery, 1998; Makadok, 1998; Porter, 1983; Schmalensee, 1982). Other firms may afford a 'wait-and-see' approach that enables them to free-ride on first-movers investments in market development, appropriate learning, and postpone investments until technological and market uncertainties are resolved (Dasgupta, 1988; Freeman and Soete, 1997; Golder and Tellis, 1993; Mitchell, 1991; Shamsie, Phelps and Kuperman, 2004). As first-mover (dis)advantages do not materialise identically across firms and industries (Robinson, 1988; Robinson and Fornell, 1985; Schoenecker and Cooper, 1998; Song, Di Benedetto and Zhao, 1999) cross industry alliances typically involve timing tensions. This fact has been subject to little scholarly attention. We suggest that while it may be naive to assume that timing preferences will be openly revealed, they may surface in the coordinating contributions phase, when project participants integrate sub-project's milestones with the overall project's time schedules. Behaviour of participants, for example, when delaying sub-projects can be observed and linked to the causes of timing preferences. In this phase it will be crucial for managers of R&D consortia to identify causes and to isolate slow sub-projects from the overall pace of progress. A fruitful path for future research is to focus on the causes of timing behaviour in R&D consortia. Finally, while rich linkages to earlier literature exist on the nature of the specific challenges in R&D consortia, our framework integrates them and suggests when they may best be managed.

6 Conclusion

This study focused on the management of multi-firm collaboration in an emerging high-tech market. Extant process studies have focused on dyadic alliances. Yet, R&D consortia have increased in popularity and importance over the last decade (Doz and Hamel, 1998; Gomes-Casseres, 1994; Zeng and Chen, 2003) and several scholars have argued that research on R&D consortia has been sporadic and that increased focus on these is warranted (Das and Teng, 2002; Gomes-Casseres, 2003; Jones et al., 1998; Spekman et al., 1998). Multi-firm collaboration in the context of service development exhibit high output, cognitive and behavioural uncertainty and greater difficulties of specifying common goals (Evan and Olk, 1990; Ring, Doz and Olk, 2005). This results in added coordination challenges including aligning interest, cognition and timing preferences. Thus, the extent of the challenges and the importance of approaching them at the right time are more pronounced in R&D consortia. We present a framework that suggests when it is important to master particular challenges in order to cope with the failure sources of multi-firm cooperation. Beyond the theoretical implications the framework also holds important implications for management. R&D consortia increase the chances of success when cognition can be aligned, diverging interest can be mitigated; and agreement on time preferences can be reached. We also find that if attempts to manage such challenges are ill-timed in the process phases of strategic imagination, common ground development, coordinating contributions and performance,

the success of R&D consortia is jeopardised. Thus managers of R&D consortia need not only to identify specific challenges as outlined above, but they also need to address them at the right time. To enable right timing of addressing management challenges, we integrate case findings with earlier literature in a simple, yet comprehensive process framework. Utilising this framework should assist managers in reducing the gap between potential and realised value creation in multi-firm service development alliances.

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Note

[1]UMTS stands for Universal Mobile Telecommunications System.