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How are corporate ventures evaluated and selected?

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Abstract

This study provides a fine-grained analysis of the decision-making process and criteria underlying the evaluation and selection of nascent corporate ventures. By integrating a small sample case-based analysis and the examination of a longitudinal dataset comprising 14 years of archival data, it explores the selection and funding process of early-stage entrepreneurial initiatives supported by the internal corporate venture unit of a major energy company. Its findings extend prior conceptualizations of the internal venture selection process, uncovering differences in the relevance of the criteria used to evaluate ventures at different stages.

Keywords: internal venturing, stage-gate system, evaluation and selection.

Accepted manuscript.


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1. Introduction

Internal corporate venturing is a vital source of growth and diversification opportunities for established organizations (Bhardwaj et al., 2006; Block and MacMillan, 1993). By enabling the exploration of new business domains and the emergence of ideas for new products, technologies and managerial practices, it enhances firms’ ability to adapt to fast-changing environments, and to survive and grow (Burgelman, 1991; Burgelman and Grove, 2007).

While many large companies do not suffer from a shortage of innovative proposals, relying on different mechanisms to expedite the emergence of entrepreneurial ideas (Hornsby et al., 2002; Kuratko et al., 1990; Perry-Smith and Shalley, 2003; Reid and De Brentani, 2004), deciding which ventures to invest in appears to be a more critical issue (Reitzig, 2011). A major challenge in selecting entrepreneurial ideas is related to the assessment of their risk profile and value-creating potential (Kim and Mauborgne, 2000; Shimizu, 2012). Most corporate ventures operate with high-technology products whose outcomes are projected so far in the future that decision-makers, when evaluating their embryonic proposals, can only get a vague idea of the technical hurdles, potential revenues and critical resources needed to deploy them (Bazerman, 1998; Forlani and Mullinis, 2000; Huchzermeir and Loch, 2001; Keh et al., 2002; MacMillan et al., 1987). Therefore, ensuring that the selection process is effectively structured and well-managed is key to lower the risk of either rejecting valuable ideas or supporting solutions with limited market prospects and innovative potential (Balachandra, 1984; Elfring and Foss, 2000).

Despite the centrality of selection issues to internal venturing programs’ outcomes, knowledge about how funding decisions are made in the development process of new corporate ventures is still limited (Birkinshaw, 1997; Burgelman, 1983, 1984; Kazanjian and Drazin, 1990; Reitzig, 2011). So far, scholarly attention has primarily focused on the generation and implementation of new entrepreneurial initiatives, leaving aspects related to their evaluation and selection largely unexplored (Dess et al., 2003; Phan et al., 2009). Although research
applying ecological and resource-allocation process models to the corporate decision-making context (Burgelman, 1983, 1994; Noda and Bower, 1996) has helped uncover some evaluation criteria which firms can use to inform their venture selection decisions (Block and MacMillan, 1993; Desarbo et al., 1987; Hart et al., 2003; MacMillan et al., 1987), our understanding of the mechanisms by which they sort through competing innovative proposals is far from complete.

The nature of the selection process itself remains ambiguous. While most studies on internal corporate venturing frame selection as a single-stage event mainly shaped by the top management’s evaluation logics (Burgelman, 1991; Lovas and Ghoshal, 2000; Sathe, 2003), anecdotal evidence suggests that firms increasingly rely on multi-stage evaluation models when making decisions about their venture investments and tend to involve managers at different organizational levels (Eckhardt et al., 2006; Jouret, 2009; McGrath and Keil, 2007; O’Connor and Rice, 2001). The innovation literature also discusses staged funding mechanisms within corporations, entailing regular go/no-go decisions at different phases of a product/technology development (Cooper et al., 2002; Desouza et al., 2007; Ettlie and Elsenbach, 2007; Van de Ven et al., 2000). By linking transition to subsequent development stages and increased resource commitment to the achievement of defined milestones, stage-gate systems allow firms to winnow out less promising and riskier ideas quickly and reallocate resources to those deemed potentially more valuable (Kijkuit and Van den Ende, 2007). This filtering process is more challenging when applied to early-stage ventures, often based on embryonic ideas for which critical elements of the future business are difficult to determine ex-ante (McGrath and Keil, 2007; Nagji and Tuff, 2012). As McGrath (1997) suggests, to cope with the experimental nature of this type of ventures, selection processes must use reviewing mechanisms and funding criteria able to balance the need of avoiding a detrimental escalation of commitment with that of preventing a premature rejection of potentially valuable initiatives.
To date, evidence on the drivers and dynamics underlying the structured development process of early-stage corporate ventures scarcely exists (Keil et al., 2009). Most studies in the corporate entrepreneurship field have focused on mature and successfully deployed initiatives, neglecting those initiated but discontinued along the way, and which are usually regarded as failures (Birkinshaw, 1997; Birkinshaw and Ridderstrale, 1999; Kalnins, 2007; Zahra, 1996). Knowledge about their evaluation and selection process is, therefore, limited, reflecting the lack of large-scale empirical research at the project level. Moreover, as a thorough examination of the extant literature reveals, the evaluation and selection criteria identified for mature ventures derive almost exclusively from studies employing post-hoc and experimental research methods, which suffer from survival and self-reporting biases and tend to oversimplify the context of investigation (Desarbo et al., 1987; MacMillan et al., 1987; Riquelme and Ricards, 1992).

The present study aims at addressing the identified limitations and gaps, and thereby at contributing to a more fine-grained understanding of the decision-making process and criteria underlying the evaluation and selection of nascent (i.e. early-stage) corporate ventures. To do so, it considers three interrelated questions. First, how the process through which nascent corporate ventures are evaluated and selected is structured, its constituent stages and the decision criteria employed. Second, whether and how the relevance of the criteria used to review nascent corporate ventures changes at different stages of the evaluation process. Third, whether and how the relevance of decision criteria varies between successful and unsuccessful venturing attempts at different stages of the review process.

To address these questions, we conducted a longitudinal investigation of the evaluation and selection process of nascent entrepreneurial initiatives supported by the internal corporate venture unit of a leading energy company. To identify how actual selection decisions are made in that context, our research adopted a two-stage procedure. This involved a small sample case-based analysis and the examination of 14 years of comprehensive archival data tracking the
progress of nascent ventures at different stages of development. Notably, the archived venture files made available by the company relate to both successful and unsuccessful venturing attempts and report what was actually decided at the time of the proposals’ evaluation, providing an objective account rather than one just based on a recall of organizational actors involved in the decision-making process.

In the first part of our investigation, drawing on an exploratory study of the development of eight nascent internal corporate ventures, the constituent phases of the process through which they evolved in the internal selection environment were empirically documented. Establishing the selection structure for early-stage corporate ventures is a novel addition to the literature, which, as previously highlighted, offers limited evidence on how decisions about the progress of this type of ventures are made (Keil et al., 2009). Besides validating critical selection criteria, such as novelty and strategic fit – which have already been identified by prior research dealing with more mature ventures – our exploratory study also uncovers the relevance of additional factors, i.e. expected time to implementation and prospective deployment routes, whose influence on venture selection decisions has been so far largely overlooked.

The second part of our study, which involved the analysis of archived venture files related to the evaluation process of 1,527 venture proposals submitted over a 14-year time frame, reveals how the importance of the identified evaluation criteria varies between different stages of venture development. While aspects related to novelty and strategic fit play a central role in the initial stages of the review process, their relevance decreases and other criteria, i.e. expected time to implementation and deployment routes, become more prominent as ventures progress through the selection gates. Interesting insights come also from the comparison between ventures that were accepted and rejected at different stages. It reveals that all identified

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1 By “deployment” we mean the implementation of novel solutions (products, technologies, services) proposed by venture initiators, which results in making them available for use. For the purpose of this paper, we use the terms “deployment” and “implementation” as synonyms.
evaluation criteria are more relevant to rejection than acceptance decisions in the initial phases of the review process, while become more central to acceptance decisions as ventures mature. This suggests that the identified criteria serve different purposes within the evaluation and selection process, i.e. filtering out the least promising ideas in the initial phases and determining those worth developing later on. Altogether, our findings offer a novel and significant contribution to the corporate venturing literature. Although prior research (Pinto and Prescott, 1988; Rietschel et al., 2010) has suggested the existence of stage-based differences in the criteria used to evaluate ventures, to the best of our knowledge, there has been no documented evidence of them so far, with ours representing one of the first attempts to uncover them.

2. Background literature

Scholarly interest in corporate venturing has grown dramatically over the past few decades, with a proliferation of studies on its antecedents, forms and outcomes (Block and MacMillan, 1993; Burgelman, 1983, 1984; Campbell et al., 2003; Guth and Ginsberg, 1990; Kanter, 1985; Keil, 2004; Miles and Covin, 2002; Narayanan et al., 2009; Sharma and Chrisman, 1999). Given their intrinsic risks and uncertainties, and the long timeframes on which they usually operate, corporate ventures require different management logics and systems compared to mainstream activities (Dougherty, 1995; Kanter, 2006; McGrath et al., 2006; Sykes and Block, 1989). It is therefore not surprising that several studies have highlighted that the value of the internal corporate venturing approach lies in the creation of structurally-differentiated and semi-autonomous organizational entities, such as new business development divisions and corporate venture units, where early-stage venturing ideas can be explored, nurtured and eventually turned into deployable solutions (Birkinshaw and Hill, 2005; Block and MacMillan, 1993; Burgelman, 1985; Leifer et al., 2001; Sykes, 1986). The creation of purposely designed units with dedicated funds expedites the exploratory processes underlying most venturing endeavours and shields
them from dominant managerial logics and organizational inertia (Burgers et al., 2009; Chesbrough, 2000; Fast, 1979; Husted and Vintergaard, 2004; Kanter et al., 1990).

Notwithstanding the benefits of this approach, many corporate venture units report unsatisfactory performance (Birkinshaw and Campbell, 2004; Birkinshaw, 2005). The average success rate of the ventures they pursue, measured in terms of survival, profit or growth contribution, is traditionally quite low (Campbell and Park, 2004; Stevens and Burley, 1997). Yet relatively little is known about the process through which new ventures are initiated and developed in the corporate context (Birkinshaw, 1997; Dess et al., 2003; Garvin, 2002; Narayanan et al., 2009).

One of the challenges inherent in the study of corporate ventures is the long gestation period of most initiatives. Since these initiatives evolve through several stages entailing the generation, evaluation, selection, and implementation of novel ideas, it is difficult to capture their underlying dynamics and the roles of the numerous actors involved (Block and MacMillan, 1993; Kazanjian, 1988; O’Connor and Rice, 2001; Van de Ven and Polley, 1992; Van de Ven et al., 2000). This is evident especially as concerns the evaluation and selection phase of the internal venturing process. Despite being acknowledged as of central importance, this shortcoming has surprisingly received only limited attention in extant corporate entrepreneurship research (Phan et al., 2009).

Most available contributions frame selection as a single-stage event, with venture acceptance or rejection decisions made by panels of senior managers with relevant technical and business experience using pre-determined evaluation criteria (Burgelman, 1985, 1991; Lovas and Ghoshal, 2000). More recent studies suggest the existence of a more complex and iterative selection process than suggested by traditional models, with opportunity structuring and scoping activities intertwined with early-stage development. Yet despite the growing interest in selection-related issues (Keil et al., 2009; Reitzig, 2011; Rietschel et al., 2010;
Soukhoroukova et al., 2012), to date the empirical evidence on how firms pick new ventures to invest in is rather scant.

Discriminating among competing venturing projects is one of the most critical tasks for enterprising organizations (Kim and Mauborgne, 2000). The complexity embedded in venture selection decisions mainly arises from the novel and uncertain nature of the proposed initiatives (Husted and Vintergaard, 2004; O’Connor and Rice, 2001). Prior research on corporate innovation more generally suggests that stage-gate systems can help firms reveal information, resolve uncertainty, and adjust resource allocation to support the most promising ideas (Barringer and Gresock, 2008; Chesbrough, 2000; Cooper et al., 2002; Desouza et al., 2007; Keil et al., 2009; Kim and Wilemon, 2002; Mason and Rohner, 2002; Moenart et al., 1995; Van de Ven et al., 2000; Zahra et al, 2006). However, we do not yet know much about stage-gate systems designed to select early-stage internal corporate ventures, for which the appropriateness of traditional stage-gate decision-making mechanisms is increasingly debated (McGrath and Keil, 2007; Nagji and Tuff, 2012). The premise on which those mechanisms normally work, namely the possibility to estimate key elements of the future business, such as returns and market value, is deemed hardly reconcilable with the experimental nature of nascent entrepreneurial initiatives, in which those elements may remain undefined for a long time.

The corporate venturing literature has highlighted the role not only of supportive organizational conditions, but also of intrapreneurial capabilities embodied in the individual agents who initiate and develop new corporate ventures. Central to selection decisions are the attributes of venture proponents and corporate sponsors, or ‘champions’ (Howell and Higgins, 1990; Maidique, 1980). Evidence shows that these agents are centrally involved in venture development decisions (Green et al., 2003; Kelley et al., 2009; MacMillan et al., 1985; O’Connor and Rice, 2001). Experience provides proponents and champions with critical skills to successfully navigate the evaluation process, and a good track record signals their ability to
shepherd ventures through their different development stages (Day, 1994; Garud and Van de Ven, 1992; Girotra et al., 2010). Our empirical analysis below will build on the existing literature by exploring the nature of multi-stage venture selection processes involving these agents and it will isolate any stage-based differences between the identified evaluation criteria.

3. Data and method
To gain an in-depth understanding of decision-making process and criteria underlying the evaluation and selection of nascent internal corporate ventures, we chose an exploratory research design (Eisenhardt, 1989; Strauss and Corbin, 1990; Yin, 2014). It is deemed appropriate to the investigation of poorly documented phenomena such as the selection and development of new internal corporate ventures, for which large-scale empirical research is lacking (Gartner and Birley, 2002; Narayanan et al., 2009). In this study, we use the term internal corporate ventures to describe nascent entrepreneurial initiatives aimed at expanding markets and/or products/technologies for the parent firm outside its core business. Departing from most studies on corporate venturing that examine only ventures that resulted in actual new business for the parent firm, we focus our investigation on the early-stage (pre-commercialization) development of new internal corporate ventures, considering also initiatives that were discontinued before reaching the point of market entry.

A two-stage procedure entailing, first, a small sample case-based analysis and, then, the examination of a large longitudinal set of archival data tracking the development and progress of nascent internal corporate ventures through sequential selection interfaces was followed. By integrating archival data analysis and an interview approach, the qualitative research design adopted in this study enabled us to uncover the decision-making process and evaluation criteria underlying the development and selection of early-stage internal corporate ventures.
After using the interview data to reveal patterns and elements defining the venture selection process, and inductively deriving an initial staged model for venture evaluation and selection, we used archival sources for triangulation purposes (Jick, 1979; Miles and Huberman, 1994). To explore possible differences in the criteria used to review nascent internal corporate ventures at different development stages, we conducted a content analysis of thousands semi-structured minutes and action log entries related to the evaluation and funding process of the entire population (1,527) of venturing ideas submitted between 1996 and 2009 to the internal corporate venture unit of our focal company.

3.1. Research setting

We investigated the evaluation and selection process of early-stage ventures reviewed and supported over the period 1996-2009 by the internal corporate venture unit (BV) of a major global energy company, which we shall call Alpha from now on. Alpha operates in both the upstream and downstream segments of the oil and gas industry, engaging in the exploration, production, refining, transportation, trading and marketing of hydrocarbons across more than 70 countries. The company is also an active player in the renewable energy business with investments in biofuels, hydrogen, wind and solar power. Alpha is a recognized innovative leader in a number of technological domains and is one of the largest investors in R&D among its peers. Although innovation and technology development have always been central to its strategy, over the past two decades, in the face of the increasing challenges placed upon its oil and gas business and with the aim of sustaining its leadership position, Alpha has further intensified its internal R&D efforts while also embracing a more “open” approach to innovation.

To support the development of early-stage and highly innovative ideas outside the scope of the existing corporate strategy, in the mid-1990s Alpha set up an internal corporate venture unit, called BV. The underlying objective was to offer entrepreneurial employees an outlet to
autonomously initiate innovative ventures, thus enabling Alpha to explore opportunities in new technological and business domains and identify new strategic options for the future. Accordingly, the BV team explicitly welcomed innovative ideas in emerging and unchartered areas, with the potential to open up new businesses for Alpha and transform the energy industry, while it was not open to support incremental innovations in existing business domains. Building on a dedicated team of experienced professionals, BV offered innovators guidance and resources to move their nascent ventures forward. Acting as an orchestrator, it brought panels of relevant experts together to evaluate the potential and viability of innovative ideas originated within or outside Alpha. Although more than 4,000 proposals for novel products, technologies and processes have been received by the BV team since it was created about two decades ago, fewer than 10% have survived the review process and have been fully sponsored.²

Proposed ideas go through a stage-gate review and funding process that involves several rounds of vetting and validation associated with a phased allocation of resources. At each round, BV review panels decide whether they should progress to the next stage of development and receive further investments or be discontinued. After submitting a short description of their ideas through the BV website, proponents are typically invited to give a presentation to a selection panel made of two members of the BV team. If they pass successfully this initial screening gate, they are granted some time and money to mature their ideas further, prior to undergoing the next round of scrutiny, which normally involves three BV team members and three experts in the idea domain. If their assessment is positive and panellists see merits in the idea, proponents are awarded funds to execute the project according to an agreed plan. They are assigned specific deliverables throughout the execution phase, which ends when they are able to prove that the concept works and that the project is ready for implementation. A final validation gate, at which the same panel members involved in the previous rounds of vetting

² This is consistent with data reported by other studies on internal corporate venturing.
assess whether a proof of concept has been reached successfully, marks the end of the BV review and funding process. It typically takes about four years for an early-stage idea to mature into a deployable project and an average investment of $500,000. Some projects are deployed internally, finding application in one of Alpha’s businesses, while for others external deployment routes, such as licensing or the creation of new companies are pursued.

In the first part of our study we focused on eight nascent internal corporate ventures reviewed by BV. Within the entire population of 1,527 venture proposals submitted between November 1996 and December 2009, which dealt with various upstream activities of the oil and gas business, we picked ideas that had reached different stages of the BV review and funding process (creation, scoping, execution and validation) and were representative of various technological domains. For each stage, we included in our sample projects for which both internal and external prospective deployment routes had been identified, trying to maximize variation also in terms of manner of deployment (i.e. new company creation, licensing, partnership and internal deployment). Based on the criteria highlighted above, members of the BV team helped us identify the internal corporate venturing projects most suitable for our investigation among those for which richer information could be obtained either by interviewing relevant participants or through archival data, or both. Table 1 below provides an overview of our selected projects and of some of their key characteristics.³

(Table 1 about here)

3.2. Data collection

This study draws on multiple sources of qualitative and quantitative data. Primary and secondary data at the organizational and project levels were collected over different rounds (see

³ In this paper, the terms “ideas”, “projects”, “initiatives” are used to indicate the nascent ventures evaluated by the BV group.
Table A1 in Appendix A).

To gain a clear understanding of the structure and functioning of the BV unit and of its role within Alpha, between February and April 2008 we conducted a first round of open-ended interviews with BV team members, the director of Alpha’s venture capital fund and other senior executives overseeing or involved in the activities of the BV unit. They helped us capture relevant aspects of the BV review and funding process and identify the main roles and criteria driving decisions about the selection of innovative ideas. Moreover, they facilitated the identification and contact of target respondents for two subsequent rounds of interviews, which took place in 2009 and 2010 and focused mainly on project-level dynamics. Whenever possible, we interviewed proponents and sponsors of the eight innovative projects selected for investigation, as well as members of the BV review panels that took part in their evaluation. Following a semi-structured interview protocol, we asked them questions about: the origins of the ideas; their key characteristics; their development process; the main factors that influenced their progress; outcomes; and the mode of deployment. We also participated in some BV review panel meetings, which allowed us to observe how decisions about project funding or termination were made. Overall, we conducted 42 interviews, mostly on site. They generally lasted between 30 minutes and one hour, were tape-recorded, transcribed and subsequently validated with interviewees. We also utilized archival sources, including BV internal documentation (e.g. project plans and presentations), for triangulation purposes (Eisenhardt and Graebner, 2007).

The final stage of our data collection process took place between January and May 2010, when we downloaded from the BV central electronic database the entire set of action logs, minutes and files related to the evaluation process of all 1,527 venture proposals submitted to the BV team over the preceding 14-year period. Action logs, which were used to track the progress of each proposal throughout the evaluation process, recorded key information such as
date of proposal submission, source, domain, proponent and sponsor names, status (open vs closed), stage of the review process, dates and outcomes of previous review meetings and related comments made by the decision panels. The length of action log entries and minutes of panel review meetings, which followed a semi-structured format, depended on the stage of review process reached by the proposed ideas, and ranged from few lines to thousand words.

3.3. Data analysis

The data analysis aimed to uncover the decision-making process and criteria underlying the evaluation and selection of internal corporate ventures. First, we coded our interview data searching for passages that contained references to the nature, structure and salient decision-making milestones of the BV review and funding process. At this stage, our goal was identifying: the approach followed by the BV unit to evaluate early-stage innovative ideas and decide on their progress; the key mechanisms used to support the development of promising ideas; and the key roles in this process.

The second step of our analysis elucidated the main criteria used to review proposed ideas and to make decisions about their funding and development. We used within-case and cross-case analysis to identify the key factors that influenced decisions about the progress of our eight focal ideas throughout the BV review process, searching for analogies and differences (Eisenhardt, 1989). In doing so, we grouped the basic concepts derived from the thematic analysis of our interview data into 4 more general conceptual categories (novelty, strategic fit, time to implementation, deployment routes), iterating between factors grounded in the literature and emerging from the data (Flick, 2006; Yin, 2010).

A further step, which stemmed from the outcomes of the preceding steps, involved content analysis of the semi-structured minutes and action log entries related to the review process of all 1,527 ideas submitted to the BV unit since its creation until the end of 2009.
Through that, we aimed at exploring whether the relevance of the four decision-making criteria identified through the case-based analysis varied between different phases of the review process. For each of those criteria, we identified some keywords and measured how frequently they were used when evaluating ideas at different stages of the review process (see Table 2).

Finally, in the last stage of our investigation, we took advantage of the longitudinal nature of our dataset to examine some dynamic aspects of the evaluation and selection process and, in particular, the evolution over time of the acceptance rates of ventures at different stages.

(Table 2 about here)

4. Findings

Consistent with our investigation procedure, we present our findings in four main sections. The first offers a comprehensive picture of: how the evaluation and selection process of early-stage innovative ideas works in the corporate venture unit BV; its main constituent stages and decision-making milestones; and the roles played by different agents. The second section describes the actual criteria that informed the review and funding decisions of the 8 innovative ideas we investigated. The third section illustrates the differences in the relevance of the identified evaluation criteria at different stages of the decision-making process and between successful and unsuccessful venturing attempts. The fourth and last section shows the evolution over time of the acceptance rates of ventures at different stages of the review process.

4.1. The evaluation and selection of early-stage ventures at BV: a multi-stage process

In their search for new growth platforms and business opportunities, firms put increasing efforts on sourcing and generating innovative ideas. As a result, some of them face a surplus of proposals and struggle to identify those worth supporting, due to the lack of effective evaluation

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4 Keywords were defined by matching those normally associated with the identified decision criteria both in the data and in the extant literature.
processes. “Idea generation is easy. The difficult part is to convert ideas into valid business propositions, pick the right ones and take them to the market” (DM5, BV manager). Designing evaluation and selection systems that discriminate among competing ideas and filter out those with no or limited potential is one the biggest challenges for innovative companies.

Alpha’s BV team follows a disciplined multistage decision process to evaluate and select early-stage ventures. Sequential gates are set up to review proposed ideas along their development journey and funds are allocated in a phased manner to those deemed promising. “A review panel defines which ideas, out of those submitted, deserve to progress to the next stage of development. Those surviving this initial screening gate get some seed money to cover further scoping activities. A subsequent review panel, involving experts from Alpha or other companies, evaluates the potential feasibility and value of the retained ideas, and decides whether to allocate funds to develop them further or to discontinue them. On average, it takes about 4 years for an early-stage idea to reach the proof-of-concept stage, which is when our review and development process ends” (GB, BV manager).

Based on our empirical evidence, four crucial stages have been identified in the BV venture development process, which we have called “creation”, “scoping”, “execution” and “validation” according to the nature of the activities performed in each stage (see Figure 1).

(Figure 1 about here)

The “creation” stage identifies the initial phase of the process, in which proposals submitted by the relevant initiators through an online platform are ready to be examined by the BV team. Only a short description of the proposed ideas and of their basic conceptual features is available at this stage, so evaluators have limited elements to gauge the potential of the

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5 Throughout the paper, interviewees are identified only by initials for confidentiality reasons.
proposed solutions and determine whether they deserve to progress to the subsequent development phases. Therefore, it is crucial that proponents effectively convey the original and differentiating elements of their ideas, highlighting how they could help the company solve existing challenges and/or create opportunities to expand in new business domains. If the first screening gate is successfully passed, ideas enter the “scoping” stage in which the emphasis is on maturing the embryonic concepts that have been deemed promising at the initial scrutiny and developing them further. The objective of this phase, which typically lasts up to three months and may involve the allocation of a small amount of money (up to $25,000) is to reduce uncertainty about the potential value and feasibility of the selected ideas by working out salient technical and business aspects. “In the maturing stage, the ideas that are retained from the screening review are then developed in terms of a rough business model and value proposition, an analysis of the competitors, the identification and evaluation of major risks and a description of the experiments and prototypes that are needed to address them. They are better defined than at the screening phase, therefore enabling the review panel to have a clearer understanding of the technical hurdles and commercial prospects” (WS, member of the BV team). Ideas surviving this further round of vetting, which entails an in-depth assessment of their potential viability and impact, enter the “execution stage”. While in the first two stages of the BV review and funding process the focus is on identifying and developing a new concept/idea and on making preliminary investigations about its potential applications and feasibility, the execution stage revolves around its actual development and testing. This may entail extensive technical work and the deployment of a significant amount of resources allocated to proponents in accordance to a development plan agreed with the review panel. However, to turn ideas into viable projects, skills that go beyond those of proponents are often required. “You can’t be good at everything, you need someone with different skills and experience to help you move your project forward” (MG, idea proponent). Therefore, idea proponents are assigned a sponsor in
the BV group that guides them through the review process and help them gain the resources they need to develop their projects. As ideas move into the execution phase and turn into fully developed projects, clear tollgates and deliverables are defined to monitor progress until proponents have a working prototype ready to be tested in the field. “As an inventor, you have to test your ideas against experts, until you prove that the concept works and that the project is ready for deployment” (AK, idea proponent). If the results of the field tests are deemed satisfactory by the panel, projects gain a “validation” status. This identifies projects that have reached the end of the BV review and funding process, whose technical and commercial feasibility has been proven, and, hence, are ready to be implemented within Alpha or deployed externally through licensing, partnering or venturing modes.

Although largely consistent with the stage-gate models proposed by the innovation management and corporate venturing literatures (e.g. Cooper, 2008; Garvin, 2002; McGrath and Keil, 2007), the multi-stage selection process we have identified offers a more granular view on the early development activities of new corporate ventures, i.e. all those preceding formal launch and implementation, while most stage-gate models adopt a broader perspective and generally encompass also launch and post-launch activities. Its structure, with several decision points associated with a phased resource allocation, is purposely geared to de-risking the development of early-stage corporate ventures, which are often experimental in nature.

4.2. Evaluation criteria at BV

What guides the evaluation and selection of early-stage corporate ventures? In this section, we rely on case-based data collected during our second round of interviews to illustrate the main criteria guiding selection decisions in our context of investigation, the BV unit.

Assessing the potential of early-stage innovative ideas, typically characterized by several elements of uncertainty, is a challenging task for those who decide about their progress and
funding. “The value of an early-stage idea is something that even when you reach the proof-of-concept you are not sure about. We try to cope with this uncertainty by systematically reviewing ideas according to a few basic criteria. Novelty is one. The second is time to implementation. Another one is the fit with Alpha. And, a fourth one is potential value” (GB, member ofBV review panels). 6

The criteria cited above are largely consistent with those derived from previous studies on the evaluation of new ventures (Block and MacMillan, 1993; Desarbo et al., 1987; Hart et al., 2003; MacMillan et al., 1987). However, evidence drawn specifically from the interviews with proponents and sponsors of the eight ideas we selected for investigation, offers additional insights into the aspects assessed during the BV review process. As illustrated in Table 3, besides novelty, strategic fit, potential value and time to implementation, there is another element central to the evaluation of some of the proposed ventures, but largely neglected in prior research on decision-making in the corporate venturing context: deployment routes. Normally, deployment routes are discussed only after the feasibility of an idea is proven and shouldn’t influence evaluation and selection decisions at earlier stages. However, our case-based evidence shows that “finding out as early as possible where an idea goes is key to its development process” (LR, BV manager). “You can prove the concept of the most innovative idea, but it has still to be adopted by the business” (KM, BV manager). Hence, the BV team encourages venture proponents to find and involve potential deployers early in the process. “We hope this can lead to a quick implementation in the field” (GB, BV manager).

Interestingly, neither proponents nor sponsors mentioned the potential value of their focal ideas as a critical evaluation factor. Although a synthetic score is typically used by BV review panels to indicate the potential value of proposed ideas, their early-stage nature makes it scarcely possible to provide sound estimates of key business aspects, such as market value,

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6 The criteria reported by our interviewee, which are used by the BV team to review submitted ideas, are stated in the applicants’ guidelines as well as in an internal manual developed by the BV team to describe the review process.
which can remain undefined for a long time. That would explain why this element was absent in the accounts of the key factors that influenced the progress of the eight investigated ideas through the review process – while aspects related to novelty, strategic fit, time to implementation and deployment routes were repeatedly highlighted.

Our cross-case analysis offered another interesting insight. By comparing ideas that reached different stages of the review process, we realized that some of the evaluation criteria we had identified seemed to matter only if ideas had made some progress over their development journeys, as reported in Table 3. By measuring the frequency of comments related to each criterion for all investigated ideas, we were able to spot differences in the relevance of novelty, strategic fit, time to implementation and deployment routes over the review process that warrant further examination. We turn to this next.

(Table 3 about here)

4.3. Emerging stage-based differences in the venture evaluation and selection process

Evidence from our qualitative investigation suggests the existence of stage-based differences in BV’s internal venture selection and development process. The relevance of the evaluation criteria previously identified seem to vary according to the specific phase of the selection process. To supplement our preliminary case-based evidence, we conducted a content analysis of thousand minutes and log entries. As explained earlier, we examined semi-structured minutes and log entries for the evaluation process of 1,527 venture proposals submitted to the BV team over the period 1996-2009. Relevant keywords were defined for the identified evaluation criteria (see Table 2) and their frequencies across the main stages of the BV review process were measured. Table 4 summarizes the distribution of all ideas according to the stage of the
BV process they were in\textsuperscript{7}, and the average number of minutes and action log entries associated with different phases of the review process.

\textit{(Table 4 about here)}

To investigate potential differences in the relevance of the identified evaluation criteria (\textit{novelty, strategic fit, time to implementation and deployment routes}) at specific stages of the review process, the average numbers of words referred to each of them in both minutes and action log entries were compared. By taking each stage as a separate baseline, we checked whether the average numbers of words referred to the identified criteria, measured over the same set of observations (ideas), differed significantly from each other.

For each stage, we performed a one-sample multivariate test of means (\textit{mvtest}), which simultaneously compares the means of more than two variables (Nel & Van Der Merwe, 1986; Krishnamoorthy & Yu, 2004). All tests confirmed that the differences between the variable means were significant. Tables B1, B2, B3 and B4 in Appendix B report summary statistics for the number of words referred to each criterion respectively in the creation, scoping, execution and validation stages of the review process.

The main purpose of this analysis was to uncover possible stage-based differences in the relevance of specific evaluation criteria to the decision-making process underlying venture selection. Based on the results summarized in Table 5, we can observe that novelty and strategic fit have higher mean values than the other identified criteria in the first two stages of the review process (creation and scoping). This means that the number of words in the minutes and log entries related to novelty and strategic fit for ideas in the creation and scoping stages is higher,

\textsuperscript{7} Four different stages of the BV evaluation and selection process can be identified. 1) \textit{creation} = the idea has been submitted but either not yet evaluated at the first selection gate or rejected. 2) \textit{scoping} = the idea has either passed the screening gate and not been yet evaluated at the second selection gate or rejected there. 3) \textit{execution} = the idea has either passed the executing gate and not been yet evaluated at the third selection gate or rejected there. 4) \textit{validation} = the idea has passed the third selection gate and now is closed-out.
on average, than the one for words related to time to implementation and deployment routes. The reverse situation applies to ideas in the execution and validation stages, for which instead time to implementation and deployment routes show higher mean values.

(Table 5 about here)

Our findings suggest that the review and funding process is centered on novelty and strategy-related considerations in the initial phases of venture development. Estimating the time to implementation of the proposed ideas and defining their possible deployment routes is quite a difficult task when they are still in an embryonic state. Therefore, these aspects are downplayed in the initial stages of the evaluation process but become central to selection decisions as ideas mature.

A striking shift in the focus of the venture review process across its different stages emerges from our data analysis. As the required resource commitment increases, due to the venture progression towards more advanced development stages, implementation issues seem to progressively divert the attention of the review panels from strategic and novelty-related considerations. The time required for ideas to achieve a degree of technological readiness that allows first commercial applications, and the identification of clear deployment routes then become increasingly central to funding decisions. This shift seems to reflect also the different objectives of the selection system, respectively filtering out “the bad ventures” in the initial phases and validating the feasibility of those deemed promising later on.

To shed further light on possible stage-based differences in the relevance of different criteria to the evaluation process, we also investigated whether a specific criterion, for instance novelty, had different relevance to the decision-making process for ideas that were accepted, compared with ideas that were rejected at a specific selection gate. We compared mean values
for each criterion between accepted and rejected ventures at each gate. Several two-group tests (ttest with a variable discriminating between two groups, which in our case is the acceptance at each selection gate) were performed (Welch, 1947). Tables B5, B6 and B7 in Appendix B present summary statistics for ideas which respectively went through the screening, executing and field testing gates, and were either accepted or rejected.

Nearly all the tests confirmed that the differences between the criteria means for accepted and rejected ideas at each gate were significant. The only exception was the last selection gate (field testing) where differences were not significant.

The underlying objective of our last investigation was to show that the same evaluation criteria can have greater or lesser relevance to acceptance or rejection decisions according to the stage of the review process. Based on the results summarized in Table 6, we can observe that the mean value for novelty is higher for the rejected ideas than for the accepted ones at the first gate, but lower in the two subsequent ones. That is, the average number of words related to novelty for those ideas surviving the screening gate is lower than for those rejected. The reverse situation applies to the two following gates, where instead novelty has higher mean values for the accepted ideas than for the rejected ones, but with a significant difference only in the intermediate gate (executing). As far as strategic fit and time to implementation are concerned, a similar pattern emerges. We observe a lower mean value for accepted ideas than rejected ones at the screening gate, but a higher mean for those surviving the executing and field testing gates than for those discontinued. The deployment routes criterion shows a higher mean value for rejected ideas than for accepted ones at the screening gate, the reverse situation at the executing gate, and again a higher mean value for ideas rejected at the field testing gate than for those accepted (though the difference in this case is not significant).

(Table 6 about here)
Overall, our findings suggest that the centrality of specific evaluation criteria to venture selection decisions varies across stages. Novelty-related considerations seem to be more critical to idea acceptance when decisions about execution need to be made (executing gate). At this stage, a significant amount of resources has to be allocated to turn original proposals into implementable solutions. Therefore, review panels need to be convinced of the innovative potential of a proposed ideas before committing further funds. Novelty appears less relevant to acceptance decisions at the last gate of the review process (field testing gate), when aspects related to implementation usually dominate panel discussions, and the innovative content of the pursued ideas has already been established. Surprisingly, novelty-related considerations seem to be more central to rejection than acceptance decisions at the initial gate of the review process (screening gate). Given the embryonic shape of most ventures at that stage, conveying their truly innovative potential to designated evaluators is often very difficult. Moreover, novelty characteristics normally amplify the perceived risk associated to new ventures, increasing their chances of rejection.

Similarly, strategic fit is more central to idea rejection than acceptance at the screening gate. However, its relevance to approval grows at the later gates of the review process, when potential synergies with the core business and ventures’ value-enhancing characteristics are often emphasized to support acceptance decisions at the executing and field testing gates. As concerns time to implementation and deployment routes, we observe, as for the other criteria, greater relevance to the decision-making process at the executing gate. Discussions about the time required to bring a new product or technology to the market, and about viable deployment options contribute to lower the uncertainty surrounding execution, making acceptance more likely. Conversely, time to implementation and deployment routes have low relevance to initial
screening decisions. Venture characteristics are still poorly defined at this stage, so when aspects related to implementation are addressed, they normally support rejection decisions.

By looking at the overall differences between rejected and accepted ideas at each selection gate, an interesting pattern emerges. The mean values for all criteria are higher for the rejected ideas than for the accepted ones at the screening gate, whereas we find the opposite at the executing gate, where all criteria have higher mean values for accepted ideas. With the only exception of time to implementation, which has a higher mean value for accepted ideas, we find no statistically significant differences for the mean values of the identified criteria between ideas that were accepted and rejected at the final field testing gate. Interestingly, the fact that all four evaluation criteria are more relevant to rejection than acceptance decisions in the initial phases of venture development, while become more central to acceptance decisions as ventures mature, suggests that they serve different purposes within the evaluation and selection process. While mainly used to filter out (reject) the ideas deemed least promising at the initial screening gate, they become central to determine those worth developing (accept) at the executing gate. These findings seem consistent with the “patient approach” to corporate venturing advocated by Campbell and Park (2004), according to which firms should use tough screening systems for venture ideas and patiently wait for those few worth investing in.

4.4 Dynamic aspects of the BV evaluation and selection process

Taking advantage of the longitudinal nature of our data, in the final stage of our investigation, we examined some dynamic aspects of the evaluation and selection process. In particular, we analyzed the evolution, over our observation period, of the rate of venture acceptance. We calculated the percentage of accepted projects at each selection gate in three different periods of time (1996-2000, 2001-2005 and 2006-2009). The results, which are presented in Table 7, show that the acceptance rate at the screening gate has declined over time from 69.3% in the
first period to 56.4% in the final one. Conversely, the acceptance rates at the executing and field testing gates have significantly increased during the observation period (from 28% to 58.8% and from 34.9% to 58.8% respectively).

(Table 7 about here)

Our findings suggest that surviving the screening gate has become tougher over time, and that a growing number of venture ideas are filtered out at the initial stage of the development process. This seems to be the result of the BV team’s increased commitment to discern early on whether an idea is worth pursuing or not. “We realized that we had to kill off earlier ideas that would have died later anyways” (LR, BV manager). Stopping earlier projects bound to be eventually axed means avoiding wasting resources that could be used to foster the progress of “likely winners” (DM, BV manager). Our evidence appears consistent with this idea, in that it shows that, over time, a higher proportion of projects reached the execution and validation stages and turned into deployable solutions. This sharp improvement may be explained, on one hand, by the fact that a more selective initial screening results in ideas of better quality being evaluated at later stages. On the other hand, it reflects the BV team’s increased efforts and improved capacity to provide support to move ideas forward. “We strived to accelerate the push-through of good projects and to help them cross the valley of death” (GB, BV manager).

The identified changes in the patterns of venture selection during our observation period, with the BV unit apparently pursuing a more stringent initial vetting and a more focused development, seem to respond to the need of improving the effectiveness of the BV venture development program in light also of an evolving and more challenging external environment. High price volatility, shifting competition, depletion of easy-to-access oilfields and pressure to reduce environmental impact led Alpha to adjust its strategic priorities over time, and may have
indirectly influenced BV’s approach to venture selection. “Our strategy is to build a portfolio reflecting emerging trends in technology, business and society. We will focus on fewer ideas, devote more time to each and engage earlier with potential deployers” (LR, BV manager).

5. Discussion and conclusion
Organizations are increasingly using corporate venturing as a means of renewing themselves, creating new sources of growth, and developing internal dynamic capabilities. A better understanding of how best to nurture and develop nascent corporate ventures within organizations is therefore of paramount importance to corporate managers. Yet, despite its importance, relatively little is known about how companies manage the selection and development process of new internal ventures (Birkinshaw, 1997; Burgelman, 1983, 1984; Kazanjian and Drazin, 1990; Reitzig, 2011). This applies particularly to early-stage ventures, which as highlighted by Keil et al. (2009), have been typically neglected by previous studies on corporate venturing. The present paper has tried to fill this gap by analyzing detailed and confidential project- and organization-level data obtained over several years from a successful incumbent in the energy sector. This entailed a longitudinal investigation of the evaluation and selection processes of the entire population of early-stage entrepreneurial initiatives reviewed by the internal corporate venture unit of this company over a 14-year period. By tracking the progress of nascent ventures at different stages of development, we uncovered the structure of the decision-making process underlying their evaluation and selection and the criteria around which it revolves at different stages of venture development.

Our research design and the richness of the data that we were able to access gave us the opportunity to address key shortcomings and make several contributions to the corporate venturing literature. First, whereas prior work on corporate venturing has focused largely on mature and successful initiatives (Birkinshaw, 1997; Kalnins, 2007; Zahra, 1996), neglecting
those discontinued before reaching the point of market entry, we provide novel fine-grained evidence on the development process of nascent corporate ventures, looking also at initiatives that were abandoned along the way. By avoiding biases caused by ‘sampling on success’, our study contributes to a more nuanced understanding of corporate venturing dynamics.

Second, the granular nature of our data allowed us to uncover the structure of the decision-making process underlying the evaluation and selection of nascent internal corporate ventures. Although fairly consistent with the stage-gate models proposed by the innovation management and corporate venturing literatures (e.g. Cooper, 2008; Garvin, 2002; McGrath and Keil, 2007), the identified multi-stage process provides a more accurate depiction of the early development activities of new corporate ventures. It offers interesting insights on how firms may lower the risks associated with the pursuit of nascent ventures by designing selection mechanisms able to balance the need of avoiding escalation of commitment with the risk of stopping ventures too early, a long-debated issue in the corporate venturing literature (McGrath, 1997).

Third, unlike prior work which has largely relied on experimental or post-hoc methods to identify venture selection criteria (Desarbo et al., 1987; Macmillan et al., 1987; Riquelme and Ricards, 1992), in this study we uncovered the criteria that were employed to make actual venture investment decisions. In addition to novelty and strategic fit, already established by prior studies, we found evidence of new decision criteria related to deployment aspects, i.e. time to implementation and prospective deployment routes, whose influence on venture selection decisions has been hitherto largely overlooked.

Fourth, the longitudinal nature of our study enabled us to offer a richer perspective on venture selection, uncovering differences both in the relevance of the criteria used to evaluate internal corporate ventures at different stages of development and in the dynamics of the selection process over time. Although prior research (Pinto and Prescott, 1988; Rietschel et al., 2010) has suggested the existence of stage-based differences in the criteria used to evaluate
ventures, ours is, to the best of our knowledge, one of the first attempts to explore them. Our findings show that while novelty and strategy-related criteria are salient in the initial phases of the review process, they are increasingly outweighed by deployment-related criteria as ventures mature. Furthermore, they indicate that the criteria around which approval decisions revolve at the early stages of the development process differ from those associated with approval decisions later on. The comparison between successful and unsuccessful venturing attempts reveals also that all decision criteria are more relevant to rejection than acceptance decisions in the initial phases of the review process, while become more central to acceptance decisions as ventures progress through the selection gates. This suggests that decision criteria address different needs within the evaluation and selection process, i.e. filtering out the least promising ideas in the initial phases and determining those worth funding later on. The identification of the criteria around which the decision-making process revolves at different stages has important implications for the survival of nascent ventures, since it may inform the efforts of their proponents and sponsors to address the aspects deemed more critical by evaluators at specific stages. It may also offer insights on the potential reasons for venture termination, something that extant corporate venturing literature has not looked at yet. The analysis of the dynamics of venture selection decisions over time points to a shift towards a more stringent initial vetting and a more focused development, which appears consistent with the “patient approach” to corporate venturing advocated by Campbell and Park (2004), according to which mature companies should use tough screening processes for venture ideas and patiently wait for those few worth investing in. It also points to the existence of a stage-related learning that enhances the development of venture selection capabilities, and ultimately the success prospects of corporate venturing initiatives.

Besides offering several contributions to the corporate venturing literature, our study yields also important implications for practitioners. Some innovation managers may lack
experience with structuring internal venturing programs and could learn from a well-established and successful exemplar such as the one showcased in this article. For innovation managers who do possess experience from operating their own internal venturing programs, they can compare and benchmark their own processes with the stage-gate structure discussed here and assess whether it might be worth adopting a “patient approach” to corporate venturing (Campbell and Park, 2004). We would especially recommend innovation managers recognize the importance of deployment-related criteria. The prominent role found for these in the present study may caution innovation managers to avoid excessive exploration which may even call into question the rationale for corporate venturing efforts by internal critics within their organization. Another recommendation is to vary the weight of given decision criteria at different stages of the new internal corporate venture development process. The reasons why different criteria peaked at various stages seem both plausible and generalizable.

Yet generalizability is arguably one of the limitations of the present paper. We drew data from a single firm operating in a single industry. Although our findings may also apply to other companies with internal venturing units or analogous organizational entities, we would be reluctant to assert that the venture selection and development model described in our study is truly representative of what happens in other firms. Future research could investigate to what extent our findings apply to ventures developed within companies which adopt a different approach to corporate entrepreneurship. Another, related, limitation of our study is that by focusing only on one firm and neglecting a systematic investigation of its relative effectiveness at corporate venturing, we did not establish the suitability of this firm as a basis for benchmarking. That would require cross-organizational data on corporate venturing processes and performance – a daunting, but not impossible, task. Furthermore, despite its longitudinal nature, our investigation does not account for possible variations in the relevance attributed by the review team to the identified evaluation criteria over time, resulting from changes in the
corporate strategy. The latter might have re-oriented the organizational goals and the emphasis on different evaluation criteria. That is a concern that could be taken up by future studies.

Some of the identified limitations suggest possible avenues for future research. First, by analyzing a broader sample of firms, the robustness and generalizability of our findings could be established, identifying also ‘best practices’ which might be sector- or technology-specific. Second, future research could try to explore how the learning gained from the experience accumulated over the evaluation and selection process may enhance the “sensing capability” (Teece, 2007) of the venturing team. This capability could then be linked to corporate venturing performance and tied back to the development stages where it was acquired. To that end, it would be important to include data on abandoned as well as successful corporate ventures, since some failures can generate valuable learning too. Another interesting avenue for future research would be to investigate how the characteristics of the proponents and sponsors affect corporate venture outcomes, identifying those that make some ventures more likely to survive the selection process and gain support. Studies exploring the role of human capital in this context would be especially welcome, particularly the role of experience and how different individuals involved in the venturing process cooperate at different stages of venture development.

Clearly the work presented in this paper amounts to no more than a first step: much more remains to be discovered and understood about the structure and dynamics of early-stage corporate venturing processes. We eagerly await further studies on this topic.

Acknowledgements

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References


Welch, B.L., 1947. The generalization of 'student's' problem when several different population variances are involved. Biometrika 34, 28-35

Yin, R.K., 2010. Qualitative research from start to finish. Guilford Press.


### Table 1. Projects overview

<table>
<thead>
<tr>
<th>Project</th>
<th>Idea</th>
<th>Technological Domain</th>
<th>Duration</th>
<th>Total budget allocated by BV</th>
<th>Stage of the review process</th>
<th>Deployment route</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>New method to predict reservoir behaviour based on a novel approach to stochastic analyses</td>
<td>Field appraisal and development</td>
<td>4 years</td>
<td>$730,000</td>
<td>Validation</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proof-of-concept successfully achieved</td>
<td>New method adopted by Alpha’s business divisions</td>
</tr>
<tr>
<td>B</td>
<td>New downhole solution for water and gas shut off based on the use of reactive balls</td>
<td>Well completion</td>
<td>4 years</td>
<td>$500,000</td>
<td>Validation</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proof-of-concept successfully achieved</td>
<td>Technology licensed to third parties</td>
</tr>
<tr>
<td>C</td>
<td>New method to interpret seismic data based on sequence tracking</td>
<td>Geophysical imaging</td>
<td>3 years</td>
<td>$100,000</td>
<td>Execution</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project discontinued during the execution phase</td>
<td>If continued, it would have been adopted by Alpha’s divisions</td>
</tr>
<tr>
<td>D</td>
<td>New method to clean contaminated gases in the reservoir based on thermodynamic conditions</td>
<td>Gas treatment</td>
<td>5 ½ years</td>
<td>$515,000</td>
<td>Execution</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project still being executed at the time of data collection</td>
<td>Project to be deployed through joint venture with external partner</td>
</tr>
<tr>
<td>E</td>
<td>New method to detect hydrocarbons in large basins by using radar sensors</td>
<td>Geophysical imaging</td>
<td>6 months</td>
<td>$15,000</td>
<td>Scoping</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The idea didn’t progress to the execution stage</td>
<td>If continued, it would have been adopted by Alpha’s divisions</td>
</tr>
<tr>
<td>F</td>
<td>New method to separate fluid phases by using an inline device</td>
<td>Water treatment</td>
<td>9 months</td>
<td>$15,000</td>
<td>Scoping</td>
<td>External</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>The idea didn’t progress to the execution stage</td>
<td>If continued, the technology would have been licensed to third parties</td>
</tr>
<tr>
<td>G</td>
<td>New method for production logging based on the use of a jet pump completion</td>
<td>Well completion</td>
<td>3 months</td>
<td>--</td>
<td>Creation</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>The idea didn’t progress to the scoping stage</td>
<td>If continued, the technology would have been deployed through joint venture with external partner</td>
</tr>
<tr>
<td>H</td>
<td>New method to convert natural gas into liquids</td>
<td>Gas treatment</td>
<td>1 ½ months</td>
<td>--</td>
<td>Creation</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>The idea didn’t progress to the scoping stage</td>
<td>If continued, it would have been adopted by Alpha’s divisions</td>
</tr>
</tbody>
</table>
Table 2. Key words for evaluation criteria and coding examples

<table>
<thead>
<tr>
<th>Evaluation criteria and keywords</th>
<th>Examples from project-related minutes</th>
</tr>
</thead>
</table>
| **Novelty**: novelty, novel, game-changing, breakthrough revolutionary, evolutionary, incremental, radical | AED: “It has been concluded that this project is clearly revolutionary for Alpha”  
SCFM: “While your idea may be game-changing, it is hoped that through discussion in the extended panel, BV will be convinced of its novelty”  
DEM: “This is a novel technology capable of improving our smart well and 4D monitoring capability significantly”  
FOM: “In summary your idea to develop the EK technology is radical, challenging, and certainly of very high business value”  

**Strategic fit**: fit, alignment, core domains, core areas, core business, relatedness, related | EFG: “All consider the potential value of the project to our EP core areas as a sufficient justification for further exploration”  
GYU: “The potential value to Alpha is clear for this proposal, which in principle fits our core strategy”  
LGT: “We don’t believe there is sufficient potential application of the new tool within Alpha’s core business to justify continued development funding by BV”  
DSM: “In the first instance, I believe that the method is currently potentially valuable in our core areas, where we increasingly struggle with the need to figure out whether there are any hydrocarbons in our targeted remote fields”  

**Time to implementation**: speed, implementation time, time to field trials, time to commercialization, acceleration, time to deployment | PDO: “What we have some concerns about is helping your project reach the proof of concept, accelerate its take up, and get it into the business in 12 months rather than years”  
DSM: “A critical issue for us is the acceleration of the project towards the arrangement of field trials and through the engagement of more people to achieve critical mass”  
TYU: “The potential added value of your idea is well recognized, although implementation is considered very difficult and requiring a long time”  
FGT: “As we discussed at the meeting, BV requests that you speed up the field testing of your technology before making a final decision. It is important to more clearly identify the scope of the business opportunity inherent in the new perforation system”  

**Deployment routes**: commercialization, deployment, implementation, field trials | DEM: “The X-unit has indicated willingness to be an alpha customer for the project, and is keen on acting as focal point to take the idea to a potential field trial”  
GYU: “Involvement from other parties needs to be discussed to bring this idea to implementation”  
LGT: “We believe that the technology should be directed towards commercialization, as its uses do not directly fit with the current exploration portfolio of Alpha (i.e. frontier areas with no proven hydrocarbons)”  
ZGH: “I understood that a licensing option was recommended as the commercial path forward. You will need to clearly articulate this option to the Funding Panel as well as provide some financial projections in order for the Funding Panel to support this commercial strategy, and move the project forward”  

Note: for confidentiality reasons, we don’t report the actual names of the projects, but just some abbreviations that we used to identify them in our records.
<table>
<thead>
<tr>
<th>Project</th>
<th>Novelty</th>
<th>Strategic Fit</th>
<th>Potential Value</th>
<th>Time to implementation</th>
<th>Deployment routes</th>
<th>Stage of the review process</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>High</td>
<td>Medium</td>
<td>Small</td>
<td>Long</td>
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<td>(4 comments)</td>
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<tr>
<td>B</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>External</td>
<td>Validation</td>
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<td>C</td>
<td>Low</td>
<td>Low</td>
<td>Small</td>
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<td>D</td>
<td>Medium</td>
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<td></td>
<td>(4 comments)</td>
<td>(6 comments)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Low</td>
<td>Medium</td>
<td>Small</td>
<td>Long</td>
<td>Internal</td>
<td>Scoping</td>
</tr>
<tr>
<td></td>
<td>(3 comments)</td>
<td>(3 comments)</td>
<td></td>
<td>(0 comments)</td>
<td>(0 comments)</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Low</td>
<td>Low</td>
<td>Small</td>
<td>Long</td>
<td>External</td>
<td>Scoping</td>
</tr>
<tr>
<td></td>
<td>(3 comments)</td>
<td>(2 comments)</td>
<td></td>
<td>(0 comments)</td>
<td>(1 comments)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Low</td>
<td>Low</td>
<td>Small</td>
<td>Short</td>
<td>External</td>
<td>Creation</td>
</tr>
<tr>
<td></td>
<td>(1 comments)</td>
<td>(1 comments)</td>
<td></td>
<td>(0 comments)</td>
<td>(0 comments)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Medium</td>
<td>Medium</td>
<td>Small</td>
<td>Long</td>
<td>Internal</td>
<td>Creation</td>
</tr>
<tr>
<td></td>
<td>(2 comments)</td>
<td>(2 comments)</td>
<td></td>
<td>(1 comments)</td>
<td>(0 comments)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Venture distribution over stages and minutes related information

<table>
<thead>
<tr>
<th>Stage</th>
<th>Number of ideas</th>
<th>Average number of minutes/log entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation</td>
<td>658</td>
<td>1.21</td>
</tr>
<tr>
<td>Scoping</td>
<td>518</td>
<td>1.81</td>
</tr>
<tr>
<td>Execution</td>
<td>225</td>
<td>3.79</td>
</tr>
<tr>
<td>Validation</td>
<td>126</td>
<td>5.33</td>
</tr>
<tr>
<td>Total</td>
<td>1527</td>
<td></td>
</tr>
</tbody>
</table>
Table 5. Ranking of venture evaluation criteria for each stage

<table>
<thead>
<tr>
<th>Rank</th>
<th>Criterion</th>
<th>Mean</th>
<th>Creation stage (n=658)</th>
<th>Rank</th>
<th>Criterion</th>
<th>Mean</th>
<th>Scoping Stage (n=518)</th>
<th>Rank</th>
<th>Criterion</th>
<th>Mean</th>
<th>Execution stage (n=225)</th>
<th>Rank</th>
<th>Criterion</th>
<th>Mean</th>
<th>Validation stage (n=126)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Novelty</td>
<td>0.88</td>
<td></td>
<td>1</td>
<td>Novelty</td>
<td>1.99</td>
<td></td>
<td>1</td>
<td>Deployment routes</td>
<td>3.08</td>
<td></td>
<td>1</td>
<td>Deployment routes</td>
<td>4.67</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Strategic fit</td>
<td>0.64</td>
<td></td>
<td>2</td>
<td>Strategic fit</td>
<td>1.73</td>
<td></td>
<td>2</td>
<td>Time to implementation</td>
<td>2.39</td>
<td></td>
<td>2</td>
<td>Time to implementation</td>
<td>2.81</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Time to implementation</td>
<td>0.10</td>
<td></td>
<td>3</td>
<td>Deployment routes</td>
<td>0.29</td>
<td></td>
<td>3</td>
<td>Novelty</td>
<td>2.00</td>
<td></td>
<td>3</td>
<td>Novelty</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Deployment routes</td>
<td>0.10</td>
<td></td>
<td>4</td>
<td>Time to implementation</td>
<td>0.16</td>
<td></td>
<td>4</td>
<td>Strategic fit</td>
<td>0.61</td>
<td></td>
<td>4</td>
<td>Strategic fit</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

Note: the values reported in this table represent the average number of times a specific criterion has been mentioned in each of the four stages of the review process.

Table 6. Ranking of venture evaluation criteria across groups (accepted/rejected) and gates

<table>
<thead>
<tr>
<th>SCREENING (Creation → Scoping)</th>
<th>EXECUTING (Scoping → Execution)</th>
<th>FIELD TESTING (Execution → Validation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>Criterion</td>
<td>Rejected projects</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1</td>
<td>Novelty</td>
<td>0.89</td>
</tr>
<tr>
<td>2</td>
<td>Strategic fit</td>
<td>0.64</td>
</tr>
<tr>
<td>3</td>
<td>Time to implementation</td>
<td>0.10</td>
</tr>
<tr>
<td>4</td>
<td>Deployment routes</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Note: the values reported in this table represent the average number of times a specific criterion has been mentioned for projects that were accepted/rejected at each of the three gates.

Table 7. Evolution over time of the acceptance rate of ventures

<table>
<thead>
<tr>
<th>Time period</th>
<th>% Accepted project at the SCREENING gate</th>
<th>% Accepted project at the EXECUTING gate</th>
<th>% Accepted project at the FIELD TESTING gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996 – 2000</td>
<td>69.3%</td>
<td>28.0%</td>
<td>34.9%</td>
</tr>
<tr>
<td>2001 – 2005</td>
<td>49.9%</td>
<td>54.2%</td>
<td>43.0%</td>
</tr>
<tr>
<td>2006 – 2009</td>
<td>56.4%</td>
<td>58.8%</td>
<td>58.8%</td>
</tr>
</tbody>
</table>
Figure 1. Stage-gate venture evaluation and selection process

Stage 1: Creation
- Idea submission
  - Screening gate: Idea accepted
  - Idea rejected
- Funds allocation for scoping activities

Stage 2: Scoping
- Executing gate: Project continued
- Project discontinued
- Project development

Stage 3: Execution
- Field testing gate: Project validated
- Project not validated
- Project development

Stage 4: Validation
- Implementation

Multi-stage evaluation and selection process
### Appendix A. Data sources

#### Table A1. Data sources

<table>
<thead>
<tr>
<th>Source of data</th>
<th>Type of data</th>
<th>Main focus and use in the analysis</th>
</tr>
</thead>
</table>
| Corporate Archives     | Books published by Alpha between 1996 and 2010  
1. BV activities and process written by BV managing director and lead scientists  
2. BV success stories written by BV managing director and scientists | Books written by BV’s executives and senior scientists providing information on innovative activities run by the BV team and their role within BV projects successfully deployed.                                                    |
| Internal presentations | 1. BV review and funding process (3)  
2. BV project evaluation criteria (4)  
3. BV project domains and portfolio overview (2) | Presentations given by BV’s executives illustrating the functioning of the project review and funding process implemented by the BV unit. This material enriched our understanding of the evaluation criteria guiding the selection and development of BV projects. |
| Database               | containing semi-structured minutes related to the evaluation process of all 1,527 innovative ideas received and reviewed by the BV unit between 1996 and 2009. It includes presentations and project plans referred to each of the proposed ideas. | These project-level data enriched our understanding of the factors influencing the development and deployment of the innovative ideas vetted by the BV team, enhancing the validity of the insights gained from primary data. |
| Interviews on BV unit and projects | Three rounds (2008; 2009; 2010), 42 interviews with 16 members  
1. BV managing director and members of the BV team  
2. Managing director of Alpha’s Internal Venture Capital Fund  
3. Proponents and sponsors of selected BV projects  
4. Participants in BV panel review meetings | The first round of interviews focused on the genesis, structure, goals and practices of the BV unit. It helped us gaining a good understanding of the role of the BV unit within Alpha, of how innovative ideas are evaluated and selected, and of the role of key agents in this process.  
The second and third rounds of interviews focused on project-level dynamics. Informants were asked questions on: the genesis of selected BV projects and their main characteristics; key events in their development process; resources/capabilities required to move them forward; main hurdles that hindered their progress; their overall outcomes and deployment routes. |
| Other archival sources  | 3 scholarly publications on the BV unit | They enriched our understanding of the role of the BV unit within Alpha, of how they evaluate and select innovative ideas, and of their main deployment routes.                                                                                   |
| Participation in BV review meetings | Documentation (e.g. handouts) and personal research notes on reviewed ideas |                                                                                                                                                                                                                                     |
Appendix B. Summary statistics

Table B1. Summary statistics for numbers of words referred to each criterion for ventures in the creation stage

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>658</td>
<td>0.88</td>
<td>0.61</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Strategic fit</td>
<td>658</td>
<td>0.64</td>
<td>0.64</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Time to implementation</td>
<td>658</td>
<td>0.10</td>
<td>0.30</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Deployment routes</td>
<td>658</td>
<td>0.10</td>
<td>0.30</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table B2. Summary statistics for number of words referred to each criterion for ventures in the scoping stage

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>518</td>
<td>1.99</td>
<td>0.70</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Strategic fit</td>
<td>518</td>
<td>1.73</td>
<td>0.65</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Time to implementation</td>
<td>518</td>
<td>0.16</td>
<td>0.37</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Deployment routes</td>
<td>518</td>
<td>0.29</td>
<td>0.46</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table B3. Summary statistics for number of words referred to each criterion for ventures in the execution stage

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>225</td>
<td>2.00</td>
<td>1.06</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Strategic fit</td>
<td>225</td>
<td>0.61</td>
<td>0.67</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Time to implementation</td>
<td>225</td>
<td>2.39</td>
<td>0.92</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Deployment routes</td>
<td>225</td>
<td>3.08</td>
<td>1.54</td>
<td>0</td>
<td>17</td>
</tr>
</tbody>
</table>
### Table B4. Summary statistics for numbers of words referred to each criterion for ventures in the validation stage

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novelty</td>
<td>126</td>
<td>1.07</td>
<td>0.89</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Strategic fit</td>
<td>126</td>
<td>0.25</td>
<td>0.48</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Time to implementation</td>
<td>126</td>
<td>2.81</td>
<td>1.06</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Deployment routes</td>
<td>126</td>
<td>4.67</td>
<td>2.44</td>
<td>1</td>
<td>21</td>
</tr>
</tbody>
</table>

### Table B5. Summary statistics for number of words referred to each criterion for ventures accepted/rejected at the first gate

<table>
<thead>
<tr>
<th>SCREENING GATE</th>
<th>Novelty</th>
<th>Strategic fit</th>
<th>Time to implementation</th>
<th>Deployment routes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observations</td>
<td>Mean</td>
<td>Std. Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Rejected</td>
<td>642</td>
<td>0.89</td>
<td>0.61</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.10</td>
<td>0.30</td>
<td>0.90</td>
</tr>
<tr>
<td>Accepted</td>
<td>869</td>
<td>0.16</td>
<td>0.37</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.005</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Combined</td>
<td>1,511</td>
<td>0.47</td>
<td>0.60</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.05</td>
<td>0.21</td>
<td>0.06</td>
</tr>
</tbody>
</table>

16 censored observations were removed

### Table B6. Summary statistics for number of words referred to each criterion for ventures accepted/rejected at the second gate

<table>
<thead>
<tr>
<th>EXECUTING GATE</th>
<th>Novelty</th>
<th>Strategic fit</th>
<th>Time to implementation</th>
<th>Deployment routes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observations</td>
<td>Mean</td>
<td>Std. Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Rejected</td>
<td>449</td>
<td>2.02</td>
<td>0.70</td>
<td>1.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.36</td>
<td>0.29</td>
</tr>
<tr>
<td>Accepted</td>
<td>351</td>
<td>3.31</td>
<td>1.13</td>
<td>2.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.47</td>
<td>0.57</td>
<td>0.64</td>
</tr>
<tr>
<td>Combined</td>
<td>800</td>
<td>2.59</td>
<td>1.12</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.29</td>
<td>0.49</td>
<td>0.44</td>
</tr>
</tbody>
</table>

69 censored observations were removed
Table B7. Summary statistics for number of words referred to each criterion for ventures accepted/rejected at the third gate

<table>
<thead>
<tr>
<th></th>
<th>Novelty</th>
<th>Strategic fit</th>
<th>Time to implementation</th>
<th>Deployment routes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Rejected</td>
<td>170</td>
<td>1.88</td>
<td>0.59</td>
<td>2.32</td>
</tr>
<tr>
<td></td>
<td>1.08</td>
<td>0.69</td>
<td>0.82</td>
<td>0.91</td>
</tr>
<tr>
<td>Accepted</td>
<td>126</td>
<td>2.04</td>
<td>0.70</td>
<td>2.35</td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>0.79</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td>296</td>
<td>1.95</td>
<td>**</td>
<td>not significant</td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>**</td>
<td>not significant</td>
<td>not significant</td>
</tr>
</tbody>
</table>

Significant difference not significant

55 censored observations were removed