Chapter 5

Discussion

This dissertation contributes insight into R&D professionals’ decision making and the influence of individual decision making on the innovation process and its outcomes. The first chapter provided an overview of existing literature and revealed the research questions that I explored in the empirical chapters. This final chapter provides an overview of the three empirical studies and their contributions and discusses the theoretical implications of these studies and some recommendations for practitioners. Finally, this chapter concludes with the principal limitations of this dissertation, and makes a plea for further investigation of the behavioral foundations of decision making that can support R&D professionals to build innovative processes in a world of high connectivity.
5.1 Main research findings

The previous chapters described findings from individual studies regarding the attitudes, behaviors, and characteristics that drive innovation decision making on the micro level. A chapter-by-chapter overview of the research questions and answers is shown in Table 5.1. Table 5.2 provides a topical overview of the research questions and summarizes the most important contributions and findings. The main contributions are (1) reviving the behavioral decision-making perspective, (2) integrating the synoptic and incremental perspective on decision making, (3) understanding the decision-making process on the micro level and its effect on innovation, (4) understanding the behavioral foundations of innovation decision making by integrating insights from the field of psychology, (5) integrating the individual level of analysis to understand open innovation implementation, and (6) offering quantitative insights on open innovation by using a mixed-methods approach.
The decision-making process that drives innovation includes these steps: First, managers use intuition to identify innovation interests and mobilize their energies. Next, managers engage in political activities to motivate others for their innovative endeavor and to circumnavigate organizational norms that counteract innovative behavior. Finally, rationality is used to formalize innovation activities and reach greater efficiency. Intuition and political behavior have a greater impact on innovativeness than rationality. Political behavior positively impacts innovativeness when decision makers communicate intuitions effectively throughout the decision process.

Managerial decision orientation has a limited effect on project collaboration with external partners. Managers’ tendency to use rationality, intuition, or politics or to have a promotion or prevention focus does not significantly impact the breadth of project collaboration. However, when managers have a strongly rational decision-making style and a strong prevention focus, their projects involve less collaboration than when they decide less rationally or are less prevention oriented.

R&D professionals who hold positive beliefs, and thus, positive attitudes towards open innovation engage in open innovation activities and perceive they have control over conducting open innovation, even in difficult situations. R&D professionals who engage in open innovation do not refrain from conducting open innovation even when coworkers disapprove. A few open innovation champions drive the open innovation project process. Factors that facilitate open innovation on the micro level are entrepreneurial skills and sales skills. Factors that facilitate open innovation on the organizational and environmental level are support from other managers in the firm and the munificence of the context.

Table 5.1
Research questions and answers per chapter

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Research question</th>
<th>Brief answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>What is the sequence between rational, intuitive, and political processes, and how does the interrelation of these processes influence innovation decisions?</td>
<td>The decision-making process that drives innovation includes these steps: First, managers use intuition to identify innovation interests and mobilize their energies. Next, managers engage in political activities to motivate others for their innovative endeavor and to circumnavigate organizational norms that counteract innovative behavior. Finally, rationality is used to formalize innovation activities and reach greater efficiency. Intuition and political behavior have a greater impact on innovativeness than rationality. Political behavior positively impacts innovativeness when decision makers communicate intuitions effectively throughout the decision process.</td>
</tr>
<tr>
<td>3</td>
<td>How does the decision orientation of the manager influence collaboration in R&amp;D projects?</td>
<td>Managerial decision orientation has a limited effect on project collaboration with external partners. Managers’ tendency to use rationality, intuition, or politics or to have a promotion or prevention focus does not significantly impact the breadth of project collaboration. However, when managers have a strongly rational decision-making style and a strong prevention focus, their projects involve less collaboration than when they decide less rationally or are less prevention oriented.</td>
</tr>
<tr>
<td>4</td>
<td>How does the belief system of an R&amp;D professional influence the implementation of an open innovation process?</td>
<td>R&amp;D professionals who hold positive beliefs, and thus, positive attitudes towards open innovation engage in open innovation activities and perceive they have control over conducting open innovation, even in difficult situations. R&amp;D professionals who engage in open innovation do not refrain from conducting open innovation even when coworkers disapprove. A few open innovation champions drive the open innovation project process. Factors that facilitate open innovation on the micro level are entrepreneurial skills and sales skills. Factors that facilitate open innovation on the organizational and environmental level are support from other managers in the firm and the munificence of the context.</td>
</tr>
</tbody>
</table>
Main findings

• Managers’ intuitions and political behavior determine the innovation process (Chapter 2).
  Individual decision making has limited influence on project outcomes (Chapter 3).
  Individual beliefs influence the decision-making process and may alter existing routines (Chapter 4).
• An ordering exists between incremental processes and synoptic processes. The first predominates in
  the fuzzy front end and the latter predominates when the situation is relatively well definable (Chapter
  2).
• While decision-making processes may occur simultaneously, the preferred process in innovative
  decisions is first intuition, next political behavior, and last rationality (Chapter 2).
  R&D and project managers use all three decision-making styles to a large extent; however, they rely
  most strongly on rationality, followed by intuition. They rely weakly on political behavior (Chapter 3).
• Managers who are good at communicating intuitions can help to reach effective political decisions
  (Chapter 2).
  Managers use a mixture of rationality, intuition, and politics (Chapter 2, Chapter 3).
  Application of behavioral decision-making theory, theory of planned behavior, decision-making
  styles, and regulatory focus theory to the context of R&D in technology intensive firms offers new
  perspectives (Chapter 2, Chapter 4, Chapter 3).
• Positive attitudes regarding open innovation and perceptions of behavioral control determine open
  innovation project process. The open innovation project process is contingent on open innovation
  champions (Chapter 4).
  In managers with a strong prevention focus, a rational decision making style negatively impacted
  collaboration. When rationality was low, managers with a high prevention orientation collaborated
  more than managers with a low prevention orientation. Overall, the influence of managerial decision
  orientation is limited (Chapter 3).
• A survey of 118 R&D managers within the Dutch technology-intensive sector collected data on
  individual precedents of the breadth of project collaboration (Chapter 3).
  Research models on in-depth case study research build the basis for quantitative methods (Chapter 2,
  Chapter 4).

Table 5.2

<table>
<thead>
<tr>
<th>Topic</th>
<th>Contribution</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic decision making</td>
<td>1. Revive the behavioral decision-making perspective</td>
<td>Managers’ intuitions and political behavior determine the innovation process (Chapter 2).</td>
</tr>
<tr>
<td></td>
<td>2. Integrate the synoptic and incremental perspectives on decision making</td>
<td>Individual decision making has limited influence on project outcomes (Chapter 3). Individual beliefs influence the decision-making process and may alter existing routines (Chapter 4).</td>
</tr>
<tr>
<td>Innovation process</td>
<td>3. Understand the process of innovation decision making</td>
<td>While decision-making processes may occur simultaneously, the preferred process in innovative decisions is first intuition, next political behavior, and last rationality (Chapter 2).</td>
</tr>
<tr>
<td></td>
<td>4. Understand the behavioral foundations of innovation decision making</td>
<td>R&amp;D and project managers use all three decision-making styles to a large extent; however, they rely most strongly on rationality, followed by intuition. They rely weakly on political behavior (Chapter 3).</td>
</tr>
<tr>
<td>Open innovation</td>
<td>5. Integrate the individual level of analysis to understand open innovation implementation</td>
<td>Managers who are good at communicating intuitions can help to reach effective political decisions (Chapter 2). Managers use a mixture of rationality, intuition, and politics (Chapter 2, Chapter 3). Application of behavioral decision-making theory, theory of planned behavior, decision-making styles, and regulatory focus theory to the context of R&amp;D in technology intensive firms offers new perspectives (Chapter 2, Chapter 4, Chapter 3).</td>
</tr>
<tr>
<td></td>
<td>6. Offer quantitative insights on open innovation by using a mixed-methods approach</td>
<td>Positive attitudes regarding open innovation and perceptions of behavioral control determine open innovation project process. The open innovation project process is contingent on open innovation champions (Chapter 4). In managers with a strong prevention focus, a rational decision making style negatively impacted collaboration. When rationality was low, managers with a high prevention orientation collaborated more than managers with a low prevention orientation.; overall, the influence of managerial decision orientation is limited (Chapter 3). A survey of 118 R&amp;D managers within the Dutch technology-intensive sector collected data on individual precedents of the breadth of project collaboration (Chapter 3). Research models on in-depth case study research build the basis for quantitative methods (Chapter 2, Chapter 4).</td>
</tr>
</tbody>
</table>
5.1.1 Answering the main research question

The main question this research sought to answer was “How do the decision maker and the decision-making process influence (open) innovation in technology intensive firms?” This dissertation presented three studies that drew upon psychological theory to investigate individual and process factors that influence innovation decision making in general and open innovation implementation more specifically. The results showed that intuition and political behavior have an important influence on the innovation process. Although decision orientation had only a limited effect on collaboration in innovation projects, the R&D professional’s attitudes about open innovation and perceptions of control regarding accomplishing open innovation had considerably more influence. Especially, professionals with favorable attitudes toward open innovation can play the role of open innovation champions to drive these projects. These results indicated that decision-making process characteristics and decision and behavior-specific dispositions such as attitudes towards the behavior are better predictors of innovative outcomes at the project level than general dispositional decision-making characteristics of R&D professionals such as decision orientation.

5.2 Theoretical implications

This section provides a discussion of the most important findings from the empirical papers represented in Table 5.1 and their general contributions organized by topics as shown in Table 5.2.

5.2.1 Strategic decision making

This dissertation contributes to the strategic decision-making literature by reviving the behavioral decision-making perspective and integrating the synoptic and incremental perspectives. Both contributions are described in this section.

Revive the behavioral decision-making perspective. All studies in this dissertation contribute to the discussion on the relationship between the individual and the organization begun with Herbert Simon’s book Administrative Behavior (1997) that was first published more than 60 years ago. Decision making is not purely a rational process, but includes cognitive and behavioral aspects that influence decision outcomes. This topic is especially relevant today, particularly in innovative contexts. Now, more than ever, it is necessary to understand the individual’s role in the innovation process. Innovation is moving towards a model marked by greater interconnectedness, increased worker mobility, and rapid technological developments.
R&D is an important function of strategy making because R&D decisions are important determinants of a firm’s future. Many decisions in R&D are based on unstructured problems, and therefore, call for an integration of the behavioral perspective. Today, innovation comes not only from closed R&D departments of a few large companies, but also from practically anybody who may participate in open source projects. Innovation can be conducted anywhere, at anytime, by anyone. This development presents multiple challenges to individuals and firms. If practically everything is possible, how can academia support individuals to make choices and firms to take advantage of such diversity? This dissertation helps to answer this question through an exploration of strategic decision making, taking into account the challenges today’s decision makers face with increased interconnectedness and collaboration. As recent strategic literature has shifted focus from decision-making theories to theories of learning and routines, some researchers have called for a revival of a behavioral decision-making perspective (Gavetti et al., 2007, 2008); this dissertation contributes to that revival in the following ways.

In Chapter 2, I stated that rationality in innovation decision making only marginally influences innovation outcomes. Decision-making processes that rely on a combination of rational, intuitive, and political processes lead to more innovative results than rational processes alone. Thus, this work adds findings on the composition of the decision-making process, a topic that has occupied academics of strategic decision making since the 1980s. In Chapter 3, I explored the impact of individual differences on project outcomes. I found a limited impact of the individual, which may indicate that many firms do not take full advantage of the diversity their employees may offer. Chapter 4 discussed R&D professionals’ individual belief systems and their influence on the open innovation project process. The findings indicate that innovative behavior at the project level is contingent upon a few individuals who proactively engage in such behaviors. Hence, individuals with positive attitudes may exert more influence on innovative outcomes than those who are reluctant to behave innovatively.

Therefore, through an exploration of the R&D managers’ role on the decision-making process and their influence on innovative outcomes, this dissertation combines theory from psychology, strategy, and innovation studies to contribute to reviving the debate on behavioral decision making and the role of the individual in innovation decision making.

*Integrate the synoptic and incremental perspectives.* Innovation decision making is complex and consists of interrelated processes that guide the project from the identification of an idea or need to development and finally to market launch. Key influencers in this process are decision makers’ intuitions, realizations, and experiences (Khatri & Ng, 2000; Langley et al.,
1995); the availability and analysis of relevant information; and the social interactions and power relationships among various decision makers (Nutt, 1993). Nevertheless, existing literature on strategic decision making for the most part has taken one of two perspectives: the incremental or the synoptic. The incremental perspective describes decision making as a gradual negotiation between actors, and the synoptic describes the process as marked by rational analysis. Only a few studies have looked at the interrelation between both perspectives (Dean & Sharfman, 1993b; Elbanna & Child, 2007), and researchers have speculated on the sequence of different approaches throughout the decision-making process (Dane & Pratt, 2007). However, so far there are no empirical studies regarding the ordering of different decision approaches.

Chapter 2 of this dissertation provided insight into this question. I found that a mixture of the synoptic and incremental perspectives might offer a more accurate picture of decision making and offered a model for the interaction between rationality (the synoptic perspective), intuition, and politics (the incremental perspective). These results indicated that innovation managers prefer to apply intuition first, followed by politics and then rationality. Hence, the incremental decision-making perspective predominates in the early phases of innovation projects and the synoptic in later phases. Chapter 2 also provided insights on the interaction between intuition and politics, which existing literature neglected in preference for the rationality-intuition dimension (for example, Agor, 1986; Dane & Pratt, 2009; Shapiro & Spence, 1997). The study indicated that communicating intuition might be an important determinant in the political process.

5.2.2 Innovation process

*Understand the process of innovation decision making.* While the technology and innovation literature has touched on aspects of decision making, the process perspective has been widely disregarded. The most popular approach towards this perspective comes from Cooper’s stage-gate model for new product development (see Cooper, 2008), which describes clearly definable stages in product development. Krishnan and Ulrich (2001) provided an additional approach to the topic of new product decision making with an overview of the most important decisions throughout new product development identified from the existing literature. However, both approaches fall into the rational perspective, in which decisions have clear beginning and ending points and follow a logical sequence of steps. Based on the research described in this dissertation, I argue that this rational conceptualization does not realistically portray innovation decision making. Strategic decision making has traditionally dealt with the question of the decision-making process in uncertain decision contexts. In this dissertation, I
combined literature from the fields of strategic decision making, technology, and innovation to provide insights on the decision-making process that would contribute to the area of R&D. This work follows the example of other recent studies that examined intuition in the “fuzzy front end” (Eling et al., 2014) of product development and intuition, rationality, and political behavior in a portfolio context (Kester et al., 2011). So far, no empirical studies have provided insight into the composition and sequencing of the decision making throughout the innovation process.

Chapter 2 provided insights into the decision-making process that guides innovation. The study described was especially concerned with innovative activities that are begun as autonomous initiatives. The most important finding was that decisions to innovate are initiated through the intuition that innovation is needed, followed by political activities to find allies and organize resources. Once these two processes are in place, R&D professionals construct more formal processes. Therefore, rationality becomes important in later phases of the innovation project, although it may be used in the intuitive and political process to construct proper and coherent argumentations. Chapter 2 showed that rationality might not promote innovation as well as intuition and political decision making, and that political processes are not necessarily damaging to innovation as some strategic decision-making literature has indicated (Elbanna & Child, 2007). Even more so, political processes are necessary to circumnavigate routines and rules that are harmful to innovation. The strategic decision-making literature finds good results for rational processes; therefore, a realistic theory of innovation decision making should include several perspectives.

This dissertation contributes new knowledge to the innovation process that may serve as a starting point for further research: It offers a research framework for innovation decision making (see Figure 2.1, Chapter 2) with operationalizations of the decision-making process dimensions and effects on innovative outcomes that may help future research to develop instruments to assess innovation decision making. It also contributes a model for innovation decision making (see Figure 2.4, Chapter 2) that may stimulate further research by testing and adjusting the model, if necessary. This work invites elaboration of a comprehensive theory on the innovation decision-making process.

Understand the behavioral foundations of innovation decision making. Research in technology and innovation, which has focused predominantly on firm- and product-related characteristics, can benefit from studies into the micro processes that integrate the role that individuals play in innovation and product development. Therefore, my study of innovation decision making drew upon psychological theories, such as the theory of planned behavior,
decision-making styles, regulatory focus theory, and behavioral decision making (see Chapters 2, 3, and 4). These theories either have not been applied or scarcely applied to the context of R&D management, yet they contribute a novel approach to understanding innovation decision making. My findings showed that the relationship between the individual and the innovation project is not straightforward; therefore, theories based on personal characteristics, such as decision-making styles and regulatory focus theory, should be applied with care because organizational factors also might have an important impact on whether people are able to act according to their personal inclinations. A solution to this limitation might be to integrate a large variety of moderating and mediating variables into quantitative research designs, but this approach may not be feasible because a complex system of several orders of moderating variables could emerge (Ajzen, 2005). Indeed, many individual characteristics emerged from my survey (see Chapter 3) that had insignificant effects on project collaboration; therefore, I sought alternative approaches that might yield insight into the individual’s role in innovative processes. The search brought me to consider the R&D managers’ behavior-specific dispositions (Chapter 4). Applying the theory of planned behavior, I assessed managers’ beliefs regarding open innovation, subjective norms, and behavioral control and found a considerable influence of managers’ positive attitudes and perceived behavioral control on open innovation project process.

Therefore, among this dissertation’s contributions to understanding the behavioral foundations of the open innovation process are the suggestions that theories regarding individual characteristics should be applied with care and that alternative approaches should be considered that take specific situations and specific activities into account.

5.2.3 Open innovation

Understand the individual foundations of open innovation implementation. Although research in the field of open innovation has increased considerably in the last decade, the micro level of analysis has not received as much attention (Chatenier et al., 2009; Gassmann et al., 2010; Teece, 2007; Vanhaverbeke & Cloodt, 2006). Middle managers, project leaders, and the engineering staff may play important roles in the transition from closed to open innovation. These individuals are responsible for realizing higher-order policies and strategies, the success of which largely depends on integration at the operational level (Floyd & Wooldridge, 1997). The extent to which knowledge is exchanged with external partners depends on the behavior of individual employees and managers who encourage such behavior. In Chapters 3 and 4, I looked at the R&D professional’s role in implementing open innovation.
Most R&D managers’ decision orientations did not significantly impact the integration of collaborative approaches at the project level (Chapter 3). However, when managers had a strong tendency to avoid negative outcomes (prevention focus) paired with a tendency to rely on rigorous analysis (rational decision-making style), they engaged in less collaborative efforts than when they engaged in less rigorous analysis. Additionally, when rationality was low, a strong motivation to avoid mistakes (high prevention focus) lead to more collaboration than when this motivation was low (low prevention orientation).

The failure to find more support for the influence of individual decision orientation on project collaboration was a starting point for Chapter 4, in which I discussed a wide variety of individual beliefs that influence open innovation. For example, findings indicated that some people hold negative attitudes towards open innovation because they do not believe collaboration partners can focus on a common goal and because they do not want to become attached to an external partner. In addition, the amount of control that R&D professionals perceive they have to engage in open innovation has an important impact on the open innovation process. The most important finding in Chapter 4 is that individuals with positive beliefs and attitudes towards innovation engage in open innovation, even when conditions are disadvantageous and coworkers are unsupportive. Hence, advocates of open innovation may overrule the skeptics. Previous research into the behavioral basis of open innovation has focused mainly on the not-invented-here (NIH) syndrome, which describes people’s tendency to reject ideas and technologies from outside their firm (Katz & Allen, 1982). This research transcends the NIH syndrome to develop and test theory based on different aspects of individuals’ beliefs and their impact on open innovation.

Finally, Chapter 4 includes insights regarding the role of team composition and professional competencies in open innovation. The findings indicated that multifunctional teams with technical, entrepreneurial, and sales skills are important for conducting successful open innovation. Also, organizational support and environmental munificence may have an important influence on whether open innovation can be implemented.

**Offer quantitative insights on open innovation.** In response to open innovation researchers’ call for more quantitative research on open innovation (Dahlander & Gann, 2010; West et al., 2014), I described such a study in which data was collected from 118 R&D managers in the high technology sector (Chapter 3). The findings indicated a limited individual influence on open innovation, and I offered explanations that might serve as a starting point for quantitative research based on more complex models to utilize managerial characteristics to
predict collaboration. Chapters 2 and 4 applied in-depth qualitative research designs that may serve as a starting point for developing quantitative research designs and hypotheses based on the models offered in both these chapters.

Chapter 2 offers a research framework to study innovation decision-making process (Figure 2.4) and a list of operations to measure the different concepts (Figure 2.3). The research framework can be tested and adjusted in future research if necessary.

Chapter 4 contributes a model of open innovation behavior with propositions that may be tested and elaborated in future quantitative research (Figure 4.5). It also contributes a list of beliefs that may be used to operationalize the variables in the model (Table 4.3) and may be easily transformed into a questionnaire to measure R&D professionals’ inclination to support open innovation.

5.3 Managerial implications

In addition to the theoretical implications described in the previous section, this research also offers important recommendations for practitioners. In this section, I return to the thought experiment offered in the introduction to describe the mindset of the innovative R&D professional. I then describe seven managerial recommendations for making effective innovation decisions and for conducting open innovation.

5.3.1 The mindset of the innovative R&D professional

In the introduction, I described an R&D director who is faced with the decision whether and how to pursue changes within his department’s innovative strategy. The theories examined in this dissertation can help to organize and manage such complex decisions. The results indicated that R&D professionals should develop “soft” decision-making skills to reach more innovative results in unstructured situations. Let me illustrate the process that might result from applying the knowledge obtained in this dissertation. Imagine the following the situation:

You are the director of an R&D department in a multinational technology-intensive firm. Following a financial crisis and changes within your industry, you have fewer resources with which to come up with a new product. Based on the strategic decision-making literature, you have three options: using rationality, listening to your intuition, and/or engaging in political behavior. You decide to prioritize your intuition before taking any further steps.
Before discussing your concerns with your colleagues, you turn off your phone and take a walk or sit in a quiet space to meditate about the question. You consider the whole situation, rather than single aspects of the problem. As thoughts appear and disappear, you are aware of your body’s signals: You might identify them as stress, tension, and despair, or excitement, enthusiasm, and serenity. Let’s say the notion of open innovation suddenly presents itself as a possible solution to your problem: building a network together with diverse partners. You might not even be sure how open innovation really works or is implemented, but you have a hunch it might offer a way out.

Of course, it is also possible that you have no such feeling, and instead become more and more confused or even fearful that there is no solution. In this case, you may think of people inside or outside your firm who are experienced in managing comparable change and ask them for their input. Preferably, these “experts” do not have a personal interest in the solution to your problem, but can offer opinions and hunches about possible solutions. The conversation should not in the first place be about facts, numbers, and knowledge or to design scenarios and calculate outcomes; rather, you should draw upon the expert’s experience to imagine scenarios and to communicate hunches that you both feel.

At some point, either after taking time alone or talking to experts, your intuition will direct you to the next step. Let’s say that step is to develop open innovation within your department.

You now enter the second stage of the decision-making process, which is taking political action. Previously, you consulted people inside and outside your firm who may have had a stake in open innovation. At this stage, you are interested in understanding how other people view open innovation. Ideally, colleagues and higher management would support your initiative and offer support and resources. However, the idea is likely to meet some resistance, as new ideas often do. Perhaps a group of professionals is particularly strongly opposed to such an initiative. You engage in dialogue with these individuals, not to convince them at first, but rather to discover their beliefs regarding open innovation. Knowing that people with opposing beliefs can be reluctant to influence each other to adjust their beliefs, you hire a coach to ensure everyone is heard. A coach has the advantage of being neutral and will not insert personal
interests into the discussion. The coach can ensure that people do not state feelings as facts, but verbalize them as personal intuition and beliefs. At the end of the process, you have succeeded to establish a common goal with other important stakeholders, although you will not be able to convince everybody in the firm.

To be able to maintain your decision autonomy and experiment with the project, you decide not to involve higher management in the initiative because you have a strong intuition that they may stop the initiative in its early stages. Because you act in the firm’s best interests and do nothing illegal, you believe your behavior will help the initiative to grow. You are aware that you will need higher management’s support later and hope to convince them with your early success.

However, if your political action and open dialogue does not lead stakeholders to express their intention to participate and take proactive steps toward open innovation, you will have to cancel the initiative and return to the first step to find another strategy. Let’s imagine that this is not the case, and a substantial number of professionals are enthusiastic about the idea. In this case, you set up a multifunctional team with people who are intrinsically motivated to participate in open innovation (they believe open innovation is fun). You make sure people with technical, sales, and entrepreneurial skills are involved. You encourage them to use their intuition and to try to achieve the best possible outcome.

So far, you have focused on intuition and politics, have set up an open innovation team, and have encouraged different stakeholders to exchange their beliefs and to formulate a common objective. You believe that you are in control to implement open innovation successfully and avoid firm policies that may stagnate the project in the early phases.

The third stage in your decision making starts once the project is put into practice and you and your team have experimented with different approaches. At this point, processes are more formalized as you set up steering groups to develop new projects, distribute clear responsibilities, collect data and results, and keep stakeholders informed.
Stages overlap to some extent. For example, gathering information regarding open innovation will be necessary in early stages, and intuition and communication also contribute in later stages. In addition, as the initiative manager, you are tolerant towards autonomous initiatives from other employees and colleagues even when they do not fit with established routines.

This illustration offers an example of the R&D professional’s mindset when initiating an innovative project within a firm. Of course, the open innovation initiative’s success is not solely dependent upon the R&D professional’s decision-making approach, but is also affected by external factors, such as support within the firm and the availability of partners and resources.

Rather than a results-oriented approach, this illustration describes a process-oriented approach to unstructured problems with no right or wrong answers to which the R&D professional may use intuition to solve. Second, the approach includes a phase of influencing, marked by political behavior, to ensure that enough stakeholders are on board with the identified solution. Finally, the approach has the necessity to formalize the processes of the innovative project, which may include decision making that involves rational strategies to a much larger extent than in earlier phases.

In some cases, the project might be stopped in the early stages of the process. The individual manager must decide when the negative results outweigh the positive and when to stop a new initiative. This decision may be based on intuition, politics, or rationality, or a combination of all three.

5.3.2 Recommendations to make effective (open) innovation decisions

Based on this research, I offer seven managerial recommendations, four concerning effective innovation decision making in general and three concerning the implementation of open innovation.

*R&D professionals should detect and communicate intuition effectively.* Findings from both the survey and the case study indicated that managers and engineers in R&D trust their intuitions and act upon them. However, the case study also indicated that R&D professionals often disguise their intuition as rational arguments. Instead of saying “I feel” or “my impression is,” they look for facts and information to support their intuition, which they then present as fact. As a result, a problem may arise when two or more managers have strong but contradicting intuitions. Presenting these intuitions as facts can hinder open communication about hunches and beliefs, keeping them under the surface as the debate circulates around so-called facts that
are actually pretexts. In response, managers might intensify their political efforts to promote ideas that represent their personal beliefs rather than those a majority in the firm hold, and ultimately, implementation of decisions may stagnate. A solution lies in teaching managers about the purpose and accuracy of intuition so that they can detect and express their intuitions and listen to those of others. Higher management also could support decisions that rely on experts’ intuitions.

*Include facilitators in the decision-making process.* The facilitator may be a manager from within the firm or someone from the outside, such as a coach or consultant. A facilitator can ensure that each decision maker is heard and expresses a point of view. Many times people tend to be judgmental, but independent individuals can break such patterns.

*Be tolerant towards political behavior.* The studies indicated that decisions in early phases of an innovation project are hard to define, and intuitive and political approaches can lead to better decision making. At this stage, higher management should refrain from establishing strict routines and should tolerate “bootlegging” or “guerilla” activities, meaning autonomous activities at lower levels of the firm. This research indicated that disobeying rules might be necessary to conduct innovation.

The findings also indicated that political behavior is the least preferred strategy among R&D professionals. Political behavior is likely to have a negative connotation for most people because they associate it with power struggles between different interests in which the needs of the more powerful group receive priority over those weaker groups. When that occurs, decisions may be nonsensical for most persons and convenient for a few influential individuals. However, it does not have to be this way. Instead, professionals could realize that pursuing one’s own goal can be legitimate, and other individuals are likely to do the same. Effective communication comes into play here: When R&D professionals invite professionals with other interests to sit across the same table and openly communicate their intuitions, motivations, and interests, these potentially conflicting interests can be included in the innovative strategy and possibly create a common goal. Thus, political behavior can be a highly effective approach to influence stakeholders in innovation decision making, if alliances, power, and interests are used as starting points to communicate effectively.

*Do not solely rely on stage-gate models, but stress rationality in later phases of the innovative project.* The findings indicated that innovation processes are rather incremental, and therefore, synoptic approaches such as the stage-gate model for new product development offer radical simplifications of the actual process. Managers should be aware that using such rational
approaches to managing innovation might limit the emergence of autonomous innovative projects. An overreliance on the stage-gate model may standardize innovation to an efficient level, but also may block innovative projects not yet formalized within the firm. However, as an innovation project moves towards more maturity, firms can implement rational decision techniques and more formal decision-making processes, which may improve the efficiency of the innovation. For example, managers can build processes with clear decision points and goals and establish steering committees to make these decisions. In such decision meetings, managers can offer a clear overview of alternatives and consequences. These formal processes also may have a political function: As other stakeholders are kept informed about the projects, they are more likely to offer support.

Stimulate positive beliefs about open innovation. An important finding for the implementation of open innovation is that people with positive attitudes may become proactively engaged in open innovation and people with negative attitudes may act unsupportively. As discussed in Chapter 4, individuals’ negative attitudes towards open innovation may come from concerns about the practice in general or the specific implementation in the company. They also may be afraid that relationships with external partners will lead to a loss of resources or unfair treatment. Hence, management could identify the reasons for any negative attitudes by raising consciousness about the underlying beliefs. The discussion in Chapter 3 revealed that there is a specific profile that is more open to collaboration than others. R&D professionals who strive to avoid mistakes (prevention focus) and do not rely on a high amount of rationality in their decision making (rational decision-making style) are especially prone to engage in project collaboration. Firms can take advantage of this tendency by stressing the importance of avoiding negative results and tolerating mistakes, and by accepting non-rational approaches to decision making, such as intuition.

Look for open innovation champions. Not every professional will embrace open innovation, but individuals with positive attitudes are likely to lead open innovation implementation even when others oppose it and even when organizational conditions are not supportive. Therefore, management could try to identify these open innovation leaders and give them the autonomy to make decisions that promote open innovation. When these individuals feel they are in charge of the situation, they will seek ways to implement their intentions.

Offer support and build the right open innovation team. Management seeking to stimulate open innovation should understand that investing substantial efforts increases the chances for success. For example, management could provide support from human resource management and allow a flexible approach that facilitates training and involving new employees
with various profiles because team composition is an important success factor in open innovation. Managers could build multifunctional teams that not only involve professionals with technical and engineering backgrounds, but also people with sales experience, a commercial mindset, and entrepreneurial skills.

5.4 Limitations and future research directions

Although this dissertation builds on rigorous and valid research, it has several limitations. In this section, I focus on limitations common to two or more studies and also make recommendations for future research.

First, a common criticism of case study research is that a limited number of organizational contexts does not permit the data to be more widely generalized, a limitation that may be applied to the findings discussed in Chapters 2 and 4, which were drawn from a single company. Nevertheless, the case study approach can provide rich descriptions of innovation decision making and allows researchers to follow decision making in real time, which are more reliable than retrospective accounts. This approach does justice to the complexity of decision making without artificially reducing it to analyzable units. Although I combined qualitative and quantitative approaches for this dissertation, my central aim was to expand the investigation to include a broad array of concepts (Greene et al., 1989). Therefore, my aim with the quantitative study (Chapter 3) was primarily to elaborate on related concepts described in Chapters 2 and 4, rather than to expand generalizability of the findings. In future studies, researchers could use survey designs to validate these findings empirically to see if the decision-making sequence identified in this study could be found in other organizations or if there are individual preferences for certain sequences, and to test the belief systems of open and closed innovation professionals proposed in Chapter 4.

Second, this dissertation departs from the assumption that human agency is essential for reaching different innovation outcomes and assumes that individuals’ role is to form and influence determinants such as organizational structure and dealing with existing resources. However, this research indicated that the relationship between individual characteristics and innovation outcomes is not as straightforward as previously assumed, and offers some possible explanations for this more complex relationship. Future research could link different levels of analysis to disentangle the relationship between the individual and organizational outcomes. Specifically, research could simultaneously examine the individual, team, and process perspectives to describe the interaction of individual characteristics with the group level and their influence on decision-making process and outcomes. Interesting research might include
conducting experiments to investigate the consequences of different decision-making processes and individual characteristics and their influences on innovation outcomes in a controlled setting. In combination with survey and case study research, such a design could establish causal relationships between decision making and decision outcomes and lead to a more complete understanding of the individual’s impact on innovative outcomes. To avoid research models that are too complex when studying individual characteristics and behavioral outcomes, researchers may look at behavior-specific dispositions, an approach I chose in Chapter 4. In summary, future research could adopt a multi-method, multilevel approach to understand how the micro processes of innovation connect to the macro processes using behavior-specific characteristics that may better predict organizational outcomes than individual characteristics.

Third, a limitation is innate to this dissertation’s multidisciplinary character. The integration of psychological theories with technology management and innovation provides new insights regarding the individual perspective of technological innovation, but also prevents an in-depth discussion of either concept. Consequently, the definitions of innovation and open innovation provided in Chapter 1 are rather broad and the empirical studies discussed do not explicitly distinguish between product or process innovation or between inbound and outbound innovation. This lack of differentiation is also because of the character of the collected data and the data collection context in which R&D professionals engaged in various types of innovation. Therefore, future research could differentiate between kinds of innovation in more specialized settings or study more mature stages in the development process. Despite the difficulties of a multidisciplinary approach, future research could push the integration of different fields, as increasingly specialized functions of society call for greater integration. Much can still be learned from psychology for application to technology and innovation, and this dissertation has only scratched the surface. Psychology also may gain from business literature, especially regarding openness towards methodologies such as case study research, which may help to further understanding of phenomena in their respective contexts. Despite psychology’s tradition of quantitative research, the field could take advantage of knowledge from business science regarding rigorous qualitative research.

Fourth, I adopted an internal perspective on open innovation as I sought to understand how firms implement open innovation and transform their innovation models. However, collaboration takes place between at least two parties, and therefore, future research could integrate the dyad level of analysis to discover how decisions are made between two or more partners. Such research could integrate findings from inter-group processes from social psychology. Platforms and innovation intermediaries also are on the rise (for example, the
software PIT) and offer an interesting research area. For example, Lettl et al. (2006) identified characteristics of lead users in radical innovation. Understanding truly open decision mechanisms constitutes a highly appealing field for future research.

5.5 Concluding remarks

With the development from fourth to fifth generation R&D, the locus of innovation has shifted from the firm to a network of actors, which requires R&D professionals to interact with a large variety of external partners, such as suppliers, competitors, and customers. The Internet and increased mobility makes connecting with others easier than ever before, and individuals and firms can take advantage of a wealth of possibilities and human capital. In such an interconnected world, the question arises how business and academia can help professionals to conduct innovative R&D. I believe the answer lies in stimulating and supporting individual competence in decision making.

The findings of this dissertation indicated that a few individuals can set an innovative process in motion—individuals who overcome numerous obstacles, sometimes offered by their own management, and who may keep their efforts hidden. Routines and behavioral standards in R&D organizations can be so firmly in place that only very few individuals may act according to their personal preferences in such an effective way that they are visible in the project outcomes. Daily, for the sake of efficiency, firms lose individual potential and diversity that can drive innovation. R&D professionals often have been extensively trained in rational thought and interact with machinery and technology programmed to act rationally. Professionals act in highly specialized fields that may not communicate with one another, and yet the interconnectedness of our world demands more interaction among professionals from different areas. Professionals must not only focus on solving technical problems, but also learn to be entrepreneurial and business-oriented. The R&D professional in today’s world must possess a mindset that values other cognitive modes besides rationality that make us human, and R&D organization must support professionals in this development.

Overall this dissertation emphasizes the importance of a behavioral study of technology and innovation management that integrates insights from different fields. Academia and the business world must work together to explore the individual R&D professional’s role and support initiatives instead of holding them back. Firms will take advantage of their internal diversity when they can include intuition into debates, exchange beliefs instead of only facts, and draw upon their employees’ personal interests and contacts. In order to innovate, firms should not manage their individuals, but individualize their management, and I believe academia
has a role to support firms in achieving this transition. Participating in change and innovation is a potential. Technological development makes it possible for greater numbers of people to participate in innovation and to establish new connections to make ideas work, which presents an opportunity for business and academia to take advantage of this rich diversity. Nevertheless, much research continues to focus on high-level mechanisms in firms rather than the role of human behavior, as if human behavior must be minimized for the sake of effectiveness. In a world flooded with information, it is not the lack of rational tools that prevents innovation, but our overreliance on them. With this research, I found the effects of intuition, political behavior, individual beliefs, and innovation champions to be significant. Therefore, when studying innovation, especially from a business science perspective, we must remember that innovation is importantly derived from social sciences and seek to investigate those aspects of human behavior that technology has not (yet?) replaced: intuition, beliefs, and social interactions.
REFERENCES


and Organizational Psychology (pp. 1–40). Chichester, UK: Wiley.


Eisenhardt, K. M. (1989a). Building theories from case study research. *Academy of


Giannopoulou, E., Yström, A., Ollila, S., Fredberg, T., & Elmquist, M. (2010). Implications of openness: A study into (all) the growing literature on open innovation. *Journal of


Inauen, M., & Schenker-Wicki, A. (2011). The impact of outside-in open innovation on


Jung, C. G. (1923). *Psychological types, or, the psychology of individuation*. In C.L. Cooper, & L. A. Pervin (Eds.), *Personality* (pp.28-39). London: Routledge


Mintzberg, H., Raisinghani, D., & Théorêt, A. (1976). The structure of ‘unstructured’


