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The value of business planning before start-up – A decision-theoretical perspective

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ABSTRACT

In this paper we analyze business planning from the perspective of the nascent entrepreneur. We measure its value for the entrepreneur at the point where he must decide whether or not to plan, and we contrast our results with empirical studies that compare firms' performance after market entry. Within a formal decision-theoretical framework we show that the value of planning is driven by the possibility of evaluating alternative actions and being able to improve strategies. Before market entry, the main purpose of evaluation is to pursue good and terminate bad business ideas. We show how the value of planning is determined by the venture under consideration and how it depends on the quality of planning. Our theoretical model yields several behavioral and statistical implications that we compare with empirical observations found in the literature. In particular, we show how our model of rational decision making can be used to explain important hypotheses and contradictory observations that have fueled the debate on business planning.

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1. Executive Summary

Although business plans have long been advocated as a crucial prerequisite for creating a successful new venture, there are critics in the entrepreneurship profession that seriously doubt whether business planning is, indeed, a worthwhile activity (Bhidé, 2003; Honig and Karlsson, 2004; Lange et al., 2007). The inconclusiveness of the empirical research on this issue has led to a more nuanced discussion of the business planning process, emphasizing that the value of planning depends on the specific planning activities, contingent on what the entrepreneur knows or has learned in the process (Shane, 2000; Honig, 2004; Gruber, 2007; Brinckmann et al., 2010).

The ongoing debate in the literature cannot be seen as purely academic, because it has far-reaching implications for how business plans are to be dealt with in practice, by those who are supposed to write as well as those who are supposed to read them. In our view, the value of business planning before market entry is given by the expected benefit of being able to make a better start-up decision, in particular by terminating poor venture projects before start-up. In order to illustrate and explain our view, we analyze in this paper the decision problem of the nascent entrepreneur before entering the market. Hence, we adopt an ex-ante perspective in contrast to most empirical analyses that focus only on the relationship between planning and ex-post market performance.

We introduce a decision theoretical framework that allows us to identify and measure the value of business planning as seen by the nascent entrepreneur. Although learning and reoptimization are likely to enhance market performance, we show that ex-post performance is only one argument in favor of the nascent entrepreneur's decision to plan the business before start-up. Relevant for the entrepreneur is also the value of being able to make a better ex-ante decision after planning, i.e., whether or not to enter the market.

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Indeed, from an ex-ante viewpoint, the main purpose of evaluative business planning, which provides better forecasts of the expected cash flows for a given business, is to obtain reliable signals concerning the future prospects of the planned venture and, thus, to reduce the probability of failure by keeping poor business ideas from reaching the market. As a consequence, those carefully planned projects that do become start-ups justify higher expectations, simply due to their higher (a-posteriori) probability of success after planning. Thus, for the individual entrepreneur, planning activities, which yield sufficiently precise signals, are unambiguously of value.

The rational decision model also enables one to analyze and understand sometimes seemingly irrational entrepreneurial decisions. For example, even when a venture has a negative expected payoff before planning, the expectations after planning may very well lead to rational start-up decisions. Empirical analyses, observing only the entrepreneur's market entry, might (incorrectly) attribute this behavior to entrepreneurial hubris or over-confidence. On the other hand, if, in the absence of planning, venture failure is more likely than its success, then a rational entrepreneur, who invests in planning activities, will more likely terminate the project than enter the market. Moreover, as we can show, the probability of termination rises with the quality of planning in a highly risky environment. Applied to a population of nascent entrepreneurs, this result implies that better planning will lead to an expected reduction rather than an increase in the number of start-ups. In addition, if planning is less than perfect, which is a reasonable assumption in the light of planning costs, the majority of all entrepreneurs, who have a business plan before entering the market, may nevertheless fail. These findings reveal that an observed negative correlation between business planning and market success for a sample of entrepreneurs with business plans tells us little about the value of business plans.

For a population of planning and non-planning nascent entrepreneurs, we can also show that, even if the majority of all nascent entrepreneurs plan their businesses, the majority of ex-post successful entrepreneurs may not have a business plan. This result is important for the interpretation of those empirical studies that have a bias towards successful entrepreneurs, due to the fact that failed entrepreneurs are more reluctant to respond to surveys. Here again, the observation that there are more successful entrepreneurs without a business plan than with one tells us little about the value of planning.

To sum up, our model of the rational entrepreneur, thus, supports the view that planning is useful. It also shows how planning might affect the entrepreneur's behavior. This perspective yields important implications for entrepreneurship research, teaching, and practice. In particular, our analysis reveals the value of planning skills in the entrepreneurial process, which is also well documented by empirical studies (Shane, 2000; Dencker et al., 2009). Planning skills reduce planning costs. Since high planning costs are the only convincing argument against planning, teaching business planning should be and remain a major objective of any entrepreneurship education program.

2. Introduction

The value of business planning has been subject to much controversy in the literature over the past years, where different empirical samples have been used to investigate whether it is worthwhile for nascent entrepreneurs to “look before they leap” (Gruber et al., 2008), or simply skip planning, go ahead, and “just do it” (Lange et al., 2007). Proponents of planning regard the business plan as a crucial prerequisite for creating a successful new venture. Indeed, this has been the message of mainstream entrepreneurship education over the past decade. The persistence of this perspective is documented in the various editions of prominent textbooks (e.g., Hisrich et al., 2006 or Timmons and Spinelli, 2007). Critics, in contrast, doubt whether writing a business plan is a worthwhile activity for new venture creation (e.g., Bhidé, 1994, 2003; Honig and Karlsson, 2004, or Lange et al., 2007).

Why should entrepreneurs have a business plan? Intuitively, there should be an advantage, some measurable value of business planning. One might expect to find that enterprises, founded with a business plan, will reveal a better market performance than those started without one. Accordingly, the majority of empirical studies on this issue take an ex-post, comparative view of the relationship between planning and performance. However, it is, in particular, with regard to this relationship that one finds the most and surprisingly persistent disagreement among researchers.

Delmar and Shane (2003), for example, reveal different channels through which planning has a positive impact on the business venture (see also Armstrong, 1982; Castrogiovanni, 1996; Shane and Delmar, 2004; Gruber, 2007, and Kraus and Schwarz, 2007). In contrast, Lange et al. (2007) find support for the hypothesis that “new ventures launched with formal written business plans do not subsequently outperform ones launched without them” (further prominent examples along this line include Bhidé, 1994, 2003 and Honig and Karlsson, 2004). Karlsson and Honig (2009) conclude from this debate that the empirical “research on the link between business planning and performance has, so far, been inconclusive.” Yet, Brinckmann et al. (2010) find in their meta-analysis of the empirical literature that the results do seem to point slightly in favor of planning. We generally share the latter opinion, although the empirical support found in the literature does not seem to have ended the debate.

In this paper we adopt a different perspective. Rather than compare start-ups' market performance, after or without planning, from an external perspective, we analyze the entrepreneur's decision to plan from his point of view. Planning is an activity that the entrepreneur will only choose to perform, if the benefits of planning outweigh the costs. In order to acknowledge the whole benefits, it is important to highlight two distinct but, nevertheless, interacting functions of business planning. On the one hand, business planning encompasses the creative *development* of a business opportunity, where the objective is to enhance the venture's market performance, both in terms of the probability of survival as well as the monetary outcome. On the other hand, business planning deals with the *evaluation* of a business opportunity, thus supporting the entrepreneur in his decisions on what to do next in the entrepreneurial process and, ultimately, on whether or not he should enter the market. Relevant for the entrepreneur, confronted with the decision to plan or “just do it,” is the informational value of being able to make a better decision after planning, e.g., whether he should enter the market or disband the venture.

In order to highlight this latter aspect, we impose in our analysis the assumption that business planning before a start-up has no influence on the ex-post monetary returns of the venture, which are assumed to be fixed through a given opportunity. In other words, we take it for granted that a successful venture will not be more successful with than without a business plan, and an unsuccessful venture will not fare worse without than with a business plan. If business planning then still has any significant value, this will not be due to opportunity development. Moreover, if business planning precedes market entry, then the outcome of this activity should assist the entrepreneur in his decision to enter the market. Consequently, the value of planning should become apparent before and not only after the entrepreneur decides to enter the market.

In order to quantify this value, we employ a decision-theoretic approach that forces us to specify precisely where in the entrepreneurial process business planning occurs, thus allowing us to determine the value of planning at this point in the process based on the entrepreneur's expectations. The formal structure enables us to quantify the information value of business planning and to identify its influencing factors. We explicitly show how the information value rises with the quality of planning. The specified decision model not only lets us see what the entrepreneur chooses to do, but also understand why he does it. This enables us to interpret empirical observations of entrepreneurial behavior and performance in the light of rationality. As we will show, even when planning has an unambiguously positive value, implying that it is the rational thing for the entrepreneur to do, the venture's ex-post actual performance, measureable for the outside observer, need not be better than without planning. Thus, our model helps to explain why empirical studies of ex-post performance may plausibly lead to controversial results.

The rest of the paper is organized as follows. In [Section 3](#), we discuss terminological aspects and review the existing literature in order to show how our approach fits into the picture. In [Section 4](#), we model and analyze the decision problem of a representative, rational, nascent entrepreneur, who is confronted with two choices. One is whether or not to enter the market with a new venture. The other is whether or not to plan the venture before making this market decision. In [Section 5](#), we analyze the information value of planning and show explicitly how it is related to the quality of planning. In [Section 6](#) we show how planning rationally affects entrepreneurial behavior in the start-up process. In [Section 7](#) we acknowledge the costs of planning and explain their effect on the entrepreneur's decision to plan as well as the quality of planning. In [Section 8](#) we use the previous cost analysis to look at a population of planning and non-planning entrepreneurs that differ only with respect to their planning costs and point out further implications of the rational planning model, which may be misinterpreted as evidence against planning by empirical analyses. [Section 9](#) concludes with a discussion of our results, implications, and possible extensions for further research. The formal proofs of all propositions are given in the [Appendix](#).

3. Perspectives of Planning in the Literature

The disturbing inconclusiveness of the empirical research on the relationship between planning and market performance, to some extent, appears to be the result of differing terminology and interpretations of business planning. In the present paper, we define a *business plan* as the outcome of a completed business planning process, which we discuss below. We, therefore, regard every entrepreneur with a business plan as having gone through a planning process. The completion of the business plan very often coincides with the decision to enter the market (cf. [Liao and Gartner, 2006](#)). Conversely, however, business planning does not necessarily yield a business plan, e.g., when the venture project is disbanded. Moreover, not everyone with a business plan will necessarily have a document to prove it. For the present discussion, we do not distinguish between having a business plan in one's head and having it in one's hand.

More recently, there has been a shift to a more nuanced discussion of what business planning is all about. [Honig \(2004\)](#) proposes a contingency-based planning approach, which allows the entrepreneur to follow different, sometimes cyclical, planning and learning patterns depending on the selected planning activities. Therefore, one must scrutinize the planning process in order to reveal where measurable value is created. [Gruber \(2007\)](#) empirically demonstrates the importance of unraveling the planning process, finding the relevance of planning to depend crucially on the type of planning activities as well as the founding environment. According to [Brinckmann et al. \(2010\)](#), measurable ex-post effects of business planning seem to be related to the dynamic interaction of planning and learning. Intuitively, the quality of decisions in a planning and learning environment should depend on the decision maker's, i.e., the entrepreneur's, prior knowledge and experience. This has, indeed, been confirmed both for the discovery (cf. [Shane \(2000\)](#)) as well as the exploitation (cf. [Dencker et al. \(2009\)](#)) of opportunities, measured on the basis of ex-post market performance.

The relevance of learning for the value of planning brings into focus the importance of evaluation and decision making, because contingencies only have a measurable impact if they affect the entrepreneur's decisions on what to do next. In order to be able to measure this value, one must acknowledge the set of alternatives, including those that are not chosen. As [Gruber et al. \(2008\)](#) have found, entrepreneurs who are able to select among multiple available business opportunities tend to fare better in terms of ex-post market performance than those with only a single option. It is important to note that this observation implicitly confirms rational choice behavior, because multiple opportunities can only systematically improve performance, if the entrepreneur is able to distinguish between better and worse opportunities and then rationally chooses a better one. Analogously, [Dencker et al. \(2009\)](#) find that start-up firms that change their product line have a higher probability of survival. Again, there is the underlying assumption, that these firms, first, can identify and, second, will choose the better product-line. More generally, [Mullins and Komisar \(2009\)](#) also presume rational decision making when they state that entrepreneurs in the planning process typically benefit from switching to a new plan "B", thus improving on a given strategy path. As [McGrath and MacMillan \(2000, p. 338\)](#) point out, "The things you elect not to do are as much a part of your entrepreneurial mindset as the things you elect to do." According to these views, the entrepreneurial mindset presupposes rational decision making.

In the present paper, we wish to theoretically analyze and quantify the value of planning that is given by the benefit of being able to rationally choose a superior and, thereby, avoid an inferior alternative. Business planning, in this sense, comprises what Arora and Fosfuri (2005) refer to as “diagnostic information.” In a situation of uncertainty, the value of planning is given by the entrepreneur’s possibility of learning more about the consequences of alternative actions before making the next move. The quality of planning is then given by its reliability in assessing the venture’s market prospects. For the entrepreneur, planning quality is characterized by the validity of the encouraging (go) or discouraging (stop) signals received from the business analysis, where both are equally important for the planner. Hence, it is insufficient to observe only the performance of those entrepreneurs that have followed the “go” signals and entered the market. For an appropriate assessment one must look at the complete decision context with all alternative actions, in particular before, and not only after the entrepreneur decides to enter the market.

4. The Decision Problem of the Nascent Entrepreneur

Consider the decision problem of a representative entrepreneur before a start-up. Since business planning helps to substantiate the consequences of action, it is natural to place the decision to plan before the decision to initiate the start-up. The sequential structure of the entrepreneur’s decision problem is described by the decision tree depicted in Fig. 1, where the squares, circles, and triangles denote decision, chance, and payoff nodes, respectively.

Consider first the case where the entrepreneur decides on the start-up of the venture without prior business planning. We assume that the implementation of the business idea in the form of a new venture requires an initial investment I , where the returns of the investment are uncertain at the time when the investment decision is made. Without loss of generality, we reduce the more complex situation with multiple possible outcome scenarios to a setting with only two states. With the probability $p_S \in]0, 1[$ the start-up will generate a stream of future receipts, yielding a present value of V_S which is higher than the initial investment I , such that the resulting net present value NPV_S is positive, i.e., $NPV_S = -I + V_S > 0$. We, therefore, define this state as a ‘success’. With probability $1 - p_S$, the start-up will turn out as a ‘failure’, generating a lower present value of V_F , such that the corresponding net present value NPV_F is negative, i.e., $NPV_F = -I + V_F < 0$. The reference alternative to starting a business has a net present value NPV_0 , which we normalize at $NPV_0 = 0$.

For expositional convenience, suppose that the decision maker is risk neutral, since we are mainly interested in the qualitative nature of the entrepreneur’s decision problem, rather than the quantitative assessments of his actual decisions. The entrepreneur will choose to initiate the start-up if, and only if, the expected net present value of the start-up is positive, i.e., $p_S V_S + (1 - p_S) V_F - I > 0$. If the net present value of the start-up is negative, the nascent entrepreneur will choose the reference alternative, meaning that the current start-up project is terminated. Of course, the entrepreneur could reconsider the start-up later with a further developed project. However, we regard this as a new decision problem with a new start-up project.

Consider now the case, shown in the upper branch of Fig. 1, where the entrepreneur first plans before he decides on starting the business. The purpose of business planning is to analyze the chances of initiating a successful venture. Therefore, the entrepreneur expects to receive some signal regarding the prospects of the venture. For simplicity, we assume that business planning results in two alternative signals, positive or negative.

After a signal is obtained from planning, the terminal actions are the same as before: On the one hand, the entrepreneur can choose the reference alternative, i.e. no start-up, yielding a net present value of zero. On the other hand, the entrepreneur can go ahead with the start-up, where the venture may turn out a success or a failure. Note that, in both cases, the present value of the venture, i.e. V_S or V_F , is unaffected by business planning. Thus, following our line of argument in the previous section, we explicitly assume that planning does not affect the quality of the business idea. The sole purpose of planning in our context is to evaluate the opportunity and update the chances of success before making the decision to start. If the signal (Positive or Negative) obtained

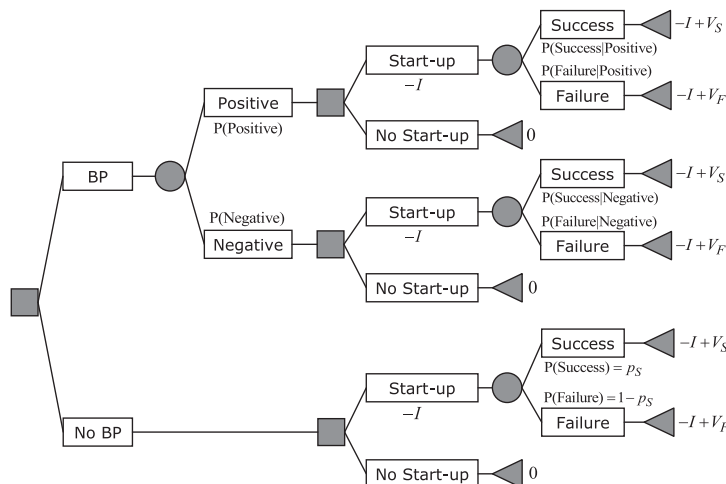


Fig. 1. The decision to plan before starting.

from planning has any relevance for the entrepreneur's decision, then the (a-posteriori) conditional probabilities of success and failure, i.e., after observing the signal, will differ from the (a-priori) unconditional probabilities that were given before planning.

In our setting, the quality of planning is given by the likelihoods, q_S and q_F , of being able to identify in advance successful or unsuccessful business ideas, respectively. These likelihoods are given in Table 1, where 'Success' and 'Failure' characterize the actual, ex-post, realization of the business idea, and 'Positive' and 'Negative' are the two alternative signals obtained from planning.

One can consider different plausible constellations of q_S and q_F , reflecting whether it is easier to detect successes ($q_S > q_F$) or failures ($q_F > q_S$). Both likelihoods characterize the quality of planning and, together, determine the entrepreneur's decision behavior. Note that the condition $q_S + q_F > 1$, which is equivalent to $q_S > 1 - q_F$ or $q_F > 1 - q_S$, states that the likelihood of a correct diagnosis is higher than the likelihood of an incorrect diagnosis, meaning that planning is better than guessing.

For his decision on whether or not he should enter the market, the entrepreneur is interested in the expected net present value of implementing the start-up. This critically depends on the probabilities of success and failure, conditional on the signal of business planning. Given our characterization of planning quality in Table 1, we can calculate these conditional probabilities with Bayes' rule:

$$P(\text{Success}|\text{Positive}) = \frac{q_S p_S}{q_S p_S + (1 - q_F)(1 - p_S)}, \tag{1}$$

where $P(\text{Failure}|\text{Positive}) = 1 - P(\text{Success}|\text{Positive})$, and

$$P(\text{Success}|\text{Negative}) = \frac{(1 - q_S) p_S}{(1 - q_S) p_S + q_F (1 - p_S)}, \tag{2}$$

where $P(\text{Failure}|\text{Negative}) = 1 - P(\text{Success}|\text{Negative})$. From the denominators of the conditional probabilities in Eqs. (1) and (2) we can also directly infer the probabilities of the two planning signals,

$$P(\text{Positive}) = q_S p_S + (1 - q_F)(1 - p_S) \tag{3}$$

and

$$P(\text{Negative}) = (1 - q_S) p_S + q_F (1 - p_S). \tag{4}$$

From Eqs. (1) and (2) one can verify that planning, if it is better than guessing (i.e., $q_S + q_F > 1$), lets the conditional (a-posteriori) probabilities of success deviate from the a-priori probability p_S , such that $P(\text{Success}|\text{Positive}) > p_S > P(\text{Success}|\text{Negative})$. Moreover, the difference between the two conditional probabilities, given in Eqs. (1) and (2), increases as the quality of planning, i.e., q_S or q_F , rises.

Our simple model, thus, provides a rational explanation for the observation made by Cooper et al. (1988), stating that most (68%) entrepreneurs "perceived their odds for success as better than others" in a similar business. If an entrepreneur entering the market perceives his own odds for success as $P(\text{Success}|\text{Positive})$, with the general odds given by $P(\text{Success}) = p_S$, the difference in perception, in the present setting, is simply the logical consequence of planning. Hence, this perception does not require cognitive dissonance, hubris, or other psychological aspects that Hayward et al. (2006), for example, see as characteristic for entrepreneurial decision making. According to the research agenda of Shane and Venkataraman (2000), one of the basic questions of entrepreneurship is "why some people and not others exploit opportunities." A simple, rational explanation could be that some people are just better in assessing the prospects of ventures than others, i.e., in our setting, their planning is characterized by higher planning quality. The deviation of the conditional probabilities in Eqs. (1) and (2) from their a-priori value p_S also offers a rational explanation for why Townsend et al. (2010) find that the a-priori probability of success (referred to as 'outcome expectancy') loses its relevance for influencing the entrepreneur's decision to initiate the venture, once the entrepreneur's quality of planning (belonging to what the authors refer to as 'ability expectancy') is taken into account.

5. The information value of planning

With the formal characterization of the entrepreneur's decision situation, we can now derive the information value of business planning. Intuitively, planning will have a positive value, if it affects the entrepreneur's behavior, i.e., if a positive signal induces the entrepreneur to initiate and a negative signal induces the entrepreneur to terminate the start-up. More specifically, the

Table 1
The information structure.

		States	
		Success	Failure
Signals	Positive	q_S	$1 - q_F$
	Negative	$1 - q_S$	q_F

relationship between the information value and the quality of planning, which we denote by $\Omega_{BP}(q_S, q_F)$, is summarized in the following proposition.

Proposition 1. *The information value of business planning, $\Omega_{BP}(q_S, q_F)$, is greater than zero, if planning qualities exceed minimum levels q_{Smin} and q_{Fmin} , which are jointly determined by the parameters of the venture and are linearly related. For $q_S > q_{Smin}$ and $q_F > q_{Fmin}$ the information value $\Omega_{BP}(q_S, q_F)$ increases linearly with both planning qualities.*

According to [Proposition 1](#), planning is not advantageous per se, but requires minimum planning quality in order to be of any positive value to the entrepreneur, where the minimum quality levels q_{Smin} and q_{Fmin} are jointly determined by the venture under consideration. Intuitively, if the quality of planning is too low, then the signal that the entrepreneur receives is too imprecise to yield distinguishable implications. Consequently, he will do whatever he would do without planning, implying that planning is of no value to the entrepreneur.

The specific advantage of business planning depends on the situation without planning, where one must distinguish between two cases:

- i. $p_S V_S + (1 - p_S) V_F - I > 0$: If starting a venture without planning has a positive expected net present value, implying that the entrepreneur would be willing to enter the market without planning, then the advantage of planning is to identify and *stop* seemingly unsuccessful ventures.
- ii. $p_S V_S + (1 - p_S) V_F - I < 0$: If starting a venture without planning has a negative expected net present value, implying that the entrepreneur would not be willing to enter the market without planning, then the advantage of planning is to identify and *start* seemingly successful ventures.

Note that, in case *ii.*, starting a business is a priori unattractive. Nevertheless, for a sufficiently high quality of planning, the rational entrepreneur will initiate the venture, if he receives a positive signal. This behavior, again, has nothing to do with overconfidence, although the sole observation of the entrepreneur's entering the market might suggest otherwise (cf. [Camerer and Lovallo, 1999](#); [Hayward et al., 2006](#)).

In order to illustrate the impact of business planning quantitatively, we construct a numerical example of a representative entrepreneur, which we pursue parallel to our theoretical analysis. By calibrating the decision model with plausible, observable data, i.e. values for the parameters of the decision model that all lie well within the ballpark of empirical observations, we can quantify all relevant aspects of the entrepreneur's decision problem. Moreover, the calibrated model allows us to contrast the behavioral implications of the decision model with actual empirical observations.

Let the necessary investment in the venture be given by $I = 200,000$. The a-priori probability of success is assumed to be $p_S = 0.20$, where success yields a present value of $V_S = 800,000$, and failure results in $V_F = 100,000$. Hence, the expected net present value of the start-up is $p_S V_S + (1 - p_S) V_F - I = 40,000 > 0$, implying that the risk-neutral entrepreneur would initiate the venture without planning (this is case *i.* above), although the odds for a successful venture are quite low. If we assume further that $q_S = q_F = q$, the minimum quality of planning, for planning to be of any value for the entrepreneur's decision problem, is given by $q_{min} = 0.60$.¹

Suppose now that the entrepreneur has the possibility of planning with a quality $q = 0.75$, meaning that in three out of four cases the evaluation of the opportunity successfully forecasts the ex-post actual performance. Planning is, thus, better than tossing a coin, but far from providing a perfect forecast. Remarkably, for the individual entrepreneur who chooses to plan, the probability of a successful start-up increases by 115% from $p_S = 0.20$ to $P(\text{Success}|\text{Positive}) = 0.43$, while the probability of failure drops by almost 30% from $1 - p_S = 0.80$ to $P(\text{Failure}|\text{Positive}) = 0.57$, thus increasing the expected outcome of the venture, after receiving a positive signal from planning.

It is important to note, though, that the planning entrepreneur in our example has, ex ante, only a 15% chance ($P(\text{Positive}) \times P(\text{Success}|\text{Positive}) = 0.35 \times 0.43 = 0.15$) of being successful, which is even lower than the probability ($p_S = 0.20$) of implementing a successful venture without planning. This is because less-than-perfect planning with a quality of $q = 0.75 < 1$ entails the risk of incorrectly disbanding a good project. On the other hand, valuable business planning ($q > q_{min}$) also generates a lower probability of failure. In our example, the ex-ante probability of failure for the planning entrepreneur is only 20% ($P(\text{Positive}) \times P(\text{Negative}|\text{Positive}) = 0.35 \times 0.57 = 0.20$). Compared with the 80% chance of failure without planning, this is a considerable improvement, and it outweighs the reduced probability of success. The following proposition generalizes this observation.

Proposition 2. *If business planning is less than perfect in detecting potential successes, it will reduce the entrepreneur's chances of entering the market and implementing a successful start-up. However, if planning has a positive value, the chances of implementing a failure will be reduced relatively more.*

Nevertheless, even with valuable business planning, the entrepreneur who enters the market may still be likely to fail – in our numerical example the probability of failure after planning is $P(\text{Failure}|\text{Positive}) = 0.57 > 0.43 = P(\text{Success}|\text{Positive})$. This result can be stated more precisely by the following proposition.

Proposition 3. *If venture success is less likely than failure before planning ($p_S < 0.5$), then venture success will remain less likely after planning, if $q_S < 1 - p_S$ and $q_F < 1 - p_S$, i.e., if the quality of planning does not compensate the chance of failure.*

¹ q_{min} is calculated by setting $q_S = q_F = q$ in inequality. (6) in the [Appendix](#) and then solving for q .

Intuitively, even if planning is valuable, but not good enough to compensate the high risk of failure, the more likely outcome for the entrepreneur entering the market with a business plan may still be a failure rather than a success. In our example, with $q_{\min} = 0.60$ and $1 - p_S = 0.80$, the entrepreneur planning with quality $q = 0.75$ will prefer to plan, but, nevertheless, be more likely to fail than to succeed.

This theoretical result has an interesting empirical implication: For any sample of entrepreneurs with a business plan, the value of business planning cannot be inferred from the share of entrepreneurs that are successful in the market. In other words, a negative correlation between business planning and market success in a sample of entrepreneurs with business plans tells us little about the value of business plans. Hence, one must be cautious in drawing pessimistic conclusions from samples of business planners that fail (e.g., Karlsson and Honig, 2009).

Proposition 3 assumes that, a priori, success is less likely than failure. Since the probability of success, p_S , will depend on the nature and environment of the start-up project, as well as the time horizon under consideration, the empirical evidence is mixed. According to Headd (2003), the widespread belief that business failure is very high seems to be related to the official statistics on business closures, which are often misinterpreted as failures. He points to independent statistics revealing that up to 75% of start-ups survive the first two years, indicating a high value of p_S , while after six years 40% are still in business, i.e. less than half. Brüderl et al. (1992) identify several influencing factors for firm failure, the mortality rate being highest within the first year. Nevertheless, even after five years, more than 60% of the start-ups they studied were still in business. Strotmann (2007) obtains similar values, but also finds that less than half are still around after ten years. Åstebro (1998) holds a more pessimistic view, finding that less than half survive at least four years. Since venture failure in our setting only refers to a negative net present value, rather than insolvency, a low value of $p_S < 0.5$ seems to be justified even for shorter time horizons.

6. The effects of planning on entrepreneurial behavior

As our numerical example from the previous section reveals, the positive information value of planning also induces several noteworthy effects on the entrepreneur's behavior. When planning is valuable, $P(\text{Positive})$ becomes the probability of implementing the start-up, while $P(\text{Negative})$ characterizes the probability of termination. In the process of planning, with $q_S = q_F = q = 0.75$, the nascent entrepreneur is quite likely (with a probability of 65%, cf. Eq. (4)) to terminate his project, due to a negative signal. With a probability of only 35%, he will actually enter the market to become an entrepreneur. The following proposition captures this feature more generally.

Proposition 4. *If venture success is less likely than failure before planning ($p_S < 0.5$) and, if the entrepreneur is at least as good at diagnosing failures as successes ($q_F \geq q_S$), then planning, which has a positive value, will more likely lead to termination of a project than to market entry.*

Critics of business planning (e.g., Lange et al., 2007) suspect that planning is time consuming and just keeps entrepreneurs from starting their business. As Proposition 4 reveals, there is a good reason for this: Good planning enables the entrepreneur to improve his chances of success by allowing him to exit an unsuccessful venture before entering the market. Despite Bhidé's (1994) general criticism of business planning, it is this capability of sorting out the many poor and detecting the few good ideas that he finds to be characteristic for successful entrepreneurs. Indeed, as Proposition 4 highlights, being able to sort out is at least as important as being able to detect good ideas. In the light of Proposition 4, it therefore appears cynical to urge nascent entrepreneurs to start without planning.

If we extend our numerical example to a population of identical planning nascent entrepreneurs, we see that, on average, only 35% will enter the market. With the underlying parameter values, this share is well in line with empirical estimates. For example, Åstebro (1998) reports different studies showing that significantly less than 50% of nascent entrepreneurs succeed in starting a new firm. Our simple decision model, calibrated with realistic parameters, thus, yields plausible behavioral outcomes.

According to Proposition 4, a crucial aspect of business planning is that it helps to keep entrepreneurs with bad ideas from entering the market. Therefore, one might assume that better business planning should be even more effective in preventing bad business ideas. The following proposition provides a formal statement on this issue.

Proposition 5. *A higher quality level q_S unambiguously raises the probability of implementation, while a higher quality level q_F unambiguously raises the probability of termination. If both quality levels rise by the same amount, the termination (implementation) of the venture becomes more likely, if, and only if, the probability of success before planning, p_S , is lower (higher) than the probability of failure.*

Proposition 5 directly links the quality of planning to the entrepreneur's start-up decision. Whether higher planning quality, that affects both q_S and q_F , increases the entrepreneur's propensity to enter the market or to disband the project, sensitively depends on the a-priori probability of success, p_S .

It is interesting to contrast this theoretical result with the empirical study of Delmar and Shane (2003), who find that (better) business planning reduces the hazard of disbanding the venture. According to Proposition 5, this result can be expected when better planning mainly leads to a higher level of q_S , or, when q_S and q_F are affected symmetrically, and ventures are, a priori, more likely to succeed than to fail. However, with an a-priori probability of success lower than 0.5, our model predicts that better planning is more likely to induce nascent entrepreneurs to disband their projects. One must acknowledge, though, that there are two possibly counteracting effects at work, due to the two functions of business planning that we discussed in Section 2. While our

focus here is on updating probabilities through opportunity evaluation, Delmar and Shane (2003) focus their study more on value enhancement through opportunity development.

If planning quality rises with the time spent on planning, these results also explain why longer planning may reduce the entrepreneur's propensity to initiate the start-up. According to Townsend et al. (2010), a longer time spent on planning reduces the entrepreneur's outcome expectancy, because windows of opportunity close if the start-up is delayed. From a different angle, Proposition 5 states that, if outcome expectancy (p_S) is low to begin with, then longer planning will increase the nascent entrepreneur's probability of receiving a negative signal and, therefore, terminating the project.

While Proposition 5 relates the quality of planning to the individual entrepreneur's start-up decision, we can also apply this statement to a population of planning entrepreneurs to immediately obtain the following implication.

Corollary. *If for all nascent entrepreneurs the probability of success, before planning, is lower (higher) than the probability of failure, then an increase in the quality of planning ($dq_S = dq_F > 0$) will lead to a reduction (an increase) in the number of start-ups.*

This corollary has important implications for the support and promotion of start-ups, because it reveals that, in an environment with less-promising start-up projects, i.e., where $p_S < 0.5$, the improvement of business planning, e.g., through training, coaching, or support tools, may conflict with the political objective to create more start-ups. This can become frustrating for facilitators that are typically judged by the number of successful start-ups they have supported, rather than by the number of venture failures that they could prevent.

7. The costs of business planning

The information value of planning that we analyzed in the previous section was defined as the expected benefits of planning minus the expected benefits of not planning. As we showed in Proposition 1, the information value rises with the quality of planning. Consequently, the entrepreneur should aim for the highest planning quality, yielding a nearly perfect signal concerning the success of the venture, if planning were costless.

Yet, there are costs of planning, which we have omitted in our previous analysis. Planning requires time, effort, or money, which result in direct cash-based accounting costs. Moreover, opportunity costs play an important role. Firstly, since detailed planning activities take up time, the start of the project is delayed causing interest expenses and a decline in the present value of the future receipts over the planning time. Thus, we have a pure time-delay effect, where the discount in the expected net present value occurs even if the structure and size of future cash flows from launching the business idea remain unchanged. Secondly, during the planning process the market conditions could change, e.g., because new competitors enter the market. This could reduce the expected receipts, implying a "shrinking of the cake." In our model, we capture the corresponding loss of net present value in the cost function in order to neatly separate the value from the costs of planning.

Business planning might entail fixed costs, e.g., given by the necessity of basic planning materials, such as books, spreadsheets, templates, check lists, etc. There are also quality dependent variable costs. It is plausible to assume that accounting and opportunity costs increase with the quality of planning. Sometimes they are increasing at increasing marginal costs, e.g., the discount in the expected net present value increases disproportionately to the planning time. Moreover, one may also assume that perfect foresight ($q_S = 1$ and $q_F = 1$) is prohibitively costly. A plausible cost function with increasing marginal costs is shown in Fig. 2, where we assume for expositional convenience that $q_S = q_F = q$, and that the quality dependent costs of planning are characterized by the function

$$C : [0.5, 1[\rightarrow \mathbb{R}, \text{ with } C(0.5) > 0, C'(q) > 0, \text{ and } C''(q) > 0.$$

By comparing the costs with the information value $\Omega_{BP}(q)$, which rises linearly in q , one obtains the net benefit of planning, $\Pi(q) := \Omega_{BP}(q) - C(q)$. The relationship between the three corresponding curves is illustrated in Fig. 2. If there exists a range of planning quality, over which the net value of planning is positive, then the optimal quality of planning, q^* , is determined by the maximum net value.²

However, if the costs of planning are so high that they exceed the information value for all levels of $q > q_{\min}$, then the nascent entrepreneur will abstain from planning. If the a-priori expected net present value is positive ($p_S V_S + (1 - p_S) V_F - I > 0$), the entrepreneur will start without planning. Otherwise, if faced with a negative expected net present value ($p_S V_S + (1 - p_S) V_F - I < 0$), he will refrain from starting a business altogether.

Applied to a population of nascent entrepreneurs, the absolute costs of business planning have a significant impact on the number of entrepreneurs who choose to plan. In addition, the costs determine the quality of planning and, thereby, the number of start-ups.

8. Populations of planning and non-planning entrepreneurs

In order to broaden our discussion, we next construct a hypothetical world consisting of both planning and non-planning entrepreneurs, who can only be distinguished by their costs of planning. Hence, some entrepreneurs choose not to plan, but only

² Note that a convex cost function is not critical to our analysis. Other curvatures of the cost function would work just as well to determine an optimal level of planning, but might require a case discussion, due to the possibility of corner solutions.

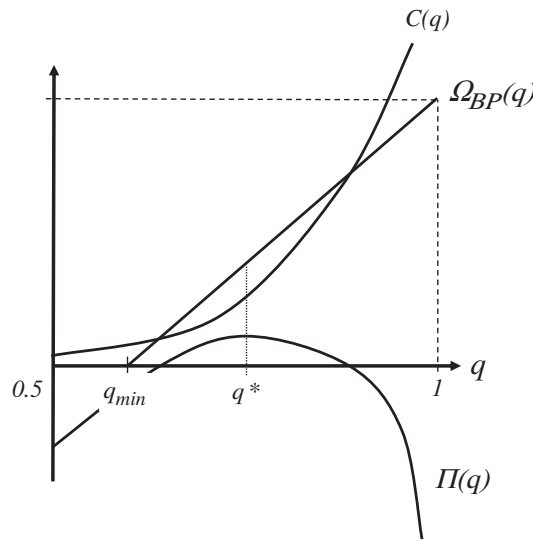


Fig. 2. The costs of planning and the optimal planning quality.

because their planning costs are too high. Again, by calibrating our decision model with plausible, observable data, we can deduce statistical implications from a decision context, in which planning is valuable by assumption, and contrast these with actual empirical observations.

Consider a start-up environment consisting of n nascent entrepreneurs, for whom we impose the assumption of rationality. As we have shown in the previous section, the only plausible reason for an entrepreneur not to plan is that the pecuniary and opportunity costs of planning outweigh the information value. Nevertheless, we must acknowledge that for some nascent entrepreneurs planning is just too costly for any planning quality.

We continue to assume that the a-priori expected net present value of the venture is positive for all n entrepreneurs, i.e., $p_S V_S + (1 - p_S) V_F - I > 0$, so that planning is not a necessity for starting a venture. Indeed, if the a-priori net present value of the project were negative, one could argue that the entrepreneur is forced to redevelop the project. However, we excluded this creative type of planning from our analysis, to avoid giving planning an extra benefit.

Suppose that a fraction $\gamma \in [0, 1]$ of the n nascent entrepreneurs has sufficiently low quality-dependent planning costs of $C_L(q_S, q_F)$, enabling them to optimally plan with qualities q_S^* and q_F^* , while the rest are confronted with planning costs $C_H(q_S, q_F)$, which are too high to ensure a positive net benefit of planning for any levels of q_S and q_F . Hence, we consider a world in which planning is possible for some entrepreneurs, and by construction has an unambiguously positive value.

Of the first group of (planning) nascent entrepreneurs, some will receive a positive signal from planning, which encourages them to initiate their start-up. In contrast, those business planners, who receive a negative signal, will prefer to terminate their projects. Of the planners, who finally enter the market, some will be successful and some will fail. In the second group, all entrepreneurs initiate their start-ups without planning. In this group as well, some will be successful, while others will fail.

The different events described above are shown in Fig. 3, where we have included the number of nascent entrepreneurs affected by the individual events, using the notation of the preceding sections. In addition, in order to provide a numerical example (characterized by the bold numbers in Fig. 3), suppose that there are $n = 10,000$ nascent entrepreneurs, of whom all are faced with a 20% a-priori chance of success. The majority of these entrepreneurs ($\gamma = 0.55$) wish to plan their business, due to sufficiently low planning costs, where business planning is conducted with optimal quality, which we, again, assume to be $q_S = q_F = q^* = 0.75$.

The first implication that we obtain from our population of entrepreneurs is related to the widespread practice of studying the traits, decisions, etc. of only successful entrepreneurs, mainly because the unsuccessful ones are not available, and then drawing far-reaching implications from the statistically significant observations.

Proposition 6. *Even if the majority of nascent entrepreneurs plan their businesses, the majority of successful entrepreneurs may nevertheless start their venture without a business plan, if the detection of successful ventures is less than perfect ($q_S < 1$).*

Consider our example shown in Fig. 3. Of the 10,000 nascent entrepreneurs in the “sample,” observe that 55% decide to plan their business. Of these planners, 825 turn out to be successful. Of the 45% nascent who “just do it,” i.e. start without planning, e.g., as Lange et al. (2007) would advise, 900 are successful. The latter make up 52% of the total of 1,725 successful entrepreneurs. Thus, while the majority of nascent entrepreneurs plan before starting, the majority of (ex-post) successful entrepreneurs start without a plan. On the surface, it seems that this observation provides evidence against business planning. It is important to note, though, that it is made in an environment, in which planning has an unambiguously positive value for those who do plan.

From Proposition 6 we can conclude that, for any sample of only successful entrepreneurs, the value of business planning cannot be inferred from the share of entrepreneurs with a business plan. For example, Honig and Karlsson (2004) find in their

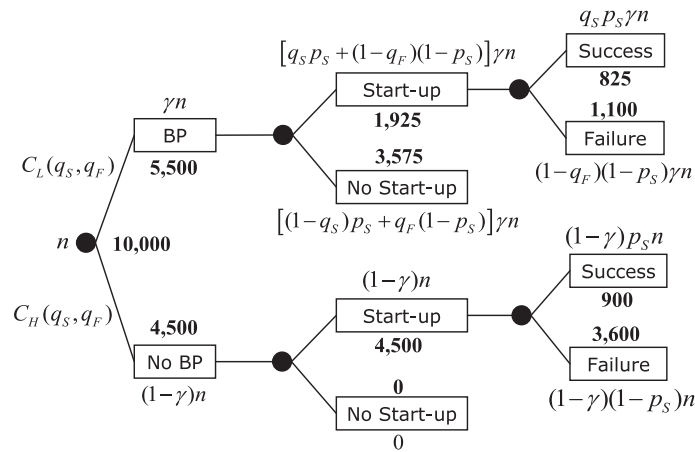


Fig. 3. The relationship between business planning and success.

empirical study of nascent entrepreneurs that “survival” (in our context “success”) seems to be unrelated to business planning. Proposition 6 shows how careful one must be in interpreting empirical characteristics of successful entrepreneurs and in drawing conclusions with respect to the value of business planning.

As we have shown above in Proposition 4, business planning keeps a large share of entrepreneurs from starting their business, which is often wrongly criticized. However, there is a further argument, namely that business planning reduces the number of successful ventures, altogether, which is stated in the following proposition.

Proposition 7. *If some entrepreneurs plan their businesses with less than perfect detection of potential successes ($q_S < 1$), then the total number of successful entrepreneurs is lower than when all entrepreneurs enter the market without planning.*

Formally, Proposition 7, which is stated for a population of planning and non-planning entrepreneurs, is an extension of Proposition 2, which refers to the individual planner. In our example, if all nascent entrepreneurs would enter the market without planning, an unbiased estimator for the number of successful entrepreneurs would be 2,000, i.e., 20% successful entrepreneurs. However, Fig. 3 reveals that there are only 1,725 successful entrepreneurs. As one can see, the loss of 275 successful ventures is only the result of business planning. Intuitively, if planning does not achieve perfect forecasts, some potentially successful ventures will be discarded.

From Proposition 7 we can conclude that, for any given sample, the value of business planning cannot be inferred from the share of successful entrepreneurs. In order to obtain a complete picture, one must also look at the failures. In our example in Fig. 3, a total of 4,700 ventures fail, which is considerably less than the 8,000 failures that one would expect in an environment without any planning. Thus, while less than perfect planning inevitably reduces the number of successful ventures, the number of failures drops even more. This undisputable benefit of business planning is typically neglected by empirical studies that exclude failures.

9. Discussion and implications

9.1. Conclusions and limitations

Within a decision-theoretic framework we were able to show that planning, in the sense of opportunity evaluation, has an important value for the entrepreneur faced with the decision to enter the market. The evaluative function of planning has its impact before market entry, as it helps to avoid poor start-ups – its value is determined by the quality of planning and the nature of the venture (i.e., V_S, V_F, I , and p_S), and it is measured by the venture’s ex-ante expected performance. Hence, empirical analyses studying only the ex-post performance of entrepreneurs that have entered the market simply do not have a sufficient sample for deducing implications on the evaluative value of planning.

In order to emphasize the latter point, we used our theoretical framework to derive “observable” consequences from a hypothetical world, in which planning has an unambiguously positive value. This enabled us to provide answers to several open questions concerning the behavior of entrepreneurs. In particular, we were able to demonstrate that the rational decision model is quite useful in explaining entrepreneurial decisions, without having to draw on over-confidence or hubris. Although we do not dispute the relevance of these personal traits for entrepreneurial decision making, we find that the rational decision model is often too quickly discarded.

Nevertheless, it is important to acknowledge that the rationality assumption, underlying our analysis, is a strong characterization of entrepreneurial behavior. Realistically, one should acknowledge that actual entrepreneurs, like any real decision makers, may be boundedly rational, meaning that they have limited information processing capacity, they do not know all alternatives or consequences in advance, use heuristics rather than optimizing techniques, and that they choose satisficing alternatives, where

optimal choices are too complicated. Moreover, the beliefs in our model could be the result of cognitive or experiential learning. However, any contingency-based planning approach must acknowledge the value of information. Hence, the logic behind the value of planning, emphasized by our model, remains valid. The rationality assumption is methodologically a convenient approach to derive results analytically.

A major advantage of the rational decision model is its theoretical foundation, which enables one to analyze and understand complex interdependencies of entrepreneurial decision making that sometimes even seem counterintuitive. The crucial aspect of this approach is the perspective of the analysis. In order to understand the entrepreneur's decisions, one must see the world from his view. If one accepts that entrepreneurs behave rationally, which despite all their fascinating traits nevertheless appears to be plausible, with or without cognitive bounds, it becomes much easier to influence their decisions and support their endeavors.

A didactically motivated simplification of our decision model is the one-step planning process preceding the decision to enter the market or terminate the project. As we discussed in our review of the literature in Section 3, planning and learning should realistically be viewed as a multi-stage decision process, where later-stage plans are revised with the information gained from earlier-stage actions. Accordingly, our decision tree would need to be extended to multiple stages. In addition, at each stage, the decision to plan could, more generally, be characterized by multiple branches, indicating different levels or degrees of planning. Nevertheless, at each stage in the process, the value of further or more planning is given by the expectation of achieving better decision outcomes than without or less planning. Hence, our one-stage model may be viewed as a condensed characterization of a multi-stage planning process, for which we analyze the informational value.

Furthermore, the decision to terminate the project need not imply that the entrepreneur abstains from starting a business altogether. More generally, termination could mean moving on to another opportunity (cf. Gruber et al., 2008; Mullins and Komisar, 2009) or improving the approach for the given opportunity (cf. Delmar and Shane, 2003).

9.2. Implications for Researchers

The theoretical framework within which we derived our results was purposely kept as simple as possible in order to emphasize our results. Nevertheless, the model is flexible enough to include additional aspects of the entrepreneurial process, thus allowing further modifications of the entrepreneur's decision context. The decision model provides an appropriate formalization for the general framework of a contingency-based planning approach, e.g., as outlined by Honig (2004). More specifically, the decision tree, which is solved recursively, formally captures the essence of what McGrath and MacMillan (2000: 236) refer to as discovery-driven plans that “begin with where you want to end up and drive the plan from the future backward.” Indeed, this vision-guided perspective of planning corresponds to Keeney's (1992) proactive approach of “value-focused thinking” (as opposed to conventional “alternative-focused thinking”) in decision making. Moreover, by linking the decision maker with the decision problem, the decision-analytic framework overcomes the dichotomy of what Eckhardt and Shane (2003) refer to as the “human-type” and the “opportunity-based” explanations of entrepreneurship. Hence, there appears to be a rich common ground for a stronger interaction of entrepreneurial planning and decision analysis, which calls for further exploration.

In a multi-stage decision model, one could also display and analyze the search behavior of boundedly rational individuals, lacking information on alternatives or action-outcome beliefs, by using the distinction between cognitive and experiential search highlighted by Gavetti and Levinthal (2000). In such a setting, planning could be viewed as the forward-looking cognitive search, and starting a new or redeveloping a given venture could be interpreted as experiential search, which allows the nascent entrepreneur to improve his action-outcome beliefs. In future research it would be interesting to investigate, e.g., through simulation of heuristics, how cognitive and experiential search activities affect venture performance.

The rational decision model, which we employ for our analysis, not only reveals the entrepreneur's optimal decision, it also shows the influencing factors that are responsible for this choice. Our discussions of the various propositions in the previous sections enabled us to reproduce and thereby understand different empirical results that have been found in the literature. For empirical researchers the decision model, thus, provides a theoretical background for tested hypotheses, where the formal framework is readily adaptable to the empirical setting. For example, Dencker et al. (2009) find, in contrast to their hypothesis, that greater planning intensity reduces firms' likelihood of survival. Since their empirical analysis focuses on funding recipients, who presumably report termination as non-survival, our Proposition 5 provides an explanation for this result. The effect of planning on the entrepreneur's decision to enter the market also provides a plausible, alternative explanation for observed market entry that is often, perhaps prematurely, attributed to over-confidence (cf. Camerer and Lovo, 1999). For empirical research to resolve this issue, one must not only observe all the outcomes of entrepreneurial decisions, but also understand more about the decision contexts in which they are made. Decision models provide a formal framework for this task.

The decision model of the planning entrepreneur can also be extended to examine the strategic interaction with other decision makers. Of particular interest is the interaction of the entrepreneur with providers of capital, who often request and, therefore, provide an additional incentive for having a business plan. How different modes of participation affect the value of planning and, thus, the entrepreneur's planning effort are important aspects for future research. For this purpose, it would also be interesting to study multi-stage processes, allowing the business opportunity to be refined in the course of interaction.

9.3. Implications for teaching

Our analysis of the information value as well as the costs of planning revealed where, and how, influencing factors affect the advantage of business planning. If planning is viewed as a multi-stage process, then different components of planning will have

differing values at individual stages in the process. In order to engage nascent entrepreneurs in the planning process, rather than let them “just do it,” it is important for them to acknowledge the ex-ante value of planning. However, since there are costs of planning, entrepreneurs must also be able to assess the value, in order to decide when to plan themselves, when to purchase planning from an expert or a new team member, and when to skip planning altogether.

Business planning is a skill, or, more precisely, a collection of skills such as opportunity analysis, business-model development, strategic marketing, financial planning, decision making, etc. As any skill, business planning can be trained, thus enabling the entrepreneur to achieve a higher quality of planning. More importantly, though, training reduces the costs of planning. The higher the quality of planning is, the more the nascent entrepreneur will benefit from planning the venture before entering the market. As we have shown, this holds irrespective of whether or not business planning enhances ex-post market performance.

As any skill, business planning should be trained before it is applied. Moreover, the different types of planning, mentioned above, are topics of semester-long courses at universities. Consequently, any business-plan workshop for nascent entrepreneurs, in particular those with a non-business background, can at most scratch the surface and convey the application of simple analytical techniques, in particular those that enable (at least crude) assessments of opportunities. Of greater relevance, however, is to convey the importance of having a team member with sound planning skills on board.

As the more detailed analyses of business planning reveal, the relevant, more sophisticated planning skills are typically taught in mainstream courses of business administration, e.g., strategic marketing, financial planning, or decision analysis. However, the teachers of these courses can do more to convey the entrepreneurial relevance of the specific skills that are taught. In addition, teachers specializing in entrepreneurship should focus more on projects that train the application of these general skills to contingency-based business planning. Preferably this training should be conducted in an interdisciplinary environment, as business ideas with a high market potential are likely to originate in non-business, often technical, environments, while business skills are best developed in a business environment.

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Appendix

Proof of Proposition 1. A positive signal induces the entrepreneur to initiate the start-up, if the expected value of entering the market is greater than zero, i.e., the value of staying out. With the conditional probabilities $P(\text{Success}|\text{Positive})$ and $P(\text{Failure}|\text{Positive})$ from Eq. (1), the critical condition is

$$\frac{q_S p_S}{q_S p_S + (1 - q_F)(1 - p_S)}(-I + V_S) + \frac{(1 - q_F)(1 - p_S)}{q_S p_S + (1 - q_F)(1 - p_S)}(-I + V_F) > 0,$$

which can be simplified to

$$q_S p_S (V_S - I) + q_F (1 - p_S)(I - V_F) > (1 - p_S)(I - V_F). \tag{5}$$

Analogously, a negative signal induces the entrepreneur to terminate the start-up, if the value of staying out of the market is greater than the expected value of entering. With the conditional probabilities $P(\text{Success}|\text{Negative})$ and $P(\text{Failure}|\text{Negative})$ from Eq. (2), the critical condition is

$$\frac{(1 - q_S) p_S}{(1 - q_S) p_S + q_F (1 - p_S)}(-I + V_S) + \frac{q_F (1 - p_S)}{(1 - q_S) p_S + q_F (1 - p_S)}(-I + V_F) < 0,$$

or, equivalently,

$$q_S p_S (V_S - I) + q_F (1 - p_S)(I - V_F) > p_S (V_S - I). \tag{6}$$

Note that inequalities (5) and (6) differ only on their right-hand sides, which are independent of the levels of planning quality. If q_S and q_F are sufficiently high to ensure that both inequalities are satisfied, the entrepreneur will initiate the start-up after receiving a positive signal and terminate the project after receiving a negative signal.³ Which of the two inequalities places the binding restriction on q_S and q_F depends on whether $(1 - p_S)(I - V_F)$, the right-hand side of inequality (5), is greater or less than $p_S(V_S - I)$, the right-hand side of inequality (6), which is equivalent to $p_S V_S + (1 - p_S)V_F - I \geq 0$. For both restrictions it is true that the minimum quality levels

³ For completeness, one must also acknowledge the case, where q_S and q_F are so low, that the entrepreneur does exactly the opposite of what planning recommends – if the signal is positive, the entrepreneur stays out of the market, and if it is negative, he enters the market. However, we regard this case as a technical peculiarity of the model and ignore it in the following analysis.

$q_{S\min}$ and $q_{F\min}$ are jointly determined and linearly related. Moreover, both restrictions require that $q_{S\min} + q_{F\min} > 1$, meaning that planning can only be valuable, if it is better than guessing.

Next we calculate the value of planning. The expected value of the venture with business planning, $NPV_{BP}(q_S, q_F)$ prior to receiving a signal, is given by

$$NPV_{BP}(q_S, q_F) = P(\text{Positive})[P(\text{Success}|\text{Positive})V_S + P(\text{Failure}|\text{Positive})V_F - I] \\ = -(1-p_S)(I-V_F) + q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F).$$

The information value of business planning, $\Omega_{BP}(q_S, q_F)$, is then given by the difference between the expected value of the venture with planning, $NPV_{BP}(q_S, q_F)$, and the expected value of the venture (start or terminate the business) without planning, NPV . Depending on the sign of the expected net present value of starting without planning, NPV is positive or zero, i.e., $NPV = \max\{0; p_S V_S + (1-p_S)V_F - I\}$, so that there are two cases to consider:

- i. $p_S V_S + (1-p_S)V_F - I > 0$: The expected present value of the venture without planning is positive, so that the entrepreneur would start the venture. The advantage of planning is then to stop seemingly unsuccessful ventures. The binding restriction for q_S and q_F is given by inequality (6), so that planning loses its value when Eq. (6) holds with equality, i.e., when planning qualities reach minimum levels $q_{S\min}$ and $q_{F\min}$, which are jointly determined by $(q_{S\min}, q_{F\min}) \in \{(q_S, q_F) | q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) = p_S (V_S - I)\}$. When this is given, the expected value of the venture with planning becomes $NPV_{BP}(q_{S\min}, q_{F\min}) = p_S V_S + (1-p_S)V_F - I$, which is just the expected net present value of starting without planning, NPV . Hence, the information value of planning is given by

$$\Omega_{BP}(q_S, q_F) = \begin{cases} -p_S(V_S - I) + q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) \geq 0, \\ \text{for } q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) \geq p_S (V_S - I) \\ 0, \\ \text{for } q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) < p_S (V_S - I). \end{cases} \quad (7)$$

- ii. $p_S V_S + (1-p_S)V_F - I < 0$: The expected present value of the venture without planning is negative, so that the entrepreneur would not start the venture. The advantage of planning is then to start seemingly successful ventures. The binding restriction for q_S and q_F is given by inequality (5), so that planning loses its value when Eq. (5) holds with equality, i.e., when planning qualities reach minimum levels $q_{S\min}$ and $q_{F\min}$, which are jointly determined by $(q_{S\min}, q_{F\min}) \in \{(q_S, q_F) | q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) = (1-p_S)(I-V_F)\}$. When this is given, the expected value of the venture with planning becomes $NPV_{BP}(q_{S\min}, q_{F\min}) = 0$, which is just the expected value of terminating the project without planning. The information value of planning is then given by

$$\Omega_{BP}(q_S, q_F) = \begin{cases} -(1-p_S)(I-V_F) + q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) \geq 0, \\ \text{for } q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) \geq (1-p_S)(I-V_F) \\ 0, \\ \text{for } q_S p_S (V_S - I) + q_F (1-p_S)(I-V_F) < (1-p_S)(I-V_F). \end{cases} \quad (8)$$

In both cases, the positive information value is a monotonically increasing, affine function of both quality levels q_S and q_F . □

Proof of Proposition 2. According to Eqs. (1) and (3), the probability of success for an entrepreneur with a business plan is given by $P(\text{Positive}) \times P(\text{Success}|\text{Positive}) = q_S p_S$. Thus, if the detection of a venture success is less than perfect ($q_S < 1$), the chance of success falls below the a-priori probability (without planning), p_S . Accordingly, from Eqs. (2) and (4), the probability of failure for an entrepreneur with a business plan is $P(\text{Positive}) \times P(\text{Failure}|\text{Positive}) = (1-q_F)(1-p_S)$, which is also lower than $1-p_S$. Yet, with $q_S + q_F > 1$, which is equivalent to $q_S > 1 - q_F$, the reduction in the probability of failure is relatively greater than the reduction in the probability of success. □

Proof of Proposition 3. From Eqs. (1) and (3) one can infer that, for an entrepreneur entering the market, the probability of failure is greater than the probability of success, if

$$P(\text{Failure}|\text{Positive}) \cdot P(\text{Positive}) > P(\text{Success}|\text{Positive}) \cdot P(\text{Positive}) \\ \Leftrightarrow (1-q_F)(1-p_S) > q_S p_S.$$

If planning is valuable, then $q_S + q_F > 1$, which is equivalent to $1 - q_F < q_S$. Hence, $p_S < 0.5$ is necessary, but not sufficient, for the above inequality to hold. Sufficient conditions for the inequality, which can equivalently be written as

$$\frac{1-p_S}{p_S} > \frac{q_S}{1-q_F},$$

are $q_S < 1 - p_S$ and $1 - q_F > p_S \Leftrightarrow q_F < 1 - p_S$. □

Proof of Proposition 4. The planning entrepreneur will be more likely to terminate his project than to enter the market, if

$$\begin{aligned}
 &P(\text{Positive}) < P(\text{Negative}) \\
 &\Leftrightarrow q_S p_S + (1 - q_F)(1 - p_S) < (1 - q_S)p_S + q_F(1 - p_S) \\
 &\Leftrightarrow (1 - 2q_F)(1 - p_S) < (1 - 2q_S)p_S \\
 &\Leftrightarrow 1 - 2q_F < 2(1 - q_S - q_F)p_S \\
 &\Leftrightarrow p_S < \frac{1 - 2q_F}{2(1 - q_S - q_F)}.
 \end{aligned}$$

With $p_S < 0.5$, a sufficient condition for the above inequality to hold is

$$\frac{1 - 2q_F}{1 - q_S - q_F} \geq 1.$$

If planning is valuable, i.e., $q_S + q_F > 1$, the sufficient condition is equivalent to $q_F \geq q_S$. □

Proof of Proposition 5. By differentiating $P(\text{Negative})$ in Eq. (4) with respect to q_S and q_F one obtains

$$\frac{d P(\text{Negative})}{dq_S} = -p_S < 0 \text{ and } \frac{d P(\text{Negative})}{dq_F} = 1 - p_S > 0.$$

If both quality levels change by the same amount, i.e., $dq_S = dq_F$, then the positive effect of q_F dominates the negative effect of q_S , if, and only if

$$1 - p_S > p_S \Leftrightarrow p_S < 0.5. \quad \square$$

Proof of Proposition 6. The share of successful entrepreneurs without a business plan is higher than the share of entrepreneurs with a business plan if

$$\begin{aligned}
 &(1 - \gamma)p_S n > q_S p_S \gamma n \\
 &\Leftrightarrow \gamma < \frac{1}{1 + q_S}.
 \end{aligned}$$

Hence, as long as $q_S < 1$, it is possible that, even with $\gamma > 0.5$, the number of counted successful entrepreneurs without a business plan exceeds the number of those entrepreneurs with a business plan. □

Proof of Proposition 7. Without any planning, the number of successful entrepreneurs is given by $p_S n$. When some entrepreneurs plan, there are two types of successful entrepreneurs, those with a business plan, $q_S p_S \gamma n$, and those without a business plan, $(1 - \gamma)p_S n$. Since

$$q_S \gamma p_S n + (1 - \gamma)p_S n = (q_S - 1)\gamma p_S n + p_S n < p_S n \text{ for } q_S < 1,$$

business planning reduces the number of successful entrepreneurs, if $q_S < 1$. □

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