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Entrepreneurs' Capital Budgeting Orientations and Innovation Outputs: Evidence From Australian Biotechnology Firms

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How do different kinds of planning orientations affect entrepreneurial firms' innovation outputs? To address this question, we position real options reasoning (ROR) and net present value (NPV) as business planning orientations with distinctive heuristics. We empirically investigate heterogeneity in entrepreneurs' business planning in terms of these ROR and NPV orientations and we relate this heterogeneity to material new venture outcomes. Key decision makers from biotechnology start-ups in Australia were surveyed and results from Generalized Method of Moments estimation models showed that an ROR orientation positively relates to the innovation outputs of new ventures in our sample, whereas a stronger NPV orientation is negatively associated with innovation outputs. We offer implications for the literatures on strategic decision-making and planning.

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Introduction

How does business planning affect innovation outputs of nascent firms? On the one hand, [Delmar and Shane \(2003\)](#) found that planning in general helps entrepreneurs to make abstract and vague attitudes more concrete, to stage speedy future actions and to anticipate and minimize bottle necks. These authors operationalize business planning with a dichotomous variable that captures whether entrepreneurs have completed a formal business plan.¹ Using a sample of 223 new Swedish ventures, they find that plans hasten product development, strengthen organizing activity (a measure of the level of development of organizational processes) and reduce the likelihood of venture failure. Each of these outcomes has the propensity to improve innovation outputs. Similarly [Zott and Amit \(2007\)](#) showed that business model design can result in novel initiatives that increase performance of entrepreneurial firms.

On the other hand, there is reason to believe that planning may impede innovation outputs. In particular, greater planning may cause planners to commit to the strategic decisions underpinning projected cash that in turn limits their ability to flex with changing market conditions ([Chemawat, 1991](#)). Planning, especially that which is based on cause and effect, may prevent entrepreneurs from resourcefully marshaling their means to find innovative solutions ([Sarasvathy, 2001](#)). The planning fallacy emphasizes that decision makers, in general, and entrepreneurs, in particular, are unduly optimistic about their ability to complete projects on time and to budget – factors that can hinder them from unleashing innovative potential ([Buehler et al., 1994](#)).

Here we seek to contribute to this debate by suggesting that the heuristics embedded in different *kinds of planning orientations* affect innovation outputs in entrepreneurial firms. At one extreme, capital budgeting and planning involves hard decision rules based on whether a project is expected to generate a positive net present value analysis, a conventional way of considering decision making in corporate finance. Finance scholars note that NPV analysis is a cornerstone of capital budgeting that provides rich and detailed assumptions about the future, replete with detailed statements of revenues, costs and capital expenditures that provide point estimates to determine whether to proceed with investments (e.g., [Brealey et al., 2007](#); [Ross et al., 2008](#)). Henceforth, reliance on NPV analysis for planning and capital budgeting is referred to as an NPV orientation. NPV orientation varies in degree and could be held in conjunction with other orientations including those that, by design, flex with emerging opportunities and hurdles ([Kogut and Kulatilaka, 2001](#); [Lejarraga and Martinez-Ros, 2013](#)).

¹ They create a score from 0 to 4 that aggregates the number of times that respondents answered yes to: "Have financial projections been developed? Has the venture gathered information about the market and competition? Has a business plan been completed, and has a formal, written business plan document been prepared?"

This latter orientation is more consistent with real options reasoning which has been cast as a mindset or way of viewing projects as “the right, but not the obligation to take an action at a predetermined cost called the exercise price, for a predetermined period of time – the life of the option” (Copeland and Antikarov, 2001, p. 5). For our purposes, planning concerns entrepreneurs’ intentions and projections for new venture outcomes, and NPV analysis and ROR are representative approaches for modeling and codifying such plans.

Henceforth, we address the research question: How do different kinds of planning orientations affect entrepreneurial firms’ innovation outputs? We seek to inform the literatures on planning and innovation by modeling how NPV and ROR orientations contribute to firms’ innovation outputs. In particular, we use a novel approach of conceiving such orientations as a series of a heuristics or implicit decision rules for planning (Barnett, 2008; McDonald and Siegel, 1986). The cross-sectional survey instrument deployed was designed to tap the heuristics that entrepreneurs deploy in planning, albeit with a limited sample size and a design intended to redress common method bias. We link those heuristics to innovation outputs in a comprehensive analysis of a sample of biotechnology start-ups. We begin by examining the role of planning in the entrepreneurship and cognition literatures. Subsequently, we position NPV and ROR orientations as different but related capital budgeting orientations before linking these approaches to entrepreneurs’ innovation outputs.

Theory and hypothesis

Planning is an all-pervasive activity, the one that perhaps best distinguishes man from primates (Gilbert, 2006). In the theory of planned behavior, human action is guided by beliefs about the likely outcomes of the behavior and the evaluations of these outcomes (behavioral beliefs); beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs); and beliefs about the presence of factors that may facilitate or impede the performance as well as the perceived power of these factors (control beliefs) (Ajzen and Madden, 1986). Here, we focus on the nature and implications of behavioral beliefs – as characterized in the literature by heuristics – held by entrepreneurs about how to decide and act that will in turn affect the outcomes of their ventures (Kahneman, 2011).

The costs and benefits of new venture planning

Links between business plans and venture outcomes are not well-established beyond the literature on planned behavior. Entrepreneurs may begin with well-calibrated judgment (i.e., an accurate assessment of their ventures’ prospects) and then, as a result of planning, become overconfident about their own capabilities and their ventures’ prospects. Overconfidence in turn has predictable and adverse influences on strategic outcomes, including over-commitment to entry into new markets (Camerer and Lovallo, 1999), excessive investment and commitment to risky, new projects and assets (Hayward and Hambrick, 1997; Simon and Houghton, 2003) and a tendency to conserve insufficient resources for emerging opportunities (Hayward et al., 2006). For each of these reasons, formal planning *per se* may diminish if not disable the entrepreneur’s ability to create and sustain innovation processes and outcomes.

Several psychological mechanisms help to explain why greater planning engenders confidence that hinders performance (Kahneman and Tversky, 1979). Planning tends to steer entrepreneurs toward an inside view, one in which they extrapolate their firms’ pre-existing cash flows and operations into the future, using causal reasoning (Kahneman and Lovallo, 1993). By contrast, entrepreneurs with an outside view are more attentive to the base rates of venture failure and more mindful of the exigencies created by market forces, including competitors’ capabilities (Camerer and Lovallo, 1999). Greater planning may imbue entrepreneurs with richer and more detailed scenarios of how and when venture developments unfold, causing entrepreneurs to miss or discount non-conforming data, such as how the inputs into, and outputs from, their work can be put to better use. Like other managers, entrepreneurs can act as though their pre-conceived notion of the future will come true (Arkes et al., 1988; Fischhoff et al., 1977) and underestimate the scope for discovery, thus becoming overly and unduly certain about what the future will hold (Gilbert, 2006; Griffin et al., 1990; Klayman and Schoemaker, 1993).

Absent from this debate on the benefits of planning for entrepreneurs, however, is consideration of whether the *nature* of planning matters, with planning treated according to whether entrepreneurs have a business plan (Delmar and Shane, 2003). Yet, plans vary along core dimensions and some kinds of plans may be more suitable than others, depending on the projects under consideration (e.g., Bingham and Eisenhardt, 2011; Burgelman and Grove, 2007). In particular, we address this shortcoming and examine entrepreneurs’ plans in terms of the extent to which they provide governing rules or discretion and convey precision and richness.

NPV and ROR planning orientations

Perhaps the most widely taught and adopted tool in capital budgeting for finance practitioners is NPV analysis that measures the present value of project cash flows (e.g., Brealey et al., 2007; Copeland and Antikarov, 2001; Ross et al., 2008). Such an orientation has been deployed distinctly in project domains ranging from agriculture (Knowler and Bradshaw, 2007) to medical devices (Reed et al., 2008) to biotechnology (Stewart, 2002). In theory, NPV analysis can be constructed to incorporate any scenario of the future, including the limitations on the firm’s ability to restrict and expand capacity, suggesting that the dichotomy between NPV and ROR orientations is questionable (Abel et al., 1996). The core judgment facing those relying on NPV analysis is whether to proceed with project whether the NPV indicates the project will create positive or negative value.

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