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WHEN IT'S RIGHT TO BE "WRONG": THE EFFECTS OF OVERCONFIDENCE AND PLANNING ON PRODUCT PERFORMANCE IN A DYNAMIC ENVIRONMENT

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ABSTRACT

Some authors emphasize overconfidence may benefit managers by increasing decision-making efficiency, whereas others argue it results in serious errors. This study helps resolve the debate by examining the relationship between overconfidence and product performance, as well as testing whether planning might mediate the link. The study sampled 52 small computer companies that had decided to introduce a product. It examined the manager's overconfidence and planning when the product was launched and measured the product's performance 18 months later. We found that overconfidence decreased planning, planning decreased performance, and, as hypothesized, planning mediated the relationship between the two other variables. By examining the meditating role of planning, we were able to better identify the causal relationships and clarify the effects of overconfidence.

Keywords: overconfidence, planning, performance, small business, product introduction

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INTRODUCTION

Seminal works (e.g., Blau & Schoenherr, 1971; Galbraith, 1977) suggest that managers in small businesses, as opposed to those in larger companies, may face different challenges and employ different processes when making strategic decisions. Often they have fewer resources and formal processes, making it more difficult to remove initial uncertainty when making strategic decisions (Simon, Houghton & Savelli, 2003). This uncertainty is multiplied when managers employ a strategy of introducing new products in dynamic environments (Simon & Houghton, 2003). Dynamic markets make it difficult for managers to use historical knowledge to inform current choices. It is, for example, difficult in dynamic environments to discern customer preference and which competitors will be relevant (e.g., Brown & Eisenhardt, 1997; Brinckmann, Grichnik, & Kapsa, 2010).

As explained by Heuer (1999), the mind is poorly "wired" to deal effectively with this inherent uncertainty. Therefore, when facing uncertain conditions, some managers deny it exists, exhibiting overconfidence (Busenitz & Barney, 1997; Simon & Houghton, 2003). Overconfidence occurs when one's certainty of specific facts exceeds the accuracy of his or her knowledge (Busenitz & Barney, 1997; Russo & Schoemaker, 1992). Specifically, scholars (e.g., D'Souza & Kemelgor, 2008; Liao, Welsch, & Stoica, 2008; McNamara & Bromiley, 1997; Simon & Houghton, 2003) have suggested that overconfidence is more likely to occur when coping with dynamic environments, ill-structured decisions, and introducing pioneering products, and it may be especially prevalent among smaller firms. Virtually every business study of overconfidence acknowledges that overconfidence may be beneficial by increasing decision-making efficiency (Hayward, Forster, Sarasvathy, & Fredrickson, 2010), but that it also could result in errors that are large, persistent and serious (Hayward, Shepherd, & Griffin, 2006). Yet, these contradictory implications have not been reconciled empirically, to date (e.g., Busenitz & Barney, 1997; Forbes, 2005). Some researchers maintain that the incorrect facts of overconfident managers hurt business performance because these managers rush to action and leapfrog classical decision formulation and implementation steps (Hayward et al., 2006). In particular, they argue that overconfidence may encourage the managers to ignore planning and start down a false path. And without planning, some assert, economic performance will suffer.

Other scholars, however, do not accept this negative view of overconfidence as universally applicable (Busenitz & Barney, 1997). While most accept that overconfidence may reduce planning, they believe that in certain circumstances, such as dynamic environments, planning is not useful. McGrath and MacMillan (1995), for example, argue that in dynamic environments, planning does not work because there is little data upon which to base projections. These, and other scholars, contend that planning leads to a futile search for "reliable" information (Busenitz & Barney, 1997; Houghton, Simon, Aquino, & Goldberg, 2000). Furthermore, by skipping planning, these managers may avoid locking into

rationales based on outdated beliefs about the emerging market situation.

The above suggests that understanding the extent and effects of planning seems to lie at the center of the debate about the effects of overconfidence on performance. As such, the core question arises; does planning mediate the relationship between overconfidence and performance, and if so, how? Examining potential mediators, such as planning, helps identify underlying processes, which, in turn, can provide insights into contradictory conclusions about relationships (Hedstrom & Swedberg, 1998). If planning mediates the effects of overconfidence on performance, it may serve as a generative mechanism and increase our understanding of cause and effect. In addition, by examining the role of planning as a mediator, we can also identify the relationships, in dynamic markets, between overconfidence and planning; as well as, between planning and product introduction success.

The following section reviews the study's theoretical model and presents the hypotheses. We then detail the research methods and report the results of the analysis. Finally, the article discusses the study's findings and implications.

OVERCONFIDENCE, PLANNING AND PERFORMANCE

Smaller firm size is associated with less structural inertia (Blau & Schoenherr, 1971), more centralization (Blau & Schoenherr, 1971), less formalization (Blau & Schoenherr, 1971), and greater strategic change (Kelly & Amburgey, 1991). These organizational characteristics suggest that strategic decision making is often not codified, sometimes resulting in the lack of procedural buffers and formal processes to "rationalize" the decision-making process (Simon et al., 2003). Thus, small firm managers may face great uncertainty when making strategic decisions.

Pursuing a strategy of introducing products in dynamic markets exacerbates this challenge. In dynamic markets, past experiences and successes cannot be extrapolated to guide current competitive behaviors; consumer tastes are unclear, the range of current competitors is changing, and historical key success factors may be unimportant in the changing circumstances. Yet even when faced with such a murky, ambiguous setting, managers of small firms must somehow eventually learn about their products' markets, technologies, and competition (Brown & Eisenhardt, 1997; Brinckmann et al., 2010).

We use the term planning to refer to the structured information gathering and analyzing process that takes place prior to acting. Planning involves comprehensively, exhaustively, and inclusively searching for and evaluating information that is deemed relevant by the decision makers. Planning is a highly analytical process that involves much up-front homework, and uses a multitude of techniques, such as Delphi analysis, concept tests, focus groups, and surveys, which all attempt to build an understanding of the competitive environment before launching a new initiative (Lynn, Morone, & Paulson, 1996). Through the planning exercises, managers socially construct a detailed schema of their competitive environment, comprised of cause and effect relationships, which guide their creation of a sequence of detailed action steps

(Fredrickson & Mitchell, 1984; Lynn et al., 1996).

Planning relies primarily on historical understandings of the environment or interpretation of responses to hypothetical questions, such as whether one might purchase a yet-to-be-developed product. It is important to distinguish planning from decision comprehensiveness (Eisenhardt, 1989; 2001). Although the two can overlap, the latter is a broader concept. Comprehensive decision making can emphasize collecting data after an action, and/or basing decisions on real time operating information (Eisenhardt, 1989; 2001).

Overconfidence and Planning

Although overconfidence may be influenced by both dispositional and contextual factors (Forbes, 2005), this study focuses on the dispositional component, consistent with our effort to study overconfidence in similar contexts across firms. Some people exhibit a tendency to be more overconfident than others (Forbes, 2005; Klayman, Soll, Gonzalez-Vallerjo, & Barlas, 1999; Soll, 1996; Yates, Lee, Shinotsuka, Patalano, & Sieck, 1998). For example, Klayman et al. (1999) found that certain people consistently expressed greater overconfidence in their information, regardless of whether that information was about presidents, prices of consumer goods, or life expectancies. These tendencies stem from cognitive trails etched in the minds of individuals (Haley & Stumpf, 1989) based upon stable factors such as long-standing habits (Yates et al., 1998), firmly established cognitive customs (Yates et al., 1998), and established personality types (Soll, 1996). Forbes (2005) found that several of the determinants of overconfidence were related to relatively stable individual differences. Consistent with this logic, Busenitz and Barney (1997) proposed that overconfidence was a quasi-trait and people high in the trait self-selected toward entrepreneurship.

We are interested in the extent to which variations in overconfidence affect the amount of planning when introducing a product in a dynamic environment. Given the unreliability of data related to product introductions in dynamic environments, managers who are not overconfident of their knowledge will realize that they do not have accurate information. This realization, in turn, may cause a manager to experience substantial uncertainty, where uncertainty is defined as the gap between the information one has and the information one needs to perform a task (Forbes, 2007). Feelings of uncertainty may inhibit proceeding with an action until the feelings are reduced (Brinckmann et al., 2010). One of the classic uncertainty-reducing procedures managers use is planning (Brinckmann et al., 2010). The process of gathering and analyzing more information alleviates feelings of discomfort before launching a product (Galbraith, 1977). Thus, is it not surprising that managers will initiate a more extensive search for information before deciding to act to reduce uncertainty (e.g., Bourgeois & Eisenhardt, 1988). Specifically, Milliken (1987) contends that the greater the managers' uncertainty about the state of the environment, the more time and resources they will invest in planning, through increased forecasting. Furthermore, Brinckmann et al. (2010) found that managers exhibiting greater uncertainty are more likely to develop plans.

This planning-dominated behavior stands in stark contrast to the behaviors of managers who are overconfident. These managers, by definition, believe that they already have sufficient information, so they may proceed immediately with their product launch and largely bypass the planning process. Mahajan (1992) argued that managers who are overconfident will commit resources without waiting to collect additional information. Along related lines, Cooper, Folta, and Woo (1995) determined that overconfident individuals do less searching for information when initiating a business. Furthermore, Schwenk (1986) suggested that a manager's overconfidence could engender commitment from others to ideas, even when their information is quite incomplete. Thus, overconfidence may encourage managers to take action without engaging in extensive information search, analysis and planning prior to starting an initiative. These arguments lead to the first hypothesis:

> *Hypothesis 1: Overconfidence decreases planning for product introductions.*

Planning and Priduct Introduction Performance in Dynamic Markets

We believe that planning has a negative relationship with product introduction performance in dynamic markets based on four key factors. First, planning can become expensive (Forbes, 2007). The employee costs associated with the time spent acquiring and analyzing data, preparing reports, and discussing alternatives may be substantial. And this is to say nothing of the monetary outlays associated with mailings, presentations, and computer time. Of course, this investment could be justified if planning generated useful results. This, however, brings us to the second reason why we believe planning is negatively correlated with product performance in dynamic environments. In dynamic environments, conditions can change in an instant, rendering planning-based information obsolete (e.g., Miller, 1996). For example, in response to a new introduction, other companies may lower their prices, increase their advertising, or modify their own current offerings. Planning data cannot incorporate these market responses because planning data are historical, not proactively generated based on experimental action (Bourgeois & Eisenhardt, 1988; Eisenhardt & Tabrizi, 1995). As explained by McGrath and MacMillan (1995), in dynamic environments, reliable and predictable knowledge of well-understood business has not yet emerged and managers only have access to assumptions about possible futures. Thus, managers who rely on planning will be wasting precious resources on studying a condition that ceases to exist as soon as they act.

The third reason why planning may decrease product introduction performance is because it may delay product launches. Decision-making speed is particularly important in dynamic environments. While, in theory, planning may increase product introduction speed by launching managers on “correct” paths (e.g., Cooper & Kleinschmidt, 1996), in dynamic settings, reliable information is unavailable, so planning is not likely to lead to the correct path (e.g., Lynn et al., 1996). Delays are one of the most significant problems that managers face when introducing new products. They decrease a firm’s profits, diminish competitive advantage, and minimize the ability to adapt to a changing environment (Cooper & Kleinschmidt, 1996;

Eisenhardt, 1989). And while one may make rapid decisions using certain processes even if they engage in comprehensive decision making; following a planning process does not seem to produce this outcome (Eisenhardt, 1989; 2001). Further, products are growing obsolete at an increasing rate and windows of opportunity are closing more rapidly than we have seen historically.

Lastly, even after the planning process is complete, it still may decrease the manager's ability to recognize and/or respond to new, ongoing, real-time information (Thomas, Clark, & Gioia, 1993), a process that is critical for managers of small businesses (Parker, 2006). Based on structured analyses of historical and non-direct product data (such as focus groups), the planning process creates an intricate articulation of underlying beliefs and elaborate schemas about the environment. When the planning is completed, the management team believes that it has an understanding of how to proceed. The planning-generated schema becomes a robust information-processing template that leads to formulaic thinking and acting (Day & Nedungadi 1994), creating cognitive rigidities in the belief system of the managers (Fiske & Taylor, 1991). The manager may find it difficult to acknowledge discordant feedback and unlearn important assumptions and beliefs about the environment (Nystrom & Starbuck, 1984).

Collectively, the arguments above suggest that the product introduction expenses, delays, and cognitive rigidities associated with planning in dynamic environments will not generate a return in the form of more useful information. Given these arguments, it is not surprising that seminal articles (Fredrickson & Mitchell, 1984) have found that although planning is associated with higher performance in stable industries, it is associated with decreased performance in unstable ones. Therefore, hypothesis two follows:

> *Hypothesis 2: In dynamic environments, planning decreases the economic performance of new product introductions.*

Planning as a Mediator of Overconfidence on Performance

Notwithstanding hypotheses one and two, the question remains, does planning mediate the relationship between overconfidence and performance? Identifying planning as a mediator would provide evidence of a causal mechanism between overconfidence and performance. Hypotheses one and two represent two of the conditions that need to be present to establish that planning is a mediator. Collectively, they suggest that lower overconfidence leads to more planning, and more planning leads to lower performance. As such, they represent necessary, but not sufficient, conditions to indicate that planning mediates the overconfidence-performance relationship (Hedstrom & Swedberg, 1998).

Nevertheless, we do believe the other conditions exist, and that planning mediates the relationship between overconfidence and performance. In addition to confirming hypotheses one and two, the argument for mediation must also establish that overconfidence would not have a direct effect, or would have less of a direct effect, on performance when planning is present in the model. We believe this to be the case because overconfidence is a cognitive process, and is therefore unlikely to directly influence a

firm level outcome. Instead, cognitive processes are more likely to have an effect through their influence on a variable that reflects actions, such as planning (Simon, Houghton, & Savelli, 2000). Actions, like planning, would then influence the outcome (Simon and Houghton, 2003). Several empirical studies in other areas have uncovered similar mediated relationship among cognitions, actions, and performance (e.g., King, Dalton, Daily, & Covin, 2004). Furthermore, if planning does mediate the relationship between overconfidence and performance, it would help explain why scholars reached different conclusions about the effects of overconfidence (King et al., 2004). Therefore, hypothesis three follows:

> *Hypothesis 3: Planning mediates the effect of overconfidence on the economic performance of new product introductions in dynamic environments.*

METHODS

Most research assessing cognitive biases has used a laboratory design approach (Camerer & Lovallo, 1999). Laboratory findings have encouraged researchers to call for field studies that examine the effects of biases in real business situations (Staw, 1991). In response, the current study examines the effects of overconfidence on the performance of an actual product that a company had recently introduced. We focused on just one product per firm; managers are best able to judge performance at this level, and aggregating all of a firm's products confounds the influence of a given variable on a product's performance (Maidique & Zirger, 1985). We gathered data at two time periods. Near the time the product was first launched, we measured the extent of the manager's overconfidence and his or her use of planning. Eighteen months later, we measured the product's overall performance.

The study focused on the top managers of smaller companies (under 100 employees) in the computer industry. As recommended by Barczak (1994), we focused on one industry because simultaneously examining multiple industries may have confounded the results of many past product introduction studies. The computer industry was an especially relevant setting for our study because it is known for its dynamism (Brown & Eisenhardt, 1997). The industry is dominated by frequent product introductions, short product lifecycles, and rapidly shifting competitive landscapes (Brown & Eisenhardt, 1997).

The sample was selected from the Georgia Technology Sourcebook, which contains a comprehensive list of Georgia-based high-technology companies. The directory indicated that there were 213 Georgia-based computer firms that had fewer than 100 employees. We contacted each of the companies by phone to determine whether it anticipated introducing a product to the market shortly or had just done so. One hundred thirty-five companies met all of the study's criteria. Sixty-one of the firms agreed to participate and provided all the information needed for the first stage of the study, generating a response rate of 45%. The firms of respondents did not differ from those of non-respondents regarding number of employees or company age at the 0.05 level of significance. Each of the firms had just launched a product within the past 3 months or anticipated a launch within 30

days. Following a pilot test, we gathered data from the individual who was most responsible for making decisions regarding the product introduction. Thirty of the respondents were at the highest level within the company, (CEOs or Presidents), while the remaining 31 respondents were one level below. Responding firms were, on average, 10 years old and had 20 employees. Eighteen months later, we surveyed the firms regarding the product's overall performance. Managers from 52 of the original firms responded, generating an 85% response rate for the second phase of the study and an overall response rate of 39% for both stages. (Appendix A details the specific steps taken to gather follow-up data.)

Overconfidence

Consistent with foundational overconfidence studies (Russo & Schoemaker, 1992; Yates et al., 1998), we defined overconfidence as being overly certain of one's facts. Overconfidence was measured by asking managers to respond to factual questions that had clear-cut right and wrong answers, and then to predict the accuracy of their responses. The managers were given two possible responses and asked to select the one they thought was correct. After choosing, they recorded how confident they were that their answer was right on a scale ranging from 50 to 100%. They would not put down less than 50% because that would suggest they should have selected the other choice. A response of 50% would indicate that they thought their response was a total guess, while 70% would indicate that they thought they had seven chances in ten of being correct. Managers were overconfident if they believed that they were accurate more often than they actually were. Specifically, each respondent's overconfidence was determined by averaging his or her level of confidence for all seven of the questions and subtracting the percentage of items correct; the greater the difference, the greater the degree of overconfidence.

Although an individual's tendency towards overconfidence is relatively stable across decision domains (Yates et al., 1998), we took the added precaution of tailoring the instrument questions to the general type of information that managers might use when deciding whether to introduce a product within the computer industry. For example, respondents were asked, "Which of the following PC 'markets' grew more rapidly last year?" The two possible answers provided were "retail sales" or "corporate sales." Eight experts specializing in the computer industry and/or product introductions (including a venture capitalist), two directors of risk assessment centers, and an academic confirmed the relevance of the questions to the computer industry (listed in Appendix B).

We did not want the measure of overconfidence to be influenced by recent experiences of the managers. To avoid this potential confound, we were careful to limit the topics of the questions to general information that managers might use, excluding questions about specific information that managers did actually use when introducing a product in the computer industry. This precaution insured that the respondent's rating of his or her confidence in their information accuracy was unlikely to change as a result of any specific product outcome experience. Consistent with traditional measures, our method did not capture one's optimism about an outcome or one's

tendency to overestimate one's general skills.

Planning

The study used three close-ended survey items adapted from past research to gather data about the degree to which managers engaged in planning. Managers responded on a five-point Likert-type scale that ranged from "strongly disagree" to "strongly agree."

Product Performance

To measure product success, the study assessed outcomes that were directly related to the product's economic performance, including the product's profitability, sales, market share, and financial success. Consistent with past research (e.g., Cooper & Kleinschmidt, 1996), we used self-report measures rather than more objective ones, because small firms often do not have the sophisticated accounting systems needed to provide "hard" data regarding a product's financial performance (Covin, Prescott, & Slevin, 1990). Instead, we argue that product's performance can best be judged by the party who is most knowledgeable about the product introduction and most responsible for its success or failure (i.e., the respondent manager). Furthermore, although not directly focusing on product introduction performance, research by Dess and Robinson (1984) suggests that subjective performance measures are appropriate when objective performance data may be unavailable, because the two types of measures are highly correlated. For example, in our study, overall product performance was associated with the extent to which the product's profit margin was higher than that of the company ($r=0.30$, $p<0.05$, $n=30$), the percent of company sales the product generated ($r=0.36$, $p<0.01$, $n=41$), and the percent of company profits the product generated ($r=0.40$, $p<0.01$, $n=33$).

In the context of our study, however, the subjective measure of performance raised a potential concern: Will managers who were more overconfident of their general computer industry information in Phase I of the data collection overstate performance in Phase II? We argue that they will not for several reasons. First, empirical studies have found no relationship between overconfidence and perceiving low risk or between overconfidence and optimism (Astebro & Adomdza, 2007; Houghton et al., 2000; Keh, Foo, & Lim, 2002). The measure of overconfidence allows the manager to be overly confident of negative information, while optimism is a bias of overconfidence only in positive information. For example, the respondent would be overconfident, but not optimistic, if he or she expressed certainty of the size of a relevant market segment, yet they underestimated the market size. Second, affect factors that might lead to overstating performance, such as the need to maintain a high self-esteem, or thinking highly of one's general skills, are also not associated with overconfidence (Forbes, 2005; Yates et al., 1998). This provides additional confirmation that overconfidence, in and of itself, does not influence the assessment of performance. Finally, we believe that measuring performance 18 months after we measured overconfidence and using widely different measurement formats (i.e., composite percentages for overconfidence; Likert scales for performance) also minimized the chance of inducing a specious relationship between the two variables. Thus, there is little reason to believe that overconfident managers, as we use the

term, would systematically overestimate performance 18 months later.

Controls

The larger the company, the more extensive the use of planning (Delvecchio & Anselmi, 2006). Therefore, when testing hypothesis one, the effects of overconfidence on planning, we controlled for the effects of company size. Consistent with past literature, we used the log of number of company employees. We also included two control variables, namely cross-functional communication and past company performance, when examining hypothesis two, the effects of planning on performance. Scholars have found that cross-functional communication enhances new product performance, arguing the effects of this variable may be one of the strongest and most robust findings in the new product literature (Brown & Eisenhardt, 1997). We measured cross-functional communication using the average score of a two-item scale.

We also included past company performance as a control variable, as it might be directly associated with performance when facing a changing environment (Audia, Locke, & Smith, 2000). Consistent with past research (Covin et al., 1990), we first asked managers to rate how satisfied they were with the firm's performance on six economic criteria and then to indicate how important each criterion was to them. We then multiplied the performance scores by the importance scores for each of the six criteria and summed the results. This process generated a weighted average performance index for each firm. Using the manager's assessment of past performance helps partial out any variance that might be caused by a manager's general tendency to be optimistic or pessimistic that might also affect their assessment of current performance.

RESULTS

The data were analyzed with structural equation modeling technique (i.e., LISREL). LISREL allows us to test the hypothesized relationships by examining the paths among overconfidence, planning, and product performance. Researchers (e.g., Iacobucci, Saldanha, & Deng 2007; Zhao, Lynch, & Chen 2010) have claimed that using LISREL to test mediation (hypothesis 3) is superior to Baron and Kenny's (1986) procedure. LISREL allows us to estimate the model simultaneously instead of assuming that the three regression equations which test for mediation are independent, as required by Baron and Kenny's (1986) procedure. Furthermore, LISREL allows us to use each of the individual measures to capture constructs, which may be a better option than using scale means to represent the constructs, as is the norm when using the Baron and Kenny's mediation test. Following Anderson and Gerbing's (1988) two-step process, we first assess the measurement model, and then examine the structural model for the testing of the substantive hypotheses 1 through 3.

Measurement Model Assessment

Table 1 reports the constructs' descriptive statistics, correlations, Cronbach alpha (α), average variance extracted (AVE), and the chi-square differences ($\Delta\chi^2$) between models with fixed versus free correlations between pairs of constructs/variables. The descriptive statistics include means, standard deviations, skewness, kurtosis, range, and the number of items used to measure each variable. The skewness values are

between minus 2 and plus 2. The kurtosis values are between minus 5 and plus 5. These values provide evidences that all three variables are normally distributed (Ghiselli, Campbell, & Zedeck, 1981).

All three variables are significantly correlated with each other ($p < 0.01$). Overconfidence is negatively and significantly correlated with planning ($r = -0.52$). Product performance is positively and significantly correlated with over confidence ($r = 0.37$) and negatively and significantly with planning ($r = -0.57$). Reliabilities are measured by Cronbach alpha (α). An alpha value of 0.7 or above indicates a good measurement scale (Nunnally, 1978). The reliabilities of 0.77 for planning and 0.86 for product performance suggest that both measurement scales have adequate reliability.

Table 1: Descriptive Statistics, Correlations, Reliability, Average Variance Extracted, and Chi-Square Test of Discriminant Validity among Three Variables

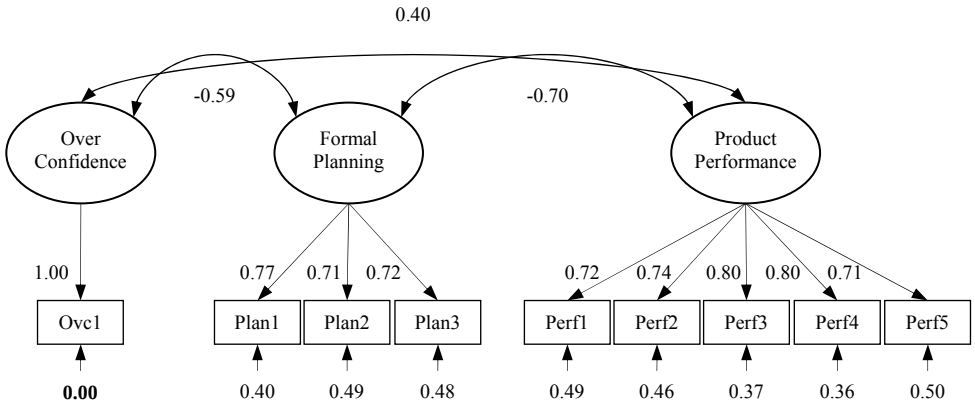
	Overconfidence	**Planning**	**Product Performance**
Mean	0.11	2.91	3.98
Standard Deviation	0.16	0.74	1.29
Skewness	0.10	-0.04	-0.49
Kurtosis	0.38	-0.08	-0.04
Range	-0.25-1.00	1-5	1-7
# of Items	1	3	5
Overconfidence	--		
	--		
Planning	-0.52	**α = 0.77**	
	$\Delta\chi^2$=44.91	AVE=0.54	
Product Performance	0.37	-0.57	**α = 0.86**
	$\Delta\chi^2$=207.98	$\Delta\chi^2$=26.26	AVE=0.57

For convergent validity of a scale, AVE should be above 0.50 (Segars, 1997). The AVE values are 0.54 for planning and 0.57 for product performance, respectively. Convergent validity is also assessed by how well the items load on their respective construct. Figure 1 depicts standardized item-factor loadings (λs) for all three variables in Table 1. All the standardized item-factor loadings are 0.71 (t=5.81) or higher. Both the AVE values and standardized item-factor loadings suggest that the measurement models have adequate convergent validity.

For discriminant validity, the AVE scores for each variable should be greater than the square of the correlation between the focal variable and other variables. An examination of Table 1 shows that the AVE scores for planning and product performance are greater than the square of the correlation between the focal-factor and other factors, suggesting adequate discriminant validity. A more rigorous chi-square (χ^2) test of discriminant validity is to examine whether a unidimensional rather than a two-dimensional model can account for the intercorrelations among the observed items in each pair (Segars, 1997). For the

three comparisons, the adjusted chi-square value for the test of discriminant validity between pairs of constructs must be equal to or greater than 8.62 for significance at $p < 0.01$ (Cohen & Cohen, 1983). Findings reported in Table 1 indicate that all chi-square differences are significant at the $p < 0.01$ level, suggesting discriminant validity between each pair of constructs.

Figure 1: Three Factor Measurement Model (Standardized Solution)



χ^2=26.73; df=25; χ^2/df=1.07; p-value=0.36947; RMSEA=0.030; NNFI=0.99; CFI=1.00

The model-data fit was evaluated by chi-square, degrees of freedom, p-value, root mean square error of approximation (RMSEA), non-normed fit index (NNFI), and comparative fit index (CFI). RMSEA value less than 0.050 suggests good model-data fit (Steiger & Lind, 1980). NNFI and CFI indices greater than 0.90 suggest good model-data fit (Bentler & Bonnett, 1980; Bentler, 1990; Joreskog & Sorbom, 1989). The three-factor/construct correlated measurement model (see Figure 1) was assessed to have good model-data fit with $\chi^2 = 26.73$ for 25 degrees of freedom, chi-square per degree of freedom = 1.07, p-value = 0.36947, RMSEA = 0.030, NNFI = 0.99, and CFI =1.00. Each of the items had item-factor loadings greater than 0.71. No major modification index has been suggested for possible improvements to the model. Having found that the three factor correlated measurement model has good model-data fit, we proceed to examine the structural model and test the hypotheses.

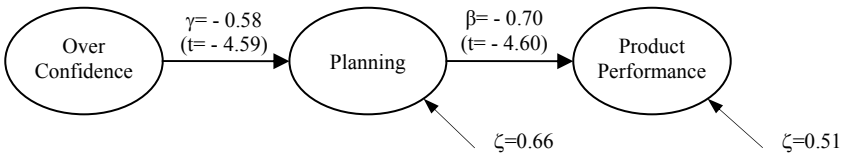
The Structural Model: Assessing Substantive Hypotheses H1 thru H3

Figure 2 illustrates the structural relationships (γ) between the exogenous variable (ξ) overconfidence and the endogenous variable (η) planning. It also depicts the structural relationship (β) between planning and product performance. The structural model (see Figure 2) indicates good model-data fit (a chi-square of 26.78 for 26 degrees of freedom, chi-square per degree of freedom = 1.03, p-value = 0.42080, RMSEA = 0.020, NNFI = 1.00, and CFI = 1.00).

The good model-data fit permits us to examine the hypotheses. Overconfidence has a significant path coefficient ($\gamma = -0.58$, $t = -4.59$, $p < 0.01$) to planning. Thus, hypothesis H1, overconfidence decreases planning for product introductions, is

supported. Planning also has a significant path coefficient (γ = -0.70, t = -4.60, p < 0.01) to product performance. Thus, hypothesis H2, in dynamic environments, planning decreases the economic performance of new product introductions, is supported. The variance explained in planning and product performance by the model is 34% (ζ = 0.66) and 49% (ζ = 0.51), respectively.

Figure 2: Structural Model for Hypotheses Testing



χ^2=26.78; df=26; χ^2/df=1.03; p-value=0.42080; RMSEA=0.020; NNFI=1.00; CFI=1.00

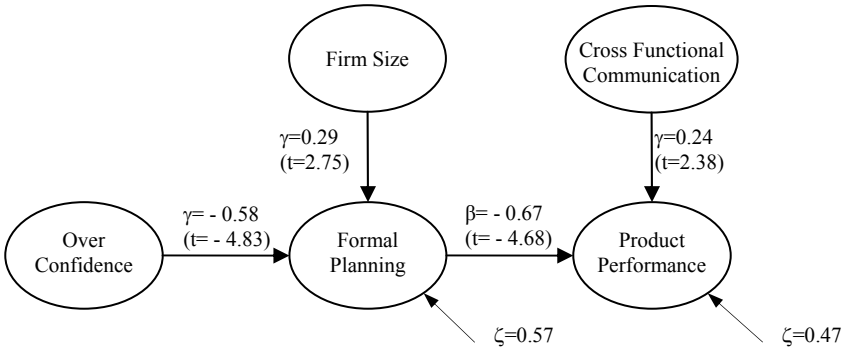
To test hypothesis H3, we followed the steps suggested by Iacobucci (2008). First, a baseline structural model was constructed to connect overconfidence directly to product performance. This baseline model had good model-data fit (chi-square of 10.30 for 9 degrees of freedom, chi-square per degree of freedom = 1.14, p-value = 0.32700, RMSEA = 0.043, NNFI = 0.99, and CFI = 1.00). Overconfidence had a significant path coefficient (γ = 0.40, t = 3.18, p < 0.01) to product performance. The variance explained in product performance by the model was 17% (ζ = 0.83). This baseline model demonstrated that overconfidence had a significant, direct relationship with product performance. Second, planning was introduced to the baseline model to mediate the direct overconfidence - product performance relationship. The re-constructed structural model had good model-data fit (see Figure 2). Overconfidence had a significant path coefficient to planning and the planning also had a significant path coefficient to product performance. Thus, hypothesis H3, planning will mediate the effect of overconfidence on the economic performance of new product introductions in dynamic environments, is supported. Third, a direct path from overconfidence to product performance was added to the model and tested for significance. The added path was not significant, suggesting that planning fully mediated the relationship between overconfidence and product performance (Iacobucci, 2008).

Control variables (firm size, past performance, and cross-functional communication) were introduced to Figure 2 one at a time. Firm size was found to significantly enhance planning (γ = 0.29, t = 2.74, p < 0.05). Cross-functional communication was found to significantly improve product performance (γ = 0.24, t = 2.37, p < 0.05). However, past performance was found to have no significant impact on product performance. None of these control variables had changed the fact that planning fully mediated the relationship between overconfidence and product performance. The combined structural model is depicted in Figure 3, where firm size and cross functional are introduced to the model simultaneously.

DISCUSSION

Our findings add to the literature by identifying that planning mediates the relationship between overconfidence and product performance. Uncovering a previously unidentified mediator suggests that scholars may have underspecified the effects of overconfidence on a product's performance. This mediation indicates that planning is a generative mechanism, thereby helping enhance our understanding of cause and effect.

Figure 3: Structural Model with Significant Control Variables Included



χ^2=40.30; df=40; χ^2/df=1.01; p-value=0.45678; RMSEA=0.010; NNFI=1.00; CFI=1.00

By identifying variables that serve as intermediate actions, our model contributes to an understanding of the complex causal chain that starts with overconfidence and ends with product performance.

More specifically, identifying planning as a mediator helps resolve a controversy in the literature. Prior research indicates that many managers of small firms may use biases, such as overconfidence, when making strategic decisions (Liao et al., 2008). Some argue that overconfidence hurts performance by causing managers to bypass planning, thereby starting down the wrong path. Other scholars, however, believe that overconfident managers save time and resources by avoiding a futile search for "reliable" information that initially does not exist in dynamic environments. These scholars also assert that overconfidence may generate action that produces useful feedback. Thus, a contribution of the current paper is to provide insight into this intense debate, which prior to this effort, to the best of our knowledge, has not been examined empirically.

We examine how overconfidence influences product performance through its effect on planning in dynamic environments. We found that overconfidence is associated with less planning (H1) and that less planning was associated with improved product performance (H2). Furthermore, planning fully mediated the relationship between overconfidence and performance (H3). Collectively, these finding help resolve the contradictory suggestions of scholars about the effects of overconfidence on performance.

It is important to note that our research does not examine the precise dynamic by which managers succeed, even if they are initially overconfident. We believe that adaptive sense-making, as compared to planning, may be more likely to lead to success in dynamic markets, although admittedly we did not explicitly test this assertion. Adaptive sense-making refers to making rapid decisions based on post-launch information gathering and taking experimental actions to generate more feedback about the emerging environment (Bogner & Barr, 2000). The process facilitates understandings that are grounded in real time, not retrospective behaviors and information. Furthermore, by bypassing planning, we believe being overconfident of one's facts may lead to rapid action,which is a prerequisite to adaptive sense-making. Because overconfident managers have not developed and committed to a detailed cause and effect schema, they are likely to notice and accept relevant feedback, which, given their confidence, the manager react to with great alacrity.

Furthermore, even if some of the unfolding information contradicted their initial beliefs, they might be more willing to modify those beliefs, given that they have not made large tangible or emotional investments in them. Their ability to become confident allows them to iterate rapidly multiple times between acting, feedback, and adjusting, which, in turn, generates the intuition needed in dynamic environments (Eisenhardt & Tabrizi, 1995). Ultimately, they generate constantly evolving schemas that are complex, based on relevant information, and contain ever increasingly useful cause and effect understanding which are needed for new product success.

Alternatively, managers who are initially overconfident may engage in improvisation (Crossan, Cuhna & Cuhna, 2005). According to Crossan, Lane, White, and Klus (1996), improvisation can reflect taking advantage of opportunities as they unfold and capture a mix of strategy formulation and implementation. Weick (2001) further explains that improvisation involves less investment in front-end loading (trying to anticipate everything that will happen or that you will need) and instead focuses on a greater reliance on the ability to do a quick study, intuitions, and sophistication in cutting losses. As such improvisation's emphasis on an experimental culture, real-time information and communication (Crossan et al., 2005) may make it ideal for dealing with dynamic environments.

The current paper complements several works on confidence and overconfidence in business settings. The largest group of these papers contain measures whose format was identical to (e.g., Busenitz & Barney, 1997; Forbes, 2005) or only slightly different from (e.g., Keh et al., 2002; Simon et al., 2000) the one used in this paper. All of this research measured the individual's confidence and accuracy regarding factual information. These studies added greatly to our knowledge of many topics, including risk perception (Simon et al., 2000), differences between entrepreneurs and managers (Busenitz & Barney, 1997), opportunity identification (Keh et al., 2002), and antecedent to overconfidence (Forbes, 2005). However, despite the authors' comments about the importance of a link between overconfidence and performance, none captured the direction of this relationship.

Other research measured or discussed overconfidence in a way that is almost synonymous with poor organizational performance. For example, although

appropriate for their research questions, Isabella and Waddock (1994) measured confidence as optimistic predictions about performance outcomes and discussed overconfidence as being optimistic and failing to achieve positive results. Similarly, Simon, Houghton, and Savelli's (2003) field study determined that overconfidence occurred when a manager was 100% certain that a product introduction would achieve a success factor and ultimately failed to do so. Both of these studies' measures made it definitional that overconfidence would yield lower performance. Our measure of overconfidence did not involve predictions of future performance, but instead focused on inappropriate certainty in current knowledge. Thus, it was potentially possible to detect a positive association between overconfidence and performance.

Our measure of overconfidence provides insights into Eisenhardt's (1989) finding that managers who followed specific processes in dynamic environments had greater confidence and improved performance. They argued that one of the reasons for this relationship was that the managers' confidence was well-founded because the process they followed generated better information. However, they did not actually examine the quality of the information that the managers used. Yet quality of information may be crucial (Forbes, 2007). Our study suggests that it is at least possible that increased confidence, even in the absence of increased initial accuracy, could have been associated with improved performance.

It is interesting to compare our finding that overconfidence decreased planning with Forbes' (2005) finding that decision comprehensiveness increased overconfidence. We believe these findings complement rather than contradict each other. At a very general level, we are proposing that uncertainty of ones facts leads to information search, whereas Forbes (2005) found that this information search leads to greater, but unwarranted, certainty. Consistent with other scholars (Zacharakis & Shepherd, 2001), he argues that considering more information may increase an individual's certainty without increasing their accuracy. Clearly, though, to test the complementary nature of these findings, future research needs to rigorously measure how overconfidence and information search change and relate to each other over time.

Limitations and Future Research Directions

This study has some limitations that suggest future research directions. The demands placed on the study's respondents, such as being in a small company that had just introduced a new product and providing data twice during a year and a half period, limited the study's sample size. The small size in turn decreases the power of the analysis while increasing the instability of the results. This, in turn, increases the likelihood that future studies may not replicate this study's results. Given this study's exploratory nature, the multiple calls to conduct longitudinal research linking managerial cognition to firm actions and performance (e.g., Thomas et al., 1993), and the difficulty of this task, we believe that the sample size was reasonable. Furthermore, other studies (e.g., Adams, Nelson, & Todd, 1992) have used comparable sample size in running LISREL. Moreover, we checked the modification index at the measurement and structural model levels and no major modifications were suggested. In addition, the t-values for all the paths (Figure 2) are significant at the .01 level. These findings provide evidence that the results are reliable. Finally, to the extent that the study

achieved significant results despite its small sample size, it served as a conservative test of the hypotheses.

The study's small sample size restricted the number of control variables (Churchill, 1979) related to both the individuals completing the questionnaire and the firm's outcomes. We did, however, minimize this problem by constraining many conditions that could have affected outcomes. For example, all the firms were small, introducing a product in the same industry, and were located in the same geographic area. Also, the respondents were at roughly the same organizational level and were the individuals most responsible for the product introductions' success. Clearly, however, if possible, future studies should strive to use larger samples and utilize more control variables, especially ones reflecting differences in individuals.

In striving to make sure that managers faced very similar decision situations, we limited the study's generalizability. Consistent with Whetten's (1989) suggestion that exploratory research should focus on areas where the phenomenon of interest is most likely to be present, we examined smaller firms. Managers of these firms exhibit the overconfidence bias to a greater degree than their counterparts (Busenitz & Barney, 1997). We also examined dynamic environments, given that the information overload, high uncertainty, and high time pressures associated with these environments may make it likely that managers are overconfident (Busenitz & Barney, 1997). Dynamic environments were also worthy of study because they pose special challenges to learning and to achieving product introduction success given their relative lack of reliable and relevant data for decision making (Isabella & Waddock, 1994).

Several scholars (e.g., Forbes, 2005), however, have argued that the performance effects of biases and heuristics depend, in part, on the environment in which they are exhibited. We concur. For example, we do not necessarily believe that the relationships we uncovered exist in more stable environments or for larger firms, where planning may be crucial to success. This belief, however, needs to be directly examined to test the boundary conditions of the relationships we uncovered.

Managerial Implications

We caution readers not to misinterpret or overstate our findings. Our study is descriptive, not prescriptive. We are *not* stating that managers should do *no* planning. *Some* planning and research may be beneficial. Also, while we found that greater overconfidence may actually enhance product performance as compared to planning, it is very doubtful that overconfidence is an overall panacea or that it is without some negative ramifications. We do not suggest that we have uncovered the *best way* to generate new product performance.

Other, more advantageous ways may exist. For example, Eisenhardt (1989; 2001) uncovered a detailed and comprehensive process that differed from planning, and allowed managers operating in dynamic environments to make decisions rapidly and effectively. Their process was quite specific, and went far beyond planning. It explained, for example, when managers should collect information, what type of information they should use, and who they should involve in the planning process. Additionally, an article by Sykes and Dunham (1995) argues that the key to success lies in initially identifying one's assumptions, and recognizing their uncertainty. Managers then need to act with

the explicit goal of testing and, as needed, modifying those assumptions. Grant (2003) suggests that planning systems which minimize the use of analytical processes, but lay out clear performance targets and corporate guidelines may enhance performance in dynamic environments. Similarly, McGrath and MacMillan (1995) suggest a unique planning process that may be especially beneficial by better enabling managers operating in dynamic environments to explore their assumptions.

In fact, our study's findings notwithstanding, it may make sense to reduce overconfidence if one does so in combination with the alternative planning methods above. Admittedly, though, it is difficult to correct the general tendency to be overconfident, and even increased awareness of the tendency does little to decrease the bias (Heuer, 1999; Russo & Schoemaker, 1992). There are, however, several effective steps managers can take which focus on the process of how people make judgment and reach conclusion, rather than just focusing on the judgments and conclusions themselves (Heuer, 1999). These steps include techniques like devil's advocacy, eliciting outside expertise, and interdisciplinary brainstorming (Heuer, 1999; Russo & Schoemaker, 1992).

Our research leaves many questions unanswered that were beyond this study's scope. We believe that early research needs to be evaluated not just by its results, but also by questions and the opportunities for future research it generates. We do not view this paper as the ultimate answer, but rather as a first foray into understanding the complex interplay of cognitive biases, planning, and organizational outcomes. Nonetheless, this longitudinal study contributes to the literature by answering the calls of researchers (e.g., Staw, 1991) to examine the effects of overconfidence in a field setting and to test opposing assertions regarding those effects. The paper's major contribution to the literature was identifying that planning mediated the relationship between overconfidence and product performance. It is our hope that this study serves as an important early step in examining these issues, and provides a building block for future work in this area.

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APPENDIX A

Eighteen months after we gathered the first wave of data, we contacted the original companies and mailed the manager most responsible for the product introduction a questionnaire about problems his or her product encountered. In 87 percent of the cases, this individual was the same person who had responded 18 months earlier. To increase response rate, we conducted multiple follow-up calls and mailings and provided all participants with two free movie tickets. We also entered respondents in a drawing for a dinner for two at an exclusive restaurant in Georgia (valued at over $100). To track firms that had moved, we used state phone directories and Internet search engines to look up both the name of the company and the name of its employees. The eight firms that failed to respond either refused to participate or were impossible to contact, possibly because they were acquired, moved, or failed. Although survivor and response bias is a consideration, the concern was minimized by the high response rate, as well as the fact that non-respondents had potentially positive (e.g., being acquired) and negative (e.g., failing) outcomes (McDougall & Oviatt, 1996). Furthermore, there was no statistical difference at the five percent level between those firms completing both parts of the study and those that dropped out on the data that was collected during the first wave including number of the firm's employees, firm age, or the level of the manager's overconfidence.

APPENDIX B

Overconfidence: Executives circled the answer they thought was correct ("A" or "B") to the questions below. Then, in the last column, they recorded their level of confidence by indicating a percentage ranging from 50 to 100%. For example, if they thought there was a three out of four chance that they chose the correct answer, they would than indicate a 75% level of confidence. Fifty percent indicated a pure guess.

Respondents' overconfidence was determined by averaging their level of confidence for all questions and subtracting the percentage of items correct. If their average level of confidence was greater than the percentage of items correct, then overconfidence occurred. This measure generated a continuous variable.

Questions	**Answers**		**Level of Confidence**
1. What percent of businesses with fewer than 100 employees use PCs?	A. Over 80%	B. Under 70%	_____
2. From October, 1994 to March, 1995 which company sold more PCs in the U.S.?	A. Compaq Computer	B. Packard Bell Electronics	_____
3. Which of the following PC "markets" grew more rapidly last year?	A. Retail sales	B. Corporate Sales	_____
4. In 1994, Lotus Development ...	A. Lost money	B. Made a profit	_____

5. What percent of new computer users utilize PC magazines to help them buy software?	A. More than Half	B. Less than Half	_____
6. Relative to 1991 sales, how much did Compaq's sales increase by in 1994?	A. Less than Double	B. Over triple	_____
7. What percent of computer owners use educational software?	A. About 66%	B. About 40%	_____

Planning: planning was measured using the average score on the three-item scale, below.

I prefer careful and thorough analysis rather than intuition if it affects results	1	2	3	4	5
My strategic decisions are generally more affected by industry experience and lessons learned by formal research and systematic evaluation*	1	2	3	4	5
We develop and use a detailed plan when marketing our products	1	2	3	4	5

Product Performance was measured using the five-item bipolar scale below. Respondents were asked to circle the number that best captured their product introduction's potential financial performance. For example, for the first item below they would circle a "1" if the product has **not** led to **a major** increase in overall company financial performance and a "7" if it has led to **a major** increase in overall company financial performance. Responses for the five items were averaged.

The product …

has **not** led to **a major** increase in overall company financial performance.	1	2	3	4	5	6	7	has led to **a major** increase in overall company financial performance.
fell far below profit goals.	1	2	3	4	5	6	7	**far exceeded** profit goals.
fell far below sales goals.	1	2	3	4	5	6	7	**far exceeded** sales goals.
fell far below market share goals.	1	2	3	4	5	6	7	**far exceeded** market share goals
has achieved a **far higher** market share than competitor's	1	2	3	4	5	6	7	has achieved a **far lower** market share than competitor's.*

Firm Size was captured using the log of number of company employees.

* Items denoted with an asterisk are reverse coded.

Cross-functional communication: We measured cross-functional communication using two-items.

We utilized a cross-functional team to introduce this product.	1	2	3	4	5	6	7
There was substantial communication between functional areas regarding this product.	1	2	3	4	5	6	7

Past Performance: The measure is reproduced below.

	How **important** is this performance measure to the company?					How **satisfied** are you with the company's achievement on this measure?				
	Not Important				Very Important	Not Satisfied				Very Satisfied
Sales Growth	1	2	3	4	5	1	2	3	4	5
Net Profit Margin	1	2	3	4	5	1	2	3	4	5
Cash Flow	1	2	3	4	5	1	2	3	4	5
Market share	1	2	3	4	5	1	2	3	4	5
Ret. on Equity	1	2	3	4	5	1	2	3	4	5
Ret. on Assets	1	2	3	4	5	1	2	3	4	5