Uncertainty in Strategic Management Research: Three Unresolved Tensions

Asda Chintakananda¹, David P. McIntyre², Erica Wen Chen³

¹National Institute of Development Administration, Bangkok, Thailand
²Providence College, Providence, RI
³Nanyang Technological University, Singapore

Abstract
This paper identifies three areas of theoretical tension and ambiguity regarding the role of uncertainty in the strategic management literature. Specifically, we describe the difference between market and product uncertainty, uncertainty and risk, and perceived and objective uncertainty. We describe the specific nature of each tension, and illustrate its impact on firm development at the value creation and appropriation stages. We conclude by offering several potential avenues for synthesis and extension of these themes.

Keywords
Uncertainty, Risk, Perceived Uncertainty, Objective Uncertainty, Product Uncertainty, Market Uncertainty

INTRODUCTION
Uncertainty has been an integral aspect of strategic management since the early works of Knight (1921). Yet despite extensive theoretical and empirical attention spanning decades, there remains substantial ambiguity regarding the concept of uncertainty as well as its usage in strategy research. Even a consistent definition of the term remains elusive, as “there are almost as many definitions of uncertainty as there are treatments of the subject” (Argote, 1982, p. 420). Furthermore, most empirical research which incorporates uncertainty fails to account for both firm-level and industry-level effects (McMullen and Shepherd, 2006). Adding to this complexity, the strategic impact of uncertainty may vary over time, even within a single firm. For example, Alvarez and Barney (2005) note that while uncertainty is a necessary condition for the early entrepreneurial founding stages, it may not be a sufficient condition for the creation and appropriation of economic profits at the latter post-formation stages of the firm – other factors such as the stage of firm development and managerial heuristics may come into play. Thus, discrepancies in the in the treatment and use of uncertainty have slowed progress in our understanding of how uncertainty can impact firms’ strategic decisions and outcomes (Grandori, 1984; McMullen and Shepherd, 2006).

Despite the vast theoretical and empirical literature examining the impact of uncertainty on strategy, three broad sources of theoretical tension remain. First, while both market uncertainty and product uncertainty significantly influence value creation activities (conceptualization, innovation, production, and product delivery) and value appropriation activities (extracting profits from the market), they are often treated in isolation by extant theory. Second, uncertainty and risk – two closely related but distinct concepts that have different implications for value creation and
appropriation – have often been used interchangeably in strategy research (Alvarez, 2007; Knight, 1921). This has led to not only incongruences in the usage of theory, but also incongruences between the construct of uncertainty and measurement of uncertainty (Downey and Slocum, 1975; Downey et al., 1977; Tosi et al., 1973). Third, objective uncertainty, the actual state of uncertainty, and perceived uncertainty, uncertainty as filtered through managerial lens, are two different concepts that can also have different implication to firm behavior, yet distinctions between these concepts are largely lacking in strategy research (Bourgeois, 1980). This has led to differences in the shift of attention of managerial focus (Ocasio, 1997). Finally, the scope of research on uncertainty has focused on a few specific strategic domains, such as the firm founding (or market entry) stage, or the firm task and structure alignment stage. There has been relatively little emphasis on how uncertainty facilitates the actual generation and appropriation of economic value from specific strategic actions (Alvarez, 2007).

Such inconsistencies and tensions suggest the need for a synthesis encompassing several aspects of uncertainty in the context of strategy research. Thus, the purpose of this research is to describe and extend the discussion of uncertainty, particularly in the context of the value creation and appropriation stages of the firm – the two firm development stages that follow the entrepreneurial founding stage of the firm. We emphasize the multidimensional nature of uncertainty, including: (1) the unique mechanisms underlying the market and product uncertainty; (2) the linkage between perceived uncertainty and objective uncertainty; and (3) the distinction between uncertainty and risk. In particular, we will build upon previous findings on inconsistencies of uncertainty research (e.g., Buchko, 1994; Hrebiniak and Snow, 1980; Koufteros et al., 2005; Milliken, 1987; Sutcliffe and Zaheer, 1998; Yasai-Ardekani, 1986) and discuss more recent research trends. Theories such as transaction cost economics, real options, increasing returns, and resource-based view are also referenced to further facilitate our understanding. This review will illustrate that critical strategic decisions often rely on the accurate assessment of product and market uncertainty, as well as risk-taking under uncertain conditions. These distinct factors frequently need to be assessed in conjunction rather than independently. The resultant discussion provides implications for further theoretical and empirical development on uncertainty in strategy research.

UNCERTAINTY IN STRATEGIC MANAGEMENT

What Do We Know?

There have been many definitions of uncertainty in the management literature. In general, uncertainty occurs when “the probabilities of alternative outcomes cannot be determined by a priori reasoning or statistical inference” (Casson, 1982). This definition aligns with those of other researchers who define uncertainty as the inability to predict the likelihood of future events or outcomes (e.g., Duncan, 1972; Lawrence and Lorsch, 1967; Milliken, 1987). Despite the agreement on the overarching definition, there have been many disagreements among management scholars on how the topic of uncertainty should be approached. Some scholars suggest that due to the difficulty in understanding
the true state of uncertainty, uncertainty should be studied as a perceived phenomenon (Lawrence and Lorsch, 1967; Duncan, 1972; Downey and Slocum, 1975; Downey et al., 1977). For example, Lawrence and Lorsch (1967) proposed using perceived certainty of sub-environments (science, market, and technical-economic) to capture the degree of congruence between firms’ organization structures and strategies and their relevant environment. Duncan (1972) suggested that uncertainty be measured along two dimensions: simple-complex (based on the level of information or lack of information) and static-dynamic (based on the degree of not knowing the outcome of a specified decision). Duncan (1972) found that static-dynamic was a better indicator of uncertainty, and complex-dynamic was linked with highest uncertainty level. Despite the similarity between the measurements and construct of certainty by Lawrence and Lorsch (1967); Duncan (1972); Downey and Slocum (1975); and Downey et al. (1977) found very little overlap between Duncan’s and Lawrence and Lorsch’s measurements, which are supposed to capture a very similar construct.

Some researchers have argued for the use of objective uncertainty rather than perceived uncertainty (Aldag and Storey, 1975; Snyder and Glueck, 1982; Tinker, 1976), as objective uncertainty has a stronger tie to firms’ value creation and appropriation outcomes. In particular, their main argument lies in the fact that despite the same concept of uncertainty, perceptive uncertainty and objective uncertainty are two different constructs. Tosi et al. (1973) found no significant relationship between Lawrence and Lorsch’s (1969) subjective measures of uncertainty and their own objective measures of uncertainty. Snyder and Glueck (1982) subsequently examined the difference between several subjective measures of uncertainty and several objective measures of uncertainty, and their outcome also supported Tosi et al. (1973)’s results.

Milliken (1987) further suggested a more comprehensive framework that captures the multidimensionality construct of uncertainty rather than perceptive and objective uncertainty. He suggested that uncertainty can be categorized into state uncertainty (the inability to predict the state of the environment), effect uncertainty (the inability to predict the effect of the environment) and response uncertainty (the inability to predict the response to the environment). Gerloff et al. (1991)’s study found construct interrelatedness between Duncan (1972)’s perceptive uncertainty and Milliken (1987)’s state uncertainty, and Duncan (1972)’s objective uncertainty and Milliken (1987)’s effect and response uncertainty.

Sutcliffe and Zaheer (1988) categorized uncertainty according to three sector source: primary, competitive, and supplier uncertainty. Such categorization allows for a better explanation of value creation and value appropriation. Sutcliffe and Zaheer (1988)’s primary uncertainty has several conceptual overlaps with Milliken (1987)’s state uncertainty which helps explains the level of value creation. Sutcliffe and Zaheer (1988)’s primary and competitive uncertainty explains firms’ value appropriation through firms’ vertical integration decisions.

More recently, researchers have refined the previous categorizations of uncertainty based on the categorizations above. Sarkar et al. (2001) used environmental dynamism to capture uncertainty and examined the moderating roles of three sources of dynamism on the relation between alliance proactiveness and performance: technological dynamism, market dynamism, and competitive dynamism. Shervani et al. (2007) classified uncertainty according to internal uncertainty versus external uncertainty to investigate how firm power influences channel integration.
Why Is it Important?

Research in strategic management has relied on uncertainty to develop newer theory and concepts as well as provide a meaningful explanation of business phenomena (Weber, 2000). For example, in transaction cost economics, uncertainty has been used to explain why firms integrate vertically (D’Aveni and Ravenscraft, 1994; Geyskens et al., 2006; Jones and Hill, 1998; Williamson, 1991). In financial economics, uncertainty has been used to explain how firms make timing decisions through growth options and deferral options (Chintakananda and McIntyre, 2014; Folta and O’Brien, 2004; McDonald and Siegel, 1986). In evolutionary economics, uncertainty has been used to explain why firms conduct search and experimentation (Altdich, 1999; Nelson and Winter, 1982). In managerial economics, uncertainty has been used to explain how firms manage flexibility (Stigler, 1961). In social network theory, uncertainty has been used to explain how firms build network governance (Jones et al., 1997). The usage of these theories as well as the combination of these theories help researchers develop a better understanding of how firms achieve sustained competitive advantage. As a result, the predictability and validity of the concepts and theories used in strategic management research, and the advancement of the strategic management domain is contingent upon a thorough understanding of the types of uncertainty that occur and the types of uncertainty used.

How uncertainty affects strategic management research can also be viewed from the process of how firms create an appropriate value. At the value creation stage, uncertainty plays a key role in determining how value is created and the amount of value created. When there is no market uncertainty, it is unlikely that firms will create value (Barney, 1986). This is because when all firms know what will happen, any rents available would be driven close to zero. On the contrary, the existence of uncertainty creates asymmetries of information, which give rise to disequilibrium in the market (Aldashev, 2009). Market disequilibrium will provide opportunities for firms to enhance their performance through value appropriation (Altrich and Zimmer, 1986). At this stage, the different usage of uncertainty by management researchers will bring about how firms create value differently, as well as the subsequent level of value created differently.

At the value appropriation stage, uncertainty mainly affects the governance mechanisms and bargaining power among actors. In terms of governance mechanisms, firms will be subject to a higher level of internal uncertainty than external uncertainty. This will be relatively easier for firms to manage and control, but from a management researcher standpoint, more difficult to measure and operationalize. In terms of bargaining power among actors, firms will be subject to a higher level of external uncertainty than internal uncertainty. This will be more difficult for firms to manage and control, but from a management researcher standpoint, easier to measure and operationalize.

Though uncertainty clearly plays a foundational role in various theoretical perspectives in strategic management, comprehensive reviews of the nature and dimensions of uncertainty are surprisingly sparse. In the following section, we describe our attempt to address this gap by surveying leading journals in the field to understand, categorize and review various aspects of uncertainty.

SURVEY OF STRATEGIC MANAGEMENT LITERATURE

In order to gain a better understanding of how uncertainty has been used in strategic management literature, we surveyed theoretical and empirical studies on uncertainty published
in leading management academic journals published over the past 20 years 1996−2015). We first searched for articles in the EBSCOhost and Web of Science databases using the terms uncertainty, certainty, risk, and ambiguity. We confined our search to journals consistently recognized as top journals for management research: Academy of Management Journal (AMJ), Academy of Management Review (AMR), Administrative Science Quarterly (ASQ), Journal of Management (JOM), Journal of Management Studies (JMS), Organization Science (OS), and Strategic Management Journal (SMJ). We also included work from two leading journals in entrepreneurship: Entrepreneurship Theory and Practice (ETP) and Journal of Business Venturing (JBV). This search returned 185 articles that had uncertainty that was the main focus of the paper (i.e., either part of the research question or critical to the theoretical development of the paper).

We then analyzed and categorized the articles by how strategy researchers have conceptualized and/or operationalized uncertainty. While our analysis revealed a number of difference approaches to such conceptualizations, we found three dimensions of fundamental distinction in the literature on uncertainty: level of analysis (market vs. product uncertainty), relative state (objective vs. perceived uncertainty), and measurement method (uncertainty vs. risk). Table 1 summarizes the broad categorizations of uncertainty with selected strategic management research that we identified and used in our review. It is important to note that Table 1 illustrates uncertainty as closely aligned to one of the three categories – level of analysis, state of objective and measurement method. However, these categorizations are not absolute, and indeed there are many instances where these categorizations overlap. However, for the objective of comparing and contrasting the inconsistencies and tensions in the use of uncertainty, we place them in the categories that they are most closely aligned with.

**TENSIONS AND INCONSISTENCIES IN STRATEGY RESEARCH**

Recent research in strategic management highlights the continuing role of uncertainty as a critical concept for strategy researchers and practitioners. Table 1 highlights several studies from leading management/strategy journals in the past 20 years in which the notion of uncertainty plays a central role. These studies encompass various dimensions of uncertainty at the product, firm, market, and environmental levels. From these and other studies at the nexus of strategy and uncertainty, we identified three sources of ambiguity in extant uses of uncertainty: market and product uncertainty, objective and perceived uncertainty, and uncertainty and risk.

**Market Uncertainty and Product Uncertainty**

Competitive firms face two dimensions of uncertainty – uncertainty in the market or market uncertainty, and uncertainty about the performance of their own products or product uncertainty (or technical uncertainty). Market uncertainty is present when managers cannot predict how the components of the environment may be changing (e.g., Duncan, 1972; Lawrence and Lorsch, 1967; Milliken, 1987). It is generated by unknown and rapid shifts in consumer preferences and needs resulting in an inability to predict or estimate future demands for products (Jones et al., 1997). Consumer preferences provide information on the potential sales and profit available to a firm, thus it provides a direct indication of the degree to which a firm may need to prepare its
Table 1

Recent Examples of Uncertainty in Strategy Research

<table>
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<tr>
<th>Level of Analysis</th>
<th>Value Creation</th>
<th>Value Appropriation</th>
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<td>Market Uncertainty</td>
<td>Das et al., 1998</td>
<td>Delios and Henisz, 2003</td>
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<td>Gulati and Higgins, 2003</td>
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<td>Song and Montoya-Weiss, 2001</td>
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<td>Both Market and Product Uncertainty</td>
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<td>Atuahene-Gima and Li, 2004</td>
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<td>Geyskens et al., 2006</td>
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<td>Objective Uncertainty</td>
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<td>McGrath, 1997</td>
<td>Puffer et al., 2010</td>
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<td>Agle et al., 2006</td>
<td>Tosi et al., 1973</td>
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<td>Huff, 1978</td>
<td>Downey et al., 1975, 1977</td>
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<td>Lewis et al., 2002</td>
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<td>State of Objective</td>
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<td>Huff, 1978</td>
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<td>Li and Atuahene-Gima, 2002</td>
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<td>Risk Measurement Method</td>
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<td>Cumming, 2006</td>
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<td>Ferrary, 2010</td>
<td>Alvarez and Parker, 2009</td>
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<td>Patel and Fiet, 2009</td>
<td>Van de Vrande and Vanhaverbeke, 2013</td>
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<td>Foo, 2011</td>
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<td>Uncertainty</td>
<td>Brauer and Wiersema, 2012</td>
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<td>Schreyogg and Steinmann, 1987</td>
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<td>Park et al., 2002</td>
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<td>Autio et al., 2013</td>
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<td>Both Risk and Uncertainty</td>
<td>Forbes, 2007</td>
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resources and production capacity to meet the anticipated demand or gain this potential share. Besides, a shift in consumer trends and preferences, market uncertainty is also generated by rapid changes in knowledge, technology or seasonality, which may result in shorter product life cycles requiring changes in resources and production capability (Garud et al., 1998). Market uncertainty has been used as a source of uncertainty in various strategy literatures. For example, Balakrishnan and Wernerfelt (1986) found that market uncertainty makes vertical integration risky owing to obsolescence. Mariotti and Cainarca (1986) found that under conditions of market uncertainty, firms disaggregate into autonomous units and conduct outsourcing in order to develop their ability to respond to a wide range of contingencies. Jones et al. (1997) found that at high levels of market uncertainty, firms will use social mechanisms to coordinate and safeguard exchanges.

Product uncertainty occurs when managers cannot predict where their performance outcome will lie within a market performance distribution (e.g., Camerer and Lovallo, 1999; Lippman and Rumelt, 1982). Product uncertainty occurs when managers cannot predict where their performance outcome will lie within a market performance distribution (e.g., Camerer and Lovallo, 1999; Lippman and Rumelt, 1982). Such uncertainty may be driven by confusion about which features of the product are most relevant, or whether the technical performance of the firm’s product matches or exceeds competitors’ products. Greater experience in production often mitigates such uncertainty, as firms can capitalize on cumulative knowledge acquired in the production process to reduce product uncertainty (Li and Rajagopalan, 1998; Levin, 2000). However, there are limits on the extent to which firms can capitalize on such cumulative knowledge to reduce product uncertainty and produce higher-quality products that match consumers’ preferences, as production-based knowledge tends to depreciate over time (Argote et al., 1990).

While both categories of uncertainty concurrently influence value creation and value appropriation by the firm, there is little theoretical discussion or empirical research about the dynamics and interplay of these two types of uncertainty. Several theories relevant to strategic management, including real options and transaction cost economics, treat product and market uncertainty in isolation. At the value creation stage, for example, real options have been used to predict or explain how a firm undertakes a certain action. However, the results have been inconclusive: research on options theory has found that highly uncertain market conditions can either induce firms to delay action (e.g., McGrath, 1997), accelerate action (e.g., Lin and Kulatilaka, 2007), or take both actions at different levels of uncertainty (e.g., Folta and O’Brien, 2004). At the value appropriation stage, researchers incorporating real options theory have found that when faced with product uncertainty, firms may delay actions such as deferring a product release or taking a staged release approach. Similarly, a transaction costs economics (TCE) perspective predicts that under uncertain product conditions, firms would release products in stages. Such perspectives, although insightful, fail to account for unique effect of each type of uncertainty (market or product uncertainty). For example, previous research has used product uncertainty to measure the effects of market uncertainty (e.g., Folta and O’Brien, 2004). In addition, many studies treat the effects of either market or product uncertainty in isolation (e.g., McGrath and Nerkar, 2004). Also, the direct of change under product and market uncertainty may not be in agreement. Moreover, the effects of uncertainty on firm action at the value creation stage and value appropriation stage may be different (Alvarez, 2007; Bhide, 2000; Busenitz and Barney, 1994). These inconsistencies have resulted in conflicting
results on the impact of market and product uncertainty on value creation and rent creation by the firm, and suggest a need to consider both sources of uncertainty in both theoretical and empirical treatments of the construct and outcomes.

**Objective and Perceived Uncertainty**

From a decision-making perspective, uncertainty is present when managers do not understand how the components of their environment may be changing (Milliken, 1987). Under uncertain conditions, the environment is the decision-maker’s primary source of information, which in turn is filtered by managerial perceptions (Galbraith, 1973; Lawrence and Lorsch, 1967). Several researchers have suggested that the level of filtration of uncertainty via the managerial lens may depend on the knowledge of the manager regarding the environment. For example, Milliken (1987) suggested that how managers respond to uncertainty depends on their understanding of the cause-effect dynamics of the environment. McGee and Sawyerr (2003) categorized different managerial tasks, and suggested that certain kinds of tasks are likely to be more responsive to objective uncertainty and perceptive uncertainty. Bourgeois (1980) suggested that as managers learn more about the environment, the level of reliance of objective state of environment increases. However, a significant amount of research has used these two concepts interchangeably with contrasting results, highlighting the need for a more consistent method of applying proxies for these phenomena to strategy research.

**Uncertainty and Risk**

Uncertainty and risk are two closely related but distinct concepts, yet researchers often use these two concepts interchangeably (e.g., Alvarez, 2007; Knight, 1921; Shane, 2003). In particular, many researchers have used risk or volatility as a proxy for uncertainty. However, this approach neglects the important theoretical distinction between uncertainty and risk. Uncertainty occurs when a resultant event, cause-effect relationships, or outcomes are unknown; if events or outcomes change in predictable ways, substantial risk or volatility may exist, but there may be little uncertainty (Knight, 1921; Miles and Snow, 1978). This follows financial logic that the reward for risk is predetermined according to the degree of risk that an individual or firm undertakes, whereas rent appropriation are “the above normal returns upon acting upon unique uncertainties or opportunities for which objective probabilities cannot be calculated” (Jones and Butler, 1992). This distinction is particularly important in the rent generation and appropriation stage of the firm, because risk and uncertainty may play different roles in influencing firm action. By using both concepts ambiguously, weakens the validity of conceptualizations of strategic management research (Miller and Bromiley, 1990; Ruefli, Collins and Lacugna, 1999).

In the firm founding stages, the role of risk and uncertainty has been well documented. For example, Wu and Knott (2006) found that entrepreneurs will be risk averse with respect to market uncertainty, yet risk-seeking with respect to product uncertainty. Such risk-seeking stems from the overconfidence that entrepreneurs have in their internal ability, which has been well-documented in research on the founding stages of the firm (Busenitz and Barney, 1994; Simon et al., 2000). In moving from the individual-level to firm-level, the relationship between uncertainty and risk has gone largely unexamined by extant research. However, research on overconfidence holds that
As businesses mature from their entrepreneurial stages, the level of managerial overconfidence and optimism in internal ability diminishes over time (Fraser and Greene, 2006). If so, it is likely that as firms move towards their value creation and appropriation stage, they will be more risk-seeking with respect to market uncertainty, yet risk averse with respect to product uncertainty. This is corroborated by recent research that suggests that as firms become less entrepreneurial, firms respond more to risk rather than uncertainty in the market (Ahmed and Skogh, 2006; Alvarez and Barney, 2005). Thus, future strategy research requires a more consistent delineation of uncertainty and risk, particularly in the later stages of firm development.

**FUTURE DIRECTIONS**

Having established several limitations and ambiguities in the uncertainty literature, we will now discuss these limitations in the context of two distinct processes in strategic management: the creation and appropriation of economic rents by the firm. Furthermore, we offer several avenues of potential extension in this domain, as summarized in Table 2.

**The Impact of Market and Product Uncertainty**

First, future strategy research must consider appropriate measures of market uncertainty and product uncertainty to measure their independent effects on firm behavior. This is especially important at the later stages of entrepreneurial development, in which each specific type of uncertainty may offer unique and divergent incentives for the creation and appropriation of value. In addition, while conceptually related, the state of the market conditions and potential product performance may not always parallel each other. As such, research at the value creation and appropriation stage must integrate or control for the possible effects of each type of uncertainty. Similarly, research at the value appropriation stage must integrate or control for the possible effects of market uncertainty.

Synthesizing these two dimensions of uncertainty provides the ability to examine firm behavior and action, along with integration of other theoretical domains such as competitive dynamics and network effects. For example, strategy research on rent creation has examined phenomena such as initial public offering (IPO) launches and mergers and acquisitions. Real options theory predicts that firms would delay their IPO launch or mergers if market conditions are unfavorable. However, by integrating market uncertainty and competitive dynamics, more nuanced analyses on firms’ incentives to defer action can be conducted, for example when there is possibility of proprietary information spillover. Similarly, at the rent appropriation stage, network effects theory predicts that early movers will benefit from market conditions which favor winner-take-all scenarios (Arthur, 1996; Bettis and Hitt, 1995). Yet, the trade-offs between early product releases, and delays which may improve product performance, are not well understood. Integrating notions of market uncertainty (the degree to which network effects are present) and product uncertainty (the extent to which a product’s features are well-suited to capture increasing returns to adoption) would provide a more comprehensive strategic framework for firms competing in high-technology settings. What is the optimal weighting of product and market uncertainty for firms releasing new products? How can future research account for market uncertainty in such scenarios?
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<th>Theoretical Distinction</th>
<th>Main Findings</th>
<th>Implications and Research Agenda</th>
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<td>Relevance to the Firm Value Creation</td>
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<td>Market vs. Product</td>
<td>Uncertainty about how components of the environment are changing vs. unpredictability of firm-specific outcomes</td>
<td>High levels of market uncertainty induces firms to delay action (e.g., Bowman and Hurry, 1993; Dixit and Pindyck, 1994; McDonald and Siegel, 1986; McGrath, 1999)</td>
<td>The appropriate measure of market and/or product uncertainty needs to be used for different stages of firm development</td>
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<td>Very high levels of market uncertainty may induce firms to take action (e.g., Kulatilaka and Perotti, 1998); Folta and O’Brien, 2004</td>
<td>How can the possible effects of product uncertainty be integrated or controlled for at the value creation stage?</td>
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<td>High levels of product uncertainty may induce firms to hasten their development (e.g., Lin and Kulatilaka, 2007)</td>
<td>How does the specific nature of each type of uncertainty influence firms’ value creation activity?</td>
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<td>High levels of product uncertainty may induce firms to take a staged development approach (e.g., McGrath, 1999)</td>
<td>How do factors such as competitive dynamics influence firms’ response to each type of uncertainty?</td>
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<td>Objective vs. Perceived</td>
<td>Inconsistencies on the degree of correlations between <em>objective</em> uncertainty and <em>perceived</em> uncertainty (e.g., Sutcliffe and Zaheer, 1998)</td>
<td>The appropriate state of uncertainty – <em>objective</em> or <em>perceived</em> – needs to be clearly defined and measured</td>
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<td>Complete information about changing environmental components vs. managerial filtering of the environment</td>
<td>Managers use <em>objective</em> uncertainty and <em>perceived</em> uncertainty for different task occasions (e.g., Bourgeois, 1980; McGee and Sawyer, 2003)</td>
<td>How does the degree of knowledge and experience influence firms’ reaction towards uncertainty in value creating activities?</td>
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<td>The level of reliance on <em>objective</em> state of the environment may increase with experience and learning (e.g., Bourgeois, 1980; Bosenitz and Barney, 1994; McGee and Sawyer, 2003)</td>
<td>How does the level of firm development, heuristics, and the joint decision of top management teams influence perceived uncertainty?</td>
<td>How can firms effectively integrate multiple, non-overlapping data sources in evaluating industry characteristics and product readiness?</td>
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| Uncertainty vs. Risk | Events and outcomes in which the probability is unknown vs. events and outcomes in which the probability can be inferred | Uncertainty and risk has been used interchangably (e.g., Alvarez, 2007) | The appropriate measure of market and/or product uncertainty needs to be used for different stages of firm development |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|

(Continued)
### Table 2
**Limitations in the Context of Two Distinct Processes**

<table>
<thead>
<tr>
<th>Uncertainty Dimensions</th>
<th>Theoretical Distinction</th>
<th>Main Findings</th>
<th>Implications and Research Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Relevance to the Firm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Value Creation</strong></td>
</tr>
<tr>
<td>Entrepreneurs are <em>risk adverse</em> with respect to <em>market</em> uncertainty, yet <em>risk seeking</em> with respect to <em>product</em> uncertainty (e.g., Wu and Knott, 2006)</td>
<td>How does the presence of both uncertainty and risk influence firms’ value creation activity?</td>
<td>Are performance outcomes becoming less predictable with respect to uncertainty and risk?</td>
<td></td>
</tr>
<tr>
<td>The level of overconfidence in internal ability diminishes over time (e.g., Fraser and Greene, 2006)</td>
<td>How do firms’ response to uncertainty and risk develop over time?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As firms progress, they respond to <em>risk</em> rather than <em>uncertainty</em> in the market (e.g., Ahmed and Skogh, 2006; Alvarez and Barney, 2005)</td>
<td>How do firms with multiple product development and launch stages respond to differing stages of risk and uncertainty?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Asda Chintakananda et al. Uncertainty in Strategic Management Research

The Perceived and Objective Nature of Uncertainty

Future research in strategy must clarify, both theoretically and empirically, whether managerial actions are being influenced by the perceived or objective state of environment. At the firm founding stage, it is likely the perceived environment plays a large role in determining action (Bhide, 2000). However, at the value creation and appropriation stages, it is likely that the level of perceived uncertainty in the environment will decline (Bourgeois, 1980). Knowledge-based views of the firm suggest that, with the passage of time, some experience and learning in both the firm’s product and external market takes place. Thus, it is important to consider not only the true level of uncertainty faced by the firm, but also its current stock of knowledge relative to such uncertainty. It is also imperative to delineate the type of knowledge – whether tacit or explicit – that is involved in the learning. Tacit knowledge is embedded and more difficult to articulate; if the firm’s knowledge base is largely tacit, then regardless of the passage of time, some level of perceived uncertainty may exist (Polanyi, 1962). If the knowledge base is more explicit – that is, codified and readily articulable - then there is likely greater diffusion of knowledge about environmental variables within the firm, and thus less filtration of the environment.

Such differences also inform the degree to which managerial biases and heuristics may determine when to take value creation actions such as M&As or IPOs, as well as when to take value appropriation actions such as releasing new products. For example, at the value creation stage, such difference gives rise to several questions on the use of uncertainty in value creation activities. How does firm knowledge affect uncertainty and enhance or mitigate its effects on value creation? How do the presence and robustness of managerial heuristics come into play? Which kind of uncertainty has more influence in joint-decision settings or among the top management team?

At the value appropriation stage, the tension between objective and perceptive uncertainty suggests several areas of inquiry. How can firms effectively integrate multiple, non-overlapping data sources in evaluating industry characteristics and product readiness? Furthermore, can knowledge-based approaches, such as examining the experiential knowledge base of a top management team, bridge the disconnect between perceived and objective uncertainty in a given setting?

The Role of Uncertainty and Risk

Third, while the distinction between uncertainty and risk in research on the entrepreneurial founding state has been relatively well-established, the distinct conceptual nature of these constructs needs to be extended to firm value creation and value appropriation activities. While recent strategy research has suggested that in value creation and value appropriation, firms may respond more to risk rather than uncertainty in the market (e.g., Ahmed and Skogh, 2006; Alvarez and Barney, 2005), this notion has not been empirically validated in different contexts. In addition, it is unclear how the interplay of risk and uncertainty may affect firms’ incentives and strategic actions. These dynamics are particularly critical at the value appropriation stage, which may be influenced by varying degrees of uncertainty and risk.

These ambiguities provide several venues for further research in at the nexus of strategy and uncertainty, but hold particular relevance to areas such as risk management, transaction costs, and increasing returns. At the value creation stage, there are several activities for which stakeholders must account for both uncertainty and risk in order to create value. For example,
in launching an IPO, managers and venture capitalists take into account the level of market uncertainty in order to ensure a launch success. But concurrently, venture capitalists also must determine the amount of risk that they undertake in order to maintain an effective portfolio of investments. These parallel strategic phenomena illustrate the complex interplay between risk and uncertainty in strategic action. How do firms’ responses to uncertainty and risk develop over time? How does the presence of both uncertainty and risk influence firm action and performance? Are there situations in which managers might respond differently, or even divergently, to the presence of high risk vs. high uncertainty? Further examination of such questions would offer more robust explanations of managerial action, but also account for the distinct conceptual nature of risk and uncertainty.

At the rent appropriation stage, recent studies of technology standards, network effects and positive feedback suggest that performance outcomes may become increasingly divergent in many industries, with a few dominant players capturing technology standards, while others are competed out of the marketplace entirely. As such, are distributions of potential performance outcomes changing? How do managers perceive risk and uncertainty in the context of winner-take-all markets? Do traditional metrics of risk and uncertainty, which often rely on past measures of volatility, still apply in today’s evolving markets?

**CONCLUSION**

Despite the extensive study of uncertainty in strategy research, there remains substantial ambiguity regarding the nature of uncertainty in different contexts. Existing research in strategic management – in particular, research on firms at the value creation and appropriation stages – tends to incorporate uncertainty without regard for its complex and multidimensional nature. In addressing this limitation, we have identified distinctions among market and product uncertainty, perceived and objective uncertainty, and uncertainty and risk. Furthermore, we have attempted to identify the unique mechanisms underlying these distinctions, and offer several potential areas for synthesis and extension. We hope that this review and the distinction and integration of these dimensions will facilitate more robust theoretical and empirical work, and provide many new avenues for research at the nexus of strategy, management, and uncertainty.

**REFERENCES**


