

TO SHAPE OR ADAPT: KNOWLEDGE PROBLEMS, EPISTEMOLOGIES, AND STRATEGIC POSTURES UNDER KNIGHTIAN UNCERTAINTY

VIOLINA RINDOVA

Marshall School of Business, University of Southern California

HUGH COURTNEY

D'Amore-McKim School of Business, Northeastern University

Despite the longstanding recognition of the importance of uncertainty in strategy, strategy researchers have given limited attention to the distinct challenges and processes involved in strategy making under uncertainty. To address this gap, we build on Knight's and Shackle's seminal ideas about how strategists address the incomplete knowledge problems that uncertainty poses. We argue that strategists adopt two distinct strategic postures when crafting strategies in uncertain markets—shaping and adapting—and theorize their constituent elements: intentions, epistemologies, and enactment strategies. Our framework extends current understanding of strategy under uncertainty by integrating research on adapting strategies, based on scientific epistemologies, which guide continuous experimentation and learning, with research on shaping strategies, based on design epistemologies, which guide significant symbolic and resource investments intended to create new market orders.

Uncertainty is a fundamental feature of markets where competitors continuously innovate to create new products and services, and where technological, economic, political, and sociocultural trends and shocks continuously make and remake firm environments (Courtney, 2001; Davis, Eisenhardt, & Bingham, 2009; Schoemaker, 2002; Teece, Peteraf, & Leih, 2016; Wernerfelt & Karnani, 1987). Whereas entrepreneurship and technology management researchers have long recognized the resolution of uncertainty as a central aspect of entrepreneurial and innovation processes (Alvarez, Barney, & Anderson, 2013; McMullen & Shepherd, 2006; Moeen, Agarwal, & Shah, 2020; Packard, Clark, & Klein, 2017), Alvarez and Barney (2010: 576) have criticized the strategy field for “generally tak[ing] the existence of opportunities as given” and focusing on “explaining returns from implementing traditional rational strategies but not on where those strategies come from.” As a result, strategy research has developed few theoretical answers to the question of how strategists simultaneously address

the profit opportunities *and* the unpredictability present in uncertain environments (Knight, 1921).

Recognizing that uncertainty critically affects the generation of profits, strategy scholars have developed frameworks that explain how firms manage different aspects of uncertain environments. The real-options perspective suggests that strategists manage unpredictability by hedging and delaying resource commitments (Kogut & Kulatilaka, 2001; McGrath, 1997). The dynamic-capabilities perspective suggests that firms capture opportunities by rapidly reconfiguring resources in dynamic markets (Eisenhardt & Martin, 2000; Rindova & Kotha, 2001; Teece, 2007). Both perspectives have made insightful and important contributions to our understanding of how firms modify their resources to either move rapidly, or delay actions when facing uncertainty. They have also demonstrated the importance of developing theoretical frameworks that clarify the distinctive processes of resource deployment in uncertain contexts. Less attention has been given to the strategies that guide these distinctive resource deployment processes.

The purpose of our paper is to take a further step in this direction by theorizing strategy making under uncertainty. We respond to Knight's (1921:199) call that “If we are to understand the workings of the economic system we must examine the meaning and significance of uncertainty; and to this end some

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inquiry into *the nature and function of knowledge itself* [emphasis added] is necessary.” We build on Knight’s arguments that uncertainty arises from unpredictable, poorly understood change, which poses knowledge problems of enumerating, classifying, and estimating large numbers of effects among interacting factors. As a result, actions are based on “*opinion*, of greater or lesser foundation and value, neither entire ignorance nor complete and perfect information, but partial knowledge” (Knight, 1921: 199). Such situations are seen as presenting a distinct type of uncertainty that bears Knight’s name—“Knightian uncertainty” (hereafter KU). Whereas scholars have agreed that under KU, neither the “right and wrong” answers, nor “what should and should not be learned” are clear (Alvarez, Afuah, & Gibson (2018: 171), much disagreement remains about the nature of the knowledge problems and the means available to strategists and entrepreneurs to address them (see Alvarez & Barney, 2010; Alvarez et al., 2013; McMullen & Shepherd, 2006; Shane, 2000; Townsend, Hunt, McMullen, & Sarasvathy, 2018; Venkataraman, Sarasvathy, Dew, & Forster, 2012).

To advance research on these issues, we theorize two distinct strategic postures and the related epistemologies that strategists can adopt under KU. We focus on epistemologies following Knight’s call for deeper inquiry into the generation and use of knowledge, and we focus on strategic postures following Knight’s reflections on how strategists’ capacities for addressing uncertainty vary based on differences in their attitudes and intentions, ranging from “want[ing] to be sure and . . . hardly tak[ing] chances” to “prefer[ring] rather than shun[ning] uncertainty” (Knight, 1921: 242). Our inquiry into strategists’ epistemologies is further amplified by debates in the economic literature about Knight’s conceptualization of uncertainty and its fit with economic theories of choice under uncertainty (for a review, see Arrow, 1951). In our view, Knight (1921: 199) posed an epistemological question about “the nature and function of knowledge itself,” whereas subsequent economic research emphasized *choice* under uncertainty, defined as “how individuals choose among alternate courses of action when the consequences of their actions are incompletely known to them” (Arrow, 1951: 404). The redefinition of the problem of uncertainty as one of choice among alternatives with unknown consequences has led to significant gaps in understanding of strategy under uncertainty (see also Kay & King, 2020).

We highlight four interrelated issues that must be addressed in order to build a more robust theory of

strategy under uncertainty. First, we argue that strategy making under uncertainty cannot be subsumed within the economic theory of choice, since actions under uncertainty require creative reorganization of knowledge, as well as imaginative generation of possibilities. The economic theory of choice is concerned with selection among available alternatives. Strategy under uncertainty, in contrast, involves generation of knowledge and possibilities that are informed by distinct theories, new evidence, unique insights, and imagination (Felin & Zenger, 2017; Garbuio, Lovallo, Porac, & Dong, 2015; McDonald & Eisenhardt, 2020). Thus, strategies under uncertainty involve creation and enactment (Alvarez & Barney, 2010), and not only *ex ante* bets and choices.

Second, much of the discussion of uncertainty has emphasized the absence of knowledge, and the related states of doubt (McMullen & Shepherd, 2006) and unknowingness (Packard et al., 2017; Townsend et al., 2018) that limit the ability of strategists to predict outcomes (Wiltbank, Dew, Read, & Sarasvathy, 2006). In contrast, the growing body of work on strategists’ agentic efforts to shape the environments in which they compete has suggested that firms generate knowledge in order to create, and not just predict, their future environments (Anthony, Nelson, & Tripsas, 2016; Benner & Tripsas, 2012; Cattani, Sands, Porac, & Greenberg, 2018; Gavetti, Helfat, & Marengo, 2017; Rindova & Fombrun, 1999). Understanding how firms generate knowledge in an effort to change their environments is an important, yet undertheorized, aspect of strategy making under uncertainty.

Third, to respond to Knight’s call for a systematic inquiry into the nature and functions of knowledge, a closer consideration of strategists’ epistemologies is needed. Epistemologies have been highlighted as important for understanding the fundamentally different approaches that entrepreneurs take to pursue opportunities—by discovering or creating them (Alvarez & Barney, 2007, 2010). In a similar vein, we argue that epistemologies shape how strategists understand and act toward uncertainty because they supply the “truth-generating” mechanisms (Rescher, 1998; Shackle, 1966; Zagzebski, 1999) through which strategists seek to resolve incomplete knowledge problems. We theorize how *scientific* epistemologies that focus on “truth-seeking” and analysis support adapting strategies, and how *design* epistemologies that focus on “truth-making” and possibility creation support shaping behaviors. Thus, our framework theorizes the roles of both analysis and design, adapting and shaping in strategy under uncertainty.

Fourth, because action under uncertainty involves incomplete knowledge, scholars have concluded that “what’s required when there is deep uncertainty is not optimization but entrepreneurship, exploration, learning, adaptation, and transformation” (Teece & Leih, 2016: 10). This view emphasizes one approach to managing uncertainty—namely, *adapting* to it by responding rapidly to the changes in available information and knowledge as uncertain situations evolve (Moeen, et al., 2020; Sarasvathy, 2001; Wiltbank et al., 2006). A different approach—*shaping*—has been suggested by the growing body of research on endogenously enacted environments highlighted above. To develop this view, we build on Shackle’s (1966, 1979) ideas of choice as an “originate” imaginative act, and on design theory as the basis for creating new options and possibilities (Simon, 1996). Our framework offers an integrative understanding of when and how firms develop adapting versus shaping postures.

The pragmatic importance of our theory rests on several intersecting factors. First, there is growing evidence that “the global economy has become more advanced and more integrated, allowing the transmission of shocks and the opening of opportunities to businesses anywhere and everywhere” (Teece et al., 2016: 15), thereby increasing the need for proactive management of varying levels and types of uncertainties. Second—and potentially most important from pedagogical and practice perspectives—the preponderance of strategic analysis tools assume the stable and structured decision contexts associated with risk, despite evidence that firms have disproportionate impact on value- and wealth-creation when they shape and transform the environments in which they compete (Gavetti & Porac, 2018). Bringing greater theoretical clarity to the fundamental differences between adapting and shaping intentions, epistemologies, and enactment strategies expands the analytical toolkit for strategy making under uncertainty.

Our paper proceeds as follows. First, we situate Knight’s ideas in an historical perspective by reviewing Arrow’s (1951) influential critique to highlight key differences between Knight’s ideas and economic theories of decision making under uncertainty. Second, we clarify the differences between the knowledge problems under conditions of risk and uncertainty. Third, we theorize two strategic postures toward uncertainty and their constituent elements: intentions, epistemologies, and enactment strategies. We illustrate our ideas throughout the paper with examples from the contexts of mobility and the unfolding COVID-19 economic crisis, as they

vividly illustrate how major political, technological, regulatory, and sociocultural changes interact to generate deep, fundamental, KU.

KNIGHT, KNOWLEDGE, AND UNCERTAINTY

A Turning Point? Kenneth Arrow’s Critique of Frank Knight’s Ideas

In this section, we clarify the fundamental challenge that the notion of KU presents to the classic economic theory of choice, and, by implication, to the majority of strategy research that has built upon economic theory. We highlight Arrow’s (1951) influential critique, as it advanced two arguments intended to downplay the significance of Knight’s ideas. First, Arrow argued that subjective probability judgments cover the range of managerial situations that Knight sought to distinguish from risk; and second, Arrow asserted that statistical, rather than scientific, epistemologies are most appropriate when making business decisions. Both arguments have influenced how scholars and practitioners have come to understand knowledge problems under uncertainty, and the strategies for addressing them (Kay & King, 2020).

In his seminal contribution, *Risk, Uncertainty and Profit*, Knight (1921) drew a sharp distinction between risk and uncertainty, and stressed the crucial role of the latter in determining business profits. He wrote that

the practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcome in a group of instances is known (either through calculation a priori or from statistics of past experience), while in the case of uncertainty this is not true . . . because the situation dealt with is in a high degree unique. (Knight, 1921: 86).

A common interpretation of Knight’s distinction is that it differentiates “between the measurability/unmeasurability or objectivity/subjectivity of probability, or between the insurability/uninsurability of probabilistic outcomes” (Langlois & Cosgel, 1993: 457).

Arrow (1951: 410)—among others (for a review, see Kay & King, 2020)—questioned this interpretation, arguing that “descriptions of uncertain consequences can be classified into two major categories, those which use exclusively the language of probability distributions and those which call for some other principle,” with the difference in viewpoints reflecting “the dispute between those who interpret probability as a measure of degree of belief (e.g., I. Fisher or Lord Keynes . . .) and those who regard

probability as a measure (objective) of relative frequency." Arrow (1951: 416) explained that Knight denied "that all types of risk can be described by probability statements," and that he "sharply distinguished" both *a priori* and statistical probabilities from *true uncertainties*, which "arise when there is no valid basis for classification." However, Arrow (1951: 417) also argued that "Knight's uncertainties seem to have surprisingly many of the properties of ordinary probabilities," and questioned the value of the distinction. He noted that "Knight appears to be worried about the seemingly mechanical nature of the probability calculus and its consequent failure to reflect the tentative, creative nature of the human mind in the face of the unknown" (Arrow, 1951: 417). While conceding that "in a fundamental sense, this is probably correct," he also argued that it "seems to lead only to the conclusion that no theory can be formulated for this case, at least not of the type of theory of choice discussed here" (Arrow, 1951: 417). Thus, Arrow (1951) questioned the value of Knight's ideas for understanding economic choice.

Arrow (1951: 409) supported his arguments by comparing the businessperson to "two other types of individuals who are actually concerned with behavior under uncertainty—the scientist and the statistician." He then argued that the statistician's highly structured approach is of "the same general type as the businessman's," whereas "little of a systematic nature can be said" about the decision-making processes of the scientist (Arrow, 1951: 409). In arguing that business problems are similar to those solved through statistical methods, Arrow further blurred the distinction between risk and uncertainty that Knight emphasized.

Arrow's critique limited the potential impact of Knight's ideas. Whereas Knight drew attention to the problems of interpretation and inference posed by uncertainty, Arrow focused on the problem of making choices among well-defined options with uncertain outcomes. Arrow's arguments sidestepped Knight's extensive discussion of the complex cognitive demands of identification, classification, enumeration, and inference under uncertainty. They ignored Knight's core argument that uncertain situations require qualitative, subjective representations. Knight referred variously to these subjective representations as "images," "estimates," "judgments," "convictions," and "opinions." Forming such subjective representations is a first step in making sense of uncertainty, in which actors conjure up an image of a future state on the basis of a present one. In the next step they assess the *value* of

this subjective image. The assessments that take place in the second step resemble subjective probabilities (see Foss & Klein, 2012; Langlois, 2007; Langlois & Cosgel, 1993), but the first step of making judgments under uncertainty involves qualitative sensemaking. By asserting that managers' tasks are similar to those of the statistician, Arrow (1951) dismissed Knight's emphasis on the subjective sensemaking processes. We return to a discussion of these issues when we theorize the role that epistemologies play in defining *how* one can know and what it means to *know* under uncertainty.

Risk and Uncertainty Revisited

The preceding discussion clarifies that, in Knight's view, the differences between the concepts of risk and uncertainty cannot be explained in terms of objective versus subjective probabilities. Rather, the differences among them rest in the different knowledge problems that strategists face. Fontana and Gerrard (2004: 626) suggested that all choice situations can be analyzed along an aleatory and an epistemic dimension: the aleatory dimension describes the nature of the underlying causal structure, whereas the epistemic dimension describes "the decision makers' knowledge and understanding of that causal structure." *Risk situations*, they argued, have "a causal structure with stable deterministic and stochastic components," which enable decision makers to have "a high degree of knowledge" and therefore, low epistemic uncertainty. High degree of knowledge allows strategists to define "the full set of future possible outcomes" and expected relative frequencies. When making choices in such risk situations, strategists are "essentially backward looking . . . at past outcomes as a guide to future actions" (Fontana & Gerrard (2004: 626). They base their expectations on assumptions that "the causal structure will remain fixed, at least in the short term" (Fontana & Gerrard, 2004: 626).

Strategic management researchers have identified such high-degree-of-knowledge situations as being associated with relatively stable industry conditions, value networks, and competitor and product classifications (Barr, Stimpert & Huff, 1992; Gimeno & Woo, 1996; Porac, Thomas, & Baden-Fuller, 1989). The high degree of knowledge in such situations is enabled by stable, well-understood means–end relationships that often become codified in "industry recipes" (Spender, 1989). Despite the well-understood relationships and interdependencies in such contexts, however, decision makers cannot know which specific

outcome will occur, although they may calculate the subjective expected value of their decisions.

In contrast, strategists face uncertainty, rather than risk, when they make significant investment decisions in markets that are changing in complex and unpredictable ways. As Knight explained, “Change of some kind is a prerequisite to the existence of uncertainty” and “change according to a known law (whether or not we call it change) does not give rise to uncertainty” (Knight, 1921: 313). Thus, *uncertain situations* involve new and unpredictable interactions with unknown consequences, including unpredictable competitive interactions (Ghemawat, 1991).

The current onslaught of the COVID-19 pandemic provides a salient example. The rapid spread of the pandemic and its extraordinary impact on health outcomes across the globe exemplifies a “black swan event” (Taleb, 2007) in being high-impact, extremely rare, and unpredictable in behavior and impact. Its novel and consequential nature creates significant uncertainty for a wide range of stakeholders, including political and business leaders and their constituents and employees. A recent McKinsey & Company article argued that

In this unprecedented new reality, we will witness a dramatic restructuring of the economic and social order in which business and society have traditionally operated. . . . A shock of this scale will create a discontinuous shift in the preferences and expectations of individuals as citizens, as employees, and as consumers. These shifts and their impact on how we live, how we work, and how we use technology will emerge more clearly over the coming weeks and months. Institutions that reinvent themselves to make the most of better insight and foresight, as preferences evolve, will disproportionately succeed. (Sneader & Singhal, 2020: 2–4)

This quote highlights how the current health and economic crisis has made more visible and more dramatic the kind of unpredictable interactions—among known and unknown elements—that define KU, as well as the critical role of new knowledge generation. Such unpredictable change, however, also provides opportunities for profit generation, as its effects could not have been anticipated and incorporated in *ex ante* calculations about resource allocations. In Knight’s (1921: 173) words, “No source of change interferes with the no-profit adjustment, if the law of change is known.”

Novel and unpredictable change requires active sensemaking (Cattani et al., 2018) and new knowledge. To generate new knowledge strategists need

to be “forward looking” (Fontana & Gerrard, 2004: 626–627), overcoming the constraints of thinking anchored in the past (Rindova & Martins, 2018b). In stating that, “the problem of knowledge depends on the future being different from the past, while the possibility of the solution of the problem depends on the future being like the past,” Knight (1921: 313) brings attention to the knowledge discontinuities posed by KU.

Shackle (1966)—another strong critic of the economic theory of choice under uncertainty—further emphasized that new knowledge represents a significant break with the past. New knowledge, he argued, “throws light from new, unsuspected directions, it makes everything look different, it upsets all calculations, it states new axioms, it leaves nothing as it was” (Shackle, 1966: 757). These ideas suggest that strategy making under KU is a knowledge generation process that requires and enables departures from the known past to respond to and reshape an unfolding present guided by subjective beliefs (Felin & Zenger, 2017) and imaginative projections (Porac & Tschang, 2013; Rindova & Martins, 2018b).

The market for mobility services presents an instructive example of multiple interacting changes, ranging from new technologies (autonomous driving), to new business models (ride sharing), and new societal preferences and concerns (climate change and global traffic congestion). These changes are transforming how consumers, strategists, and regulators think about mobility, and multiple views of the future of mobility have been advanced (Corwin, Vitale, Kelly, & Cathles, 2015). Each view articulates—and often advocates—different ends and means. For example, one framework argues that consumer preferences for privacy, flexibility, and security (traditional desirable ends) will continue to support the prevalence of private car ownership (traditional, status-quo means), with autonomous driving enhancing the quality of driver experience (new means that advance traditional ends). A shared-driver framework (current means), in contrast, envisions continued growth of ride sharing and car sharing to reduce the number of cars on the road. In this view, autonomous driving technologies create value by reducing driver-related costs rather than by increasing driver utility (current ends). Another framework combines ride sharing and autonomous vehicles (current and new means) to propose communal forms of transportation where commuters share interests and relationships (new ends).

These “theories” offer broadly framed possibilities rather than clear alternatives and decision paths. They

sketch out plausible trajectories of technological, business, and societal developments that stimulate sensemaking but do not provide sufficient structure for selecting among well-defined alternatives. Within these broad scenarios, future products, value propositions, and the infrastructure investments necessary to support different types of mobility services cannot be fully specified.¹ These scenarios illustrate the strategy-making challenges under conditions when there is “no possibility of grouping on any objective basis whatever” (Knight, 1921: 111), compelling strategists to adopt different approaches to resolving their knowledge problems.

STRATEGIC POSTURES UNDER UNCERTAINTY

Strategy making under uncertainty requires that we understand the sources and consequences of the different approaches to resolving knowledge problems. Knight (1921) emphasized this issue when discussing how strategists’ responses to uncertainty differ based on the quality of their judgment, or foresight; their capacities for planning and adaptation; and their confidence in their own judgments—which, he noted, is largely “independent of the ‘true value’ of the judgments and the powers themselves” (Knight, 1921: 242). These factors generate variation in strategists’ attitudes toward uncertainty, ranging from those who “want to be sure and will hardly ‘take chances’ at all” to those who “like to work on original hypotheses and seem to prefer rather than to shun uncertainty” (Knight, 1921: 242).

Knight’s ideas provide some important guideposts for theorizing strategy making under uncertainty. They highlight how the absence of reliable knowledge—the partial knowledge problem—increases the importance of the strategist’s subjective orientations toward the challenges and opportunities of uncertainty.² Following Knight, we argue that variations in strategists’ attitudes and capacities to

plan or adapt orient their choices toward different time horizons and scope, generate divergent beliefs about appropriate and desirable strategies and resource commitments, and give rise to different strategic postures under uncertainty. In our view, strategists’ attitudes toward the trade-off between the epistemic obstacles to action posed by partial knowledge versus the opportunity to profit from unpredictable changes define whether strategists seek to shape or adapt to uncertainty. These different postures comprise (a) intentions about resolving the knowledge problem at either the firm or market level of analysis, (b) epistemologies for knowledge generation, and (c) enactment strategies involving different resource allocation patterns. We distinguish between shaping and adapting as “ideal-type” postures, to clarify how *ex ante* strategic orientations might bring coherence and direction to strategic actions under uncertainty. Figure 1 represents our framework and Table 1 summarizes the constituent elements of shaping and adapting postures, with references to research that has addressed their specific elements.

INTENTIONS

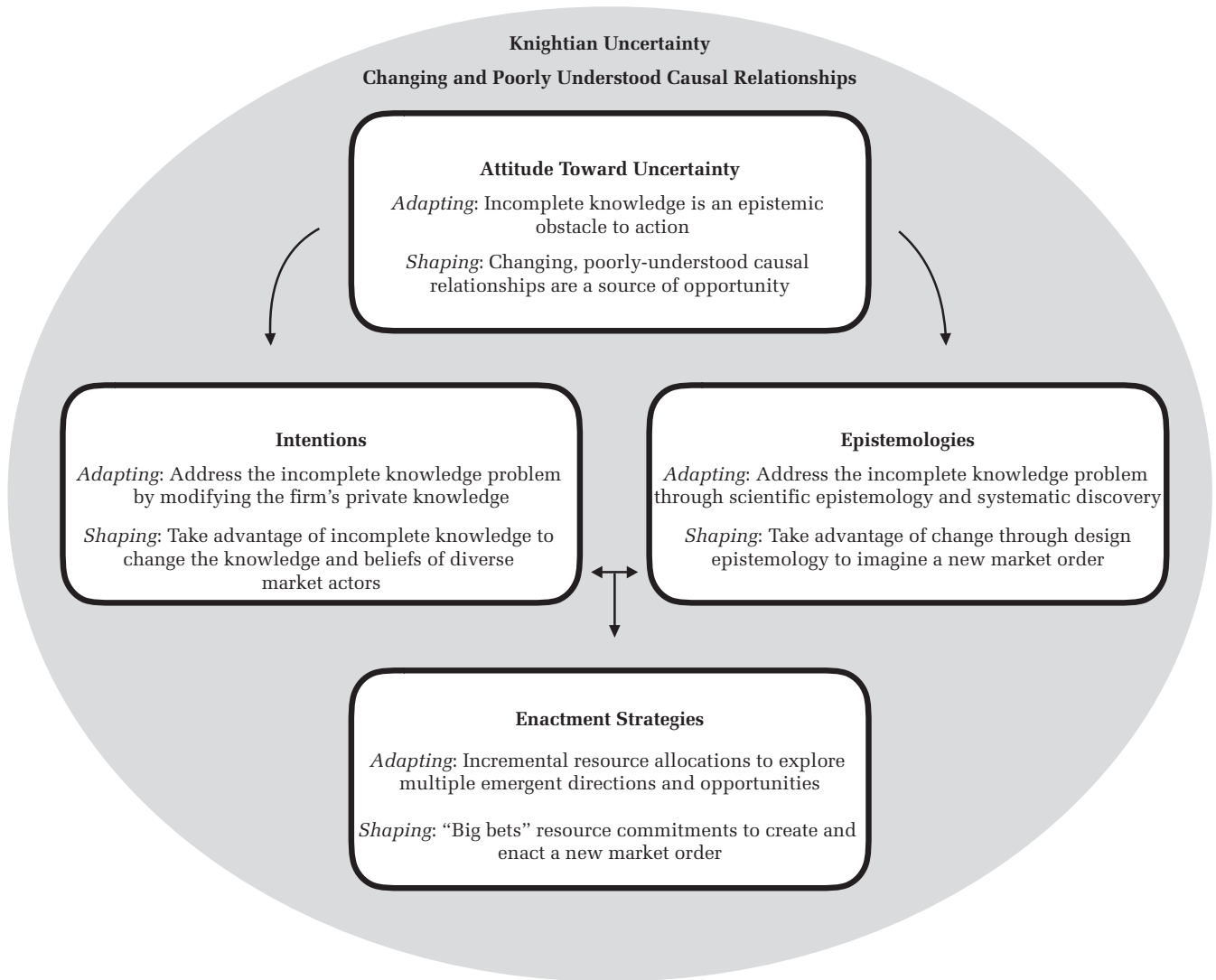
Intentions are an important element of strategic postures under uncertainty because they are “conduct-controlling pro-attitudes” that are generative for means–ends reasoning (Bratman, 1987: 20). As illustrated in our mobility example, uncertainty poses questions about what appropriate and desirable means and ends might be. Further, as uncertainty increases, so do the “degrees of freedom” to select ends and means—including means and ends beyond current understanding of what is expected, appropriate, or desirable. The less defined the knowledge frameworks that guide action, the greater the need *and* opportunity for a firm to define them, and the greater the importance of direction, coordination, and means–ends reasoning provided by intentions. Intentions also provide a form of preliminary commitment, and thus facilitate subsequent decisions and actions over extended temporal frames (Bratman, 1987).

The differences in strategists’ attitudes highlighted by Knight are likely to influence their intentions under uncertainty. Specifically, we argue that to the degree that strategists focus on the lack of reliable knowledge, they are likely to generate intentions to increase their firms’ *private knowledge*, defined as the knowledge that strategists and their firms possess. These intentions reflect an adapting posture that emphasizes the exogenous nature of uncertainty and the

¹ For example, products and services for the in-vehicle transit experience, intermodal transport hubs, and “mobility management” transportation-route-optimization services are all likely to undergo extensive development at varying rates in the coming years, depending on which scenario—or which unknowable combination of scenarios—emerges in different markets and regions.

² Expert observers of the strategic challenges posed by COVID-19 concur. A recently developed framework for crafting strategy in the face of this unprecedented uncertainty posits “resolve”—defined as “the need to determine the scale, pace, and depth of action required”—as the first step in a firms’ strategic response (Sneader & Singhal, 2020: 3).

FIGURE 1
Shaping and Adapting Strategic Postures under Knightian Uncertainty



need to gain more knowledge about the uncertain situation before making significant resource-commitment decisions. An adapting posture is implemented through reliance on scientific epistemology and incremental resource allocations to multiple emergent opportunities. This approach enables firms to maintain strategic flexibility and commit to bolder strategies when they have more knowledge.

Our discussion of *adapting* posture is consistent with much of the received wisdom on strategy under uncertainty, which has been well-summarized by Toh and Kim (2013: 1217) as follows:

The intuitive idea here is that the firm “spreads its technological bets” to diversify risk because it is not

sure if its technology will become dominant. Diversification allows the firm to gather real options in the form of initial investments with partial commitment across various technologies (McGrath, 1997), which subsequently enable the firm to invest fully in the winning technology upon resolution of uncertainty (Adner & Levinthal, 2004). .Diversification also allows the firm to accumulate knowledge incrementally across multiple technological areas, providing headway in the requisite area by the time uncertainty is resolved.

In contrast to this prevalent view on strategy under uncertainty, we argue that, to the degree that strategists view uncertainty as a source of opportunity—and “prefer rather than shun uncertainty” (Knight,

TABLE 1
Elements of Adapting and Shaping as Strategic Postures Under Uncertainty

Element	Adapting Posture	Shaping Posture
Attitude Toward Uncertainty	Incomplete knowledge is an epistemic <i>obstacle to action</i>	Changing, poorly understood causal relationships are a <i>source of opportunity</i>
Intentions	To generate additional knowledge to modify and expand the firm's partial knowledge and align firm knowledge with new causal structures	To create new knowledge for the firm, as well as diverse market actors, and steer market interactions toward an envisioned new market order
Epistemology	Scientific, discovery-oriented; employ intuitive judgments, theories, and experiments	Design, possibility-centered; employ creative cognition and design principles
Enactment Strategies	Incremental resource allocations to multiple emergent directions and opportunities (McGrath, 1997; Suarez et al., 2015; Toh & Kim, 2013) Focus on learning and flexibility to increase firm knowledge and ability to respond to an evolving market environment (Andries et al., 2013; Ott et al., 2017; Rindova & Kotha, 2001; Zuzul & Tripsas, 2020) Use new knowledge to develop products and services that respond to emerging patterns of demand (Anthony et al., 2016) and industry conditions (Hannah & Eisenhardt, 2018)	Major, "big-bet" resource allocations to create preferred envisioned possibilities Focus on (re-)defining key elements of industry structure, conduct, and performance (Gavetti et al., 2017) to steer the evolution of the market environment Use analogies and creative insights to develop novel value propositions that shift consumer preferences (Navis & Glynn, 2010; Rindova & Fombrun, 1999) Design new business models to change the interdependencies and interactions in a given market (Gavetti & Menon, 2016; McDonald & Eisenhardt, 2020; Rindova et al., 2007) Communicate new valuation frameworks (Khair & Wadhvani, 2010; Rindova & Martins, 2018a)

1921: 242)—they are likely to adopt a *shaping* posture based on intentions to change knowledge and beliefs at the market level in a direction preferred by their firm. Such intentions are supported by a design epistemology that guides rethinking, redesigning, and restructuring market and competitive relationships and categories (Cattani et al., 2018; Gavetti et al., 2017; Zuzul & Tripsas, 2020). A shaping posture calls for substantive resource commitments dedicated to the redesign of business models and interdependencies and interactions in a given market (Engler, Cattani, & Porac, 2020; Gavetti & Menon, 2016; Hannah & Eisenhardt, 2018; Martins, Rindova, & Greenbaum, 2015).

EPISTEMOLOGIES

KU arises from poor—or, at best, partial—understanding of a changing reality. Epistemologies focus on knowledge and its relation to underlying reality, and the means for knowledge creation and dissemination (Steup, 2018). It is therefore not surprising that the issue of actors' epistemologies has recurred in the academic conversation on uncertainty. Arrow (1951: 409) highlighted the importance of epistemologies when he argued that business decision-makers could learn from the epistemological approaches of either scientists or statisticians. He stressed the

advantages of the well-structured approach of statisticians, over the exploratory, emergent discovery processes of scientists. Knight (1921: 210) further questioned the utility of any structured approach, emphasizing that decision making under uncertainty involves "not reasoned knowledge, but 'judgement', 'common sense', or 'intuition.'" This is due to the unpredictability of a novel future, which "depends on the behavior of an indefinitely large number of objects, and is influenced by so many factors that no real effort is made to take account of them all, much less estimate and summate their separate significances" (Knight, 1921: 210). Instead, he conjectured, we "'infer' largely from our experience of the past as a whole, somewhat in the same way that we deal with intrinsically simple (unanalyzable) problems like estimating distances . . . when measuring instruments are not at hand" (Knight, 1921: 211). Overall, Knight stressed the use of intuitive sensemaking processes to "size up" the situation and estimate broadly what it might demand.

Shackle (1966: 767) offered a different perspective by arguing that when making strategic decisions

two different types of mind are involved. There are truth-seekers and truth-makers . . . On one hand, the pure scientist deems himself to be typically faced

with a problem which has one right answer. . . . On the other hand, the poet-architect-adventurer sees before him a landscape inexhaustibly rich in suggestions and materials for making things, for making works of literature or art or technology, for making policies and history itself.

These different perspectives point to two different knowledge modalities and associated epistemologies through which strategists may generate new knowledge under KU: knowledge of the actual, which involves “truth-seeking” best represented in a scientific epistemology (Fontana & Gerrard, 2004); and knowledge of the possible, which involves “truth-making” represented in a design epistemology (Simon, 1996).

Truth Seeking and Scientific Epistemology

Post-Keynesian economists have argued that under conditions of uncertainty strategists need to be “forward-looking and scientific” (Fontana & Gerrard, 2004: 627). They have explained that the scientific approach involves “being willing to entertain alternative hypotheses about the causal structure and possible future outcomes and able to interpret new information” as an “evidential base relating to the *whole set* [emphasis added] of alternative propositions/outcomes” (Fontana & Gerrard, 2004: 627–628).

Working from the perspective of the epistemology of forecasting, Rescher (1998: 88–89) argued that when reliable knowledge in the form of laws and rules about regularities is absent, the “duly knowledgeable are able to exploit their intuitive awareness of detectable patterns and phenomena . . . through hunches, intuitions, and educated guesses”—pointing to the same type of mental operations that Knight (1921) discussed. Such processes involve a degree of trial-and-error learning, which can be codified in initial hypotheses and “simple rules” heuristics (Bingham, Eisenhardt, & Furr, 2007). As cognitive scientists tell us, the very notion of a hypothesis rests on “conscious appreciation of how a particular thought or idea organizes or fits the pattern of clues” (Bowers, Farvolden, & Mermigis, 1995: 31). In entrepreneurship research, pattern recognition (Baron & Ensley, 2006) and aligning underlying structural relations across contexts (Grégoire, Barr, & Shepherd, 2010) have been identified as processes for opportunity recognition. These processes explain how past knowledge facilitates the generation of new knowledge.

Further, as recent work on the origins of great strategies has suggested that—because the “environment has a large if not infinite variety of features,

characteristics, and possibilities, which remain latent or dormant”—strategists rely on theories to selectively focus their attention (Felin & Zenger, 2017: 260). Similar to Knight’s argument that the connections that prompt sensemaking and inference are not determined by objective attributes per se, Felin and Zenger (2017: 260) argued that “even mundane objects, events, occurrences or readily visible factors may take on completely new meaning and insight in light of the novel theories we possess.” Strategists’ theories also enable them to project into the future based on theoretical coherence (Rescher, 1998), and to take action ahead of empirical validation.

In addition to acting on intuition, hunches, and theories, strategists may employ experiments using “controlled variation of activities and context in order to produce knowledge” (Ott, Eisenhardt, & Bingham, 2017: 310). Strategists utilize market-based experiments that involve product tests (Thomke, 1998), the development and evaluation of prototypes (Hargadon & Sutton, 1997), use of different marketing and branding messages, and other factors that can be varied without significant cost but provide new information on potential customer demand or regulatory action (McDonald & Eisenhardt, 2020). For example, Andries, Debackere, and Van Looy (2013) described how successful entrepreneurs used multiple business models as experiments, whereas less successful entrepreneurs focused on a single strategy. Similarly, McDonald and Eisenhardt (2020) showed that using experiments to test assumptions sped up and improved the development of new business models. Experiments also reveal surprising options and opportunities (McDonald & Eisenhardt, 2020), thereby enabling strategists to gain knowledge of novel causal structures and improve their understanding of the uncertain situation. Finally, employing a scientific approach to hypotheses formulation and testing leads to more flexible opportunity exploration, including discontinuing weak projects and embarking on new ones (Camuffo, Cordova, Gambardella, & Spina, 2020).

More generally, experimentation designed to probe and learn about potential profit opportunities is increasingly recognized as a core process for opportunity discovery and creation (Dalpiaz, Rindova, & Ravasi, 2016; Pillai, Goldfarb, & Kirsch, 2020). Targeted experiments can help identify consumer preferences for different product and service features; price and income elasticities of demand; the impact that different marketing, sales, and product categorization approaches have on demand and likely competitive responses; underserved markets; and the cost structures underlying different supply chains for bringing

different products and services to market. Initial experiments shape subsequent ones and generate the knowledge firms need to make informed exit or commitment decisions. For example, Capital One conducts thousands of experiments each year to determine shifting consumer demand for different credit features and uses advanced analytic techniques to design new offerings (Capital One Financial Corporation, 2020). While each experiment may be designed to create knowledge about a very specific feature of a product or service, firms can carve out new positions in changing industries through their learning across multiple features and products (Dalpiaz, et al., 2016). Firms following experimentation strategies may need to synthesize information from a broad range of experiments to generate viable competitive strategies.

Truth Making and Design Possibility-Centered Epistemology

Shackle's (1966) distinction between "truth-seeking" and "truth-making" clarifies the need for a distinct epistemology of possibility and design—in particular, one that describes knowledge about how things could be other than what they are. Herbert Simon (1996: 114) argued that, in contrast to the natural sciences, which "are concerned with how things are," design is concerned with "how things ought to be." He famously argued that "everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (Simon, 1996: 111). In strategy research, Porac and Tschang (2013: 253) argued that "'design' should be as central to theories of management as 'decision,'" and Felin and Zenger (2017: 261) highlighted the difference in viewing the mind of the strategist as a "camera" that captures reality versus a "generative organ" that refashions reality by imagining possibilities. Collectively, these different frameworks point to the fundamental difference between actors seeking to understand reality versus actors seeking to shape it to their benefit and advantage. KU intensifies this contrast, as it limits the applicability of current knowledge to effectively understand the uncertain situation, while providing opportunities for generating and propagating novel and preferred representations (Gavetti, 2012; Khaire & Wadhvani, 2010; Navis & Glynn, 2010; Rindova, Petkova, & Kotha, 2007; Zuzul, 2019).

Shackle (1972, 1979) wrote extensively on the topic of choice under uncertainty within a possibility-centered epistemology. In surveying Shackle's work, Earl and Littleboy (2014: 54) noted that "Shackle

wanted to displace probability analysis and replace it with possibility analysis." He viewed probability as "a mode of thought" (Shackle, 1972: 385) that quantifies "relative strength of belief" and "acknowledges tendencies in the world towards expected outcomes," in contrast to possibilities, which "permit anything to happen" (Earl & Littleboy, 2014: 54–55). As Shackle (1972: 404) wrote,

In the search of a language for expectations, we find the notion of *possibility* exempt from two chief disabilities which disqualify probability. It is non-distributional, and can be applied to an inexhaustible stream of origination... [and] it can be applied to hypotheses concerning the outcome of a crucial and self-destructive experiment, one which by its nature irreversibly alters the essential conditions which constitute it.

The two attributes of possibilities that Shackle highlighted point to two important aspects of design epistemology. First, design epistemology supports the creative and ongoing generation of options and the construction of possibilities; and second, it guides commitment of resources toward creating things, environments, and interactions that do not yet exist, thereby irrevocably transforming existing ones (Dorst, 2015). Design begins with an intended, valued outcome, and generates a process for improving extant interactions and steering them toward the target outcome (Dorst, 2015). Thus, whereas a scientific epistemology involves the formation of judgments about discernable patterns that may indicate causal relations, a design epistemology involves creation of new market orders, created by rearranging, redesigning, or restructuring elements of presently unfolding uncertain situations (Gavetti & Porac, 2018).

Tesla's entry into the electric vehicle (EV) market illustrates the design approach. According to some accounts, engineers Martin Eberhard and Marc Tarpenning launched Tesla because they saw a possibility to develop a fully electric vehicle based on the favorable market response to General Motors' EV1, which, although never launched, was considered an engineering success (Reed, 2019). Elon Musk joined in 2004 as an early investor and quickly expanded the vision for what might be possible for Tesla and the broader EV market. As Musk put it in 2011,

In order to change the infrastructure such that we avoid having some sort of catastrophic situation [a century from now], we must act now, because we're talking about changing what will probably be 2 billion cars. You don't just change that overnight. A whole industry has to be born. (Whittell, 2011)

Further, design epistemology informed all aspects of Tesla's entry strategy—its original powertrain technology, the architecture of the car, and the development of an aesthetically pleasing interior and exterior. Its use of design principles transformed the economics of its business model, dramatically lowering costs through fewer parts, fewer suppliers, and faster and cheaper product development. A business model design analogy transformed its approach to car distribution and servicing; and its transportation infrastructure redesign sealed its leadership in the EV market (Furr, 2019).

As this example illustrates, design epistemology relies on the use of design principles and creative cognitive processes such as analogical reasoning (Gavetti & Menon, 2016; Martins et al., 2015). Other examples include senior leaders' adoption of a design philosophy for periodic revisions of their firm strategies (Ravasi & Lojacono, 2005), use of art and design logics to create new dimensions of value and new market categories (Dalpiaz et al., 2016), and combining exploratory and reflective processes in the design of new business models (McDonald & Eisenhardt, 2020). Cattani et al. (2018) theorized the role of four sociocognitive processes in the redesign of value networks: mental time travel, comparability, counterfactual reasoning, and stories. Mental time travel enables strategists to leverage both past experience *and* imagined futures, comparability helps determine firms' competitive relationships, counterfactual reasoning generates alternative views on reality (Engler et al., 2020), and stories enable the dissemination of ideas over space and time. Collectively, these studies suggest that while diverse processes may be involved, design epistemology supports the purposeful recombination of personal and collective knowledge to envision and construct new possibilities ranging from novel products to business models, value networks, and market categories.

ENACTING ADAPTING AND SHAPING POSTURES

In this section, we theorize and illustrate the differences in patterns of resource allocations through which adapting and shaping postures are enacted. We zoom in on illustrative examples from the contexts of mobility and company responses to the COVID-19 pandemic to illustrate both the diversity of actions through which strategic postures are enacted and the degree of coherence among these actions, in accordance with the intentions and epistemology associated with each posture.

Adapting Through Incremental Resource Allocations to Explore Multiple Emergent Directions

Strategists that adopt an adapting posture take as givens both their incomplete knowledge of the situation and the exogenous nature of uncertainty. Consistent with a focus on the limitations of partial knowledge, they pursue enactment strategies that maintain flexibility and enable experimentation to rapidly improve their knowledge of the changing market environment. For example, in the mobility context discussed earlier Ford Motor Company recognized the multiple intersecting trends of electrification, connectivity, autonomous driving, and ride sharing as creating KU in the auto industry. It adopted an adaptive posture and exhibited two of the distinguishing resource allocation patterns of this posture: (a) investing in experimentation to explore in multiple directions and discover new patterns and changing patterns; and (b) increasing flexibility in current resource commitments to ensure responsiveness to emerging opportunities.

First, Ford invested in developing a global energy model tracking how vehicle technologies, energy technologies, and fuel sources interact. Following a scientific epistemology, the model was used to compare different scenarios of how energy and fuels, vehicle technologies, and demand preferences might interact in the future. Through formal modeling, Ford sought to develop a systematic causal understanding of the complex and changing environment.

Second, Ford supplemented the formal modeling of the changes in its core operational environment with small-scale experiments intended to increase its knowledge of the more ambiguous mobility landscape. Paul Mascarenas, Ford's Chief Technical Officer and Vice President for research and innovation (cited in Lakhani, Iansiti, & Fisher, 2014: 9) explained their intentions "to feel the temperature of the water in the first half of the year through some relatively inexpensive experiments, reflect on the learnings, and then move into scaled-up selective pilots in the second half of the year." These experiments involved incremental resource commitments made with the primary goal of learning about emerging patterns of demand and selecting appropriate directions for future development and growth.

Finally, to maintain strategic flexibility, Ford continued to provide "a wide range of powertrain technologies and fuel options without assuming that a single vehicle technology or fuel will dominate" (Gundling, 2018: 8). Overall, Ford sought to increase

firm knowledge through formal modeling and experimentation, while maintaining flexibility in resource allocations, in order to enable larger, more focused commitments as it gained additional knowledge of the new competitive landscape over time. As the Ford example clarifies, adapting postures are enacted through incremental resource allocations to multiple directions of exploration and learning pathways (Andries et al., 2013; Ott et al., 2017; Rindova & Kotha, 2001; Zuzul & Tripsas, 2020).

Evidence from the response to COVID-19 suggests that firms can enact adapting strategies to learn even in the context of dramatic and far-reaching disruptions. For example, Sneader and Singhal (2020: 6) observed that, “as businesses are forced to do more with less, many are finding better, simpler, less expensive, and faster ways to operate.” These authors further argued that

The crisis will reveal not just vulnerabilities but opportunities to improve the performance of businesses. . . . Decisions about how far to flex operations without loss of efficiency will . . . be informed by the experience of closing down much of global production. Opportunities to push the envelope of technology adoption will be accelerated by rapid learning about what it takes to drive productivity when labor is unavailable. (Sneader & Singhal, 2020: 6)

As the examples above illustrate, an adapting posture prioritizes learning, which extends capabilities, thereby improving the ability of the adapting firm to take action on the opportunities it discovers in the process.

Further, firms may develop not only new but also dynamic capabilities through which they “integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano, & Shuen, 1997). As Teece et al. (2016: 29) recently argued, strong dynamic capabilities minimize “the cost of achieving a particular level of organizational agility, thereby allowing management to achieve a more favorable tradeoff between agility and efficiency.” Reports on organizational efforts to adapt to COVID-19-related uncertainty confirm this insight. According to Baig, Hall, Jenkins, Lamarre, and McCarthy (2020: 7), “Companies that have led the way in adopting flatter, fully agile organizational models have shown substantial improvements in both execution pace and productivity.” By lowering the costs of agility, dynamic-capabilities strategies enable firms to better sense *and* seize new profit opportunities through rapid resource configuration. Better sensing and seizing processes generate actionable knowledge more quickly in uncertain, rapidly evolving environments,

supporting novel resource reconfigurations ahead of competitors (Rindova & Kotha, 2001).

Shaping Through “Big-Bet” Resource Allocations to Create New Market Orders

A shaping posture involves a pattern of knowledge generation and resource commitments that frame and guide the direction of industry evolution through activities that transform market-level knowledge and expectations for a variety of market actors. Shaping postures remain relatively undertheorized, as Gavetti et al. (2017: 194) recently noted, stating that “much strategy work, especially work inspired by theories of evolution . . . has tended to focus more on search than shaping the business context.” Dattée, Alexy, and Autio (2018: 492) similarly argued that the literature on strategy under uncertainty

has essentially negated the idea that clearly preferable versions of the future exist for the firm, that multiple organizations may be simultaneously competing to realize their preferred one, and that they will somehow need to influence others to commit their resources in order for any value creation and value capture to happen.

Strategists who adopt a shaping posture identify a preferred future state and adopt design epistemologies to develop strategies that move the industry as a whole toward it. In doing so, they generate new information, as well as new frameworks intended to reduce perceived uncertainty for a variety of actors, including competitors, complementors, employees, customers, legislators, regulators, financial analysts, and investors (Moeen et al., 2020). Shaping firms rely on a combination of discovery, creation, and persuasion activities to design new value networks (Cattani et al., 2018), new strategic interactions (Gavetti et al., 2017), new business models (Gavetti & Menon, 2016; Martins et al., 2015), and new category labels (Grodal, Gotsopoulos, & Suarez, 2015).

For example, Grodal et al. (2015) and Suarez, Grodal, and Gotsopolous (2015) analyzed the co-evolution of technologies and categories in the automotive sector and showed that firms that use shaping strategies “engage in active, symbolic management in order to shape stakeholders’ perceptions” and “may emerge as the industry’s categorical referents but may also run the risk of being locked into a specific categorical position that fails to gain traction” (Suarez et al., 2015: 445). In contrast, firms that use adapting strategies position their products in different categories and potentially gain “footholds in multiple

categories without fully committing to any particular one” (Suarez et al., 2015: 445).

Tesla provides a recent example of the enactment of shaping strategies in the auto industry. To appreciate the challenges presented by enacting shaping strategies, we note that Tesla’s strategy has repeatedly raised questions, such as “Why would a new company, already taking on the Herculean task of introducing an entirely new type of car to the market, also take on the incredible risk of building some of the world’s largest battery factories? Or for that matter, a dealer and repair network? Or a charging network?” (Furr, 2019). Our framework provides an answer to these questions by theorizing the role of “big bets” resource commitments in enacting a shaping posture, such as to “accelerate the advent of sustainable transportation” (Musk, 2013).

Tesla’s CEO Elon Musk (2006) stated this shaping intention in his famous blog post titled “The Secret Tesla Motors Master Plan (just between you and me),” where he outlined Tesla’s long-term strategy to enter at the high end of the market and “then drive down market as fast as possible to higher unit volume and lower prices with each successive model.” At the time of the blog post, Tesla had only developed the prototype for the Roadster, which did not enter production for two more years. Although rhetorical in nature, Musk’s statement affected market-level knowledge and shaped market expectations and collective beliefs about the potential trajectory of evolution for EVs. It clarified the direction Tesla intended to shape the EV market toward, and established Tesla as a contender for a leading position in the nascent market. In another shaping move, Tesla asked for deposits to preorder its lower-priced Model 3. By receiving 375,000 preorders in the first month, it changed the market-level knowledge about the potential demand for EVs. Finally, Tesla changed the market-level knowledge of competitors by opening its patents to them. As Dattée et al. (2018: 491) suggested, strategically sharing IP helps move a future ecosystem in the direction “where the focal firm would want it.”

The examples above illustrate the combination of “big-bet” resource allocations and persuasive rhetoric that underlie the enactment of a shaping posture. Tesla’s bold strategic moves clearly reshaped the strategic interactions (Gavetti et al., 2017) in the automobile industry. More generally, enacting shaping postures entails big-bet resource commitments that tend to (re)structure interactions and interdependencies. For example, in a study of the emerging U.S. wireless gaming industry, Ozcan and Eisenhardt

(2009: 269) showed how some new firms steered the industry architecture in a preferred direction that, once accepted, became “the blueprint that structures and motivates interactions among partners.” In the nascent residential solar panel market, Hannah and Eisenhardt (2018) observed how competitors with different ecosystem strategies—bottleneck, component, and system—sought to shape the evolving ecosystem in different directions at different points in time.

In addition, rhetorical and symbolic actions provide desirable framing and increase the salience of big-bet resource commitments (Rindova et al., 2007). Firms can do so through a variety of symbolic strategies, including discourse and storytelling (Cattani et al., 2018; Khaire & Wadhvani, 2010; Vaara & Tienari, 2011), category labels (Grodal et al., 2015), and skillful use of meanings embedded in product form design (Anthony et al., 2016; Rindova, Dalpiaz, & Ravasi, 2011; Rindova & Petkova, 2007).

Significant material and interpretative resources are required to change beliefs and behaviors in the direction of the envisioned new market order (Gavetti & Porac, 2018). Rosa, Porac, Runser-Spanjol and Saxon (1999: 64) explained that new market categories emerge as “unstable, incomplete and disjointed conceptual systems held by market actors . . . [and] become coherent as a result of consumers and producers making sense of each other’s behaviors.” Since categories shape consumer and producer perceptions and thus market demand and supply, firms also deploy category-structuring strategies in an attempt to shape how their products and services are perceived, and thus categorized, in the market (Pontikes, 2018). However, firms vary in how they shape the structure of categories, and their positions in them.

For example, Navis and Glynn (2010) showed how actors in the satellite radio category first built legitimacy for the category as a whole, and then claimed differentiated positions. Rindova and colleagues (2007), in contrast, showed how Amazon.com shaped the e-commerce category around its own business model and became the standard of evaluation of other e-commerce firms. In sum, shaping strategies restructure the cognitive frameworks for interpretation as well as the material arrangements that define market orders (Gavetti & Porac, 2018). As such, they bring about new market orders that reduce uncertainty for a variety of market participants.

Even in disruptions with the severity and unpredictability of the COVID-19 pandemic, firms can adopt shaping postures and enact shaping strategies. For example, Barriball, George, Marcos, and Radtke (2020: 6) argued that

Informed by customer insights, some companies will reinvent themselves entirely in the coming years . . . repositioning themselves within their industry's value chain by ramping up direct distribution while increasing delivery speed and flexibility. A number of companies in the food-service sector are working to create "one-stop shop" online [business-to-business] portals, for example. Offering hotels and restaurants rapid delivery of everything they need, these portals allow customers to hold less inventory and reduce their procurement costs.

These examples illustrate that even in the extreme uncertainty of the current economic crisis, one firm's shaping strategy can enable and support the adaptive strategies of others, thereby generating market-level agreement about new roles, relationships, and value-added exchanges (Cattani et al., 2018). Sneider and Singhal (2020: 7) highlighted how "the urgency of addressing COVID-19 has also led to innovations in biotech, vaccine development, and the regulatory regimes that govern drug development," enabling actors to reshape stodgy health systems. These authors concluded that "where the world lands is a matter of choice"—or, in the terms of our framework, choices defining shaping strategies can have transformative impact on industries, markets, and institutional environments.

DISCUSSION

Research in strategy and entrepreneurship has documented a variety of strategies through which firms navigate a wide range of uncertainties, including unknowable future impacts of evolving technologies, changing consumer preferences, and shifting political and regulatory agendas (Alvarez & Barney, 2010; Alvarez et al., 2013; McMullen & Shepherd, 2006; Moeen et al., 2020; Townsend, et al., 2018; Venkataraman et al., 2012). However, limited progress has been made toward addressing the central question for strategy making under uncertainty: How do strategists address the partial-knowledge problem they face and pursue the profit opportunities presented by uncertainty (Knight, 1921)?

The framework we offer extends and integrates current research on strategy under uncertainty by theorizing two distinct strategic postures—shaping and adapting. To develop our framework, we revisited Knight's (1921) extensive discussion of the knowledge problems and subjective sensemaking processes involved in making judgments under uncertainty, Arrow's (1951) critique of Knight's ideas from the perspective of the economic theory of

choice, as well as Shackle's (1966, 1979) ideas about choice as an imaginative and originitive act. Across these different perspectives, we identified relevant elements of strategic postures, and the different approaches to knowing and acting under uncertainty that they define. Our framework expands the theoretical foundations of strategy making under uncertainty by integrating ideas from research in strategy and entrepreneurship, bridging the work on adaptation (Bingham & Eisenhardt, 2011; Thomke, 1998; Teece et al., 1997) and market creation and transformation (Cattani et al., 2018; Dalpiaz et al., 2016; Gavetti et al., 2017; Pontikes & Rindova, 2020). Below, we elaborate on three directions for future research and business practice suggested by our ideas: strategic leadership under uncertainty; organizational resources and capabilities for shaping versus adapting; and strategy under uncertainty as temporal work.

Strategic Leadership Under KU

Our theoretical ideas advance the research agenda on strategic leadership by bringing into focus the role strategists play in defining a firm's strategic posture in highly uncertain situations. We specifically theorized how strategists' intentions and epistemologies undergird the firms' pattern of resource allocations to address incomplete knowledge problems. Although we theorized firms' postures as based on *ex ante* attitudes, intentions, and epistemological commitments, we recognize that in practice strategists may unreflexively default to one posture or the other; adopt some, but not all, elements of a particular posture; or make public statements about choosing one posture, while enacting the other. Further, strategists' epistemologies may be largely implicit, as well as mismatched with their intentions, as these elements of strategy making under uncertainty are not yet well established in strategy research and practice. Whereas such mismatches may occur frequently, and may be true for the "average firm," as Gavetti (2012) has argued, the behavior of the average firm and the average strategic leader should not be the basis for defining firms' and leaders' capacities for strategic agency. We agree, and suggest that future research on how strategic leaders choose and define their firms' postures is critical to advancing our understanding of strategy making under uncertainty.

Several possible lines of inquiry on this topic have been outlined in recent work on the origins of "great strategies" (Gavetti & Porac, 2018). For example, Schilling (2018) argued that visionary leaders may

think at higher levels of abstraction that enable them to see bigger pictures, reason through longer causal chains and extrapolate over longer time horizons. Such cognitive skills are evident in the development of Apple's and Tesla's successful shaping strategies, as illustrated in Elon Musk's "secret plan" discussed earlier, and Steve Jobs' "hub of the digital lifestyle" proclamation for Apple upon his return in 1997 (Isaacson, 2012). Rindova and Martins (2018a) argued that when strategists adopt a value-rational approach, they develop distinctive strategies that express their personal values. We expect that value-rational strategists may adopt shaping postures in an effort to transform their environments in accordance with their values. Further, Zuzul and Tripsas (2020) provided evidence that strategists may hold transformative change as a value in its own right. In their study of the (non)emergence of the air taxi industry, they found that some entrepreneurs—*revolutionaries*—"wanted to build companies that would change the world" and "saw themselves as creating something novel that would have tremendous impact," while others—*discoverers*—"simply sought to build successful businesses" (Zuzul & Tripsas, 2020: 404–406).

Collectively, these studies point to a variety of cognitive and motivational factors that may affect strategists' choices of strategic postures and point the way to a robust sociocognitive agenda for research on strategic leadership under uncertainty. Such an agenda should continue to build on Knight's ideas that strategists' responses to uncertainty depend not only on their knowledge and self-confidence but also on their underlying attitudes toward uncertainty as a context of doubt (McMullen & Shepherd, 2006) and unknowingness (Packard et al., 2017), versus a context of opportunity. Focusing on strategic attitudes, intentionality, and volition will expand current behavioral approaches that emphasize rational, boundedly rational, and cognitive models of decision making (Gavetti & Rivkin, 2007). Although such approaches have provided important insights into the analytical processes involved in strategy making, they have overlooked a range of motivating aspects of human experience, such as attitudes, values, desires, and imagination (however, see Brandenburger, 2017; Cattani et al. 2018; Powell, 2018; Rindova & Martins, 2018b) that are likely to play an important role under uncertainty, where action may pave the way to knowledge, and not the other way around.

In developing further knowledge about the choice of strategic postures, it is also important to consider how firms may evolve their postures over time. We stressed the analytical distinction between adapting

and shaping as ideal types in order to emphasize the different pathways through uncertainty that strategists can take. However, we do not intend to imply that a strategic posture is a fixed aspect of a firm's approach to uncertainty, that an emergent strategy is not a viable strategic alternative (Mintzberg, 1978), or that enactment strategies do not combine elements of experimentation and design. As knowledge problems and conditions that define uncertainty evolve over time, it is important for future research to examine how firms evolve their postures in response to changes in the nature and level of uncertainty at different industry evolution milestones (for a recent discussion, see Moeen et al., 2020). Relatedly, to the degree that firms face different sources and types of uncertainties, they may adopt different postures toward different uncertainties. For example, firms may adopt an adapting posture toward technological uncertainty and a shaping posture toward related regulatory uncertainty. Finally, firms may adopt different postures in their growth strategies when they pursue different opportunities (Rindova, Martins, & Yeow, 2016). Therefore, an interesting direction for future research would be to examine the extent to which firms exhibit relatively consistent tendencies, which are likely to reflect differences in strategizing priorities and abilities, versus the extent to which they adopt postures as contingent responses to industry contexts, which are likely to reflect the economic logic underlying choice of postures discussed next.

Strategic Postures and Organizational Resources and Capabilities

A different research agenda on the choice of strategic postures emerges from a rational-economic perspective that would suggest that strategists choose a posture based in their *ex ante* beliefs about which posture might provide a superior path to firm performance. Such beliefs are likely to be informed by the relevance of firm resources, capabilities, and organizational processes for the successful implementation of a chosen posture. A fruitful direction for future research, therefore, would be to examine how different resources, capabilities, and processes may facilitate the success of each posture. For example, based on our argument that shaping involves changing market-level knowledge, we would expect that shaping requires more, and more distinctive, resources in firm leadership, stakeholder relations, and persuasive communications. A shaping posture involves a broader scope of activities and longer time horizons, both of which increase complexity and

uncertainty, thereby increasing the demands on organizational systems and stakeholder and partner relationships. These higher resource requirements may explain why an adapting posture is likely to be the default option for the majority of firms (Gavetti, 2012; Schoemaker, 2002). Nevertheless, successful adaptive strategies may require specialized capabilities for implementing a scientific epistemology, as well as dynamic capabilities.

Despite the higher organizational and resource requirements for shaping, anecdotal evidence suggests that firms that adopt shaping postures devise ways to navigate such demands. Future research focusing on this issue would be particularly beneficial for understanding shaping as a viable strategic posture beyond a “select few.” For example, Tesla’s entry in the auto industry would be unlikely without its effective partnerships with Lotus, Panasonic, Daimler, and Toyota, which provided product development expertise in cars and batteries, as well as much-needed investment infusions. In addition to specific resources, these partnerships demonstrated Tesla’s ability to align industry stakeholders and overcome skepticism and opposing interests. Even a small start-up such as Rent-the-Runway was able to shape the market for designer dress rentals by investing in expensive inventory to overcome designer resistance to its disruptive business model (Eisenmann & Winig, 2011). Under COVID-19 conditions, companies have leveraged customer insights to reimagine their business models and ecosystems (Sneader & Singhal, 2020). These and other examples suggest that shaping may depend more on value-added strategies, and the “persuasive resources” to claim value (Gans & Ryall, 2017), than it depends on absolute resource levels.

Finally, both postures are likely to require capabilities and processes for generating stakeholder involvement and buy-in, as shapers have to be able to convince skeptical stakeholders to get behind their bold bets. Adaptors, in contrast, have to convince skeptical stakeholders that, at least at this stage of market evolution, avoiding the “big bet” may be the best bet to make. The epilogue of our Ford example—that CEO Mark Fields lost his job after three years—provides a cautionary tale about the importance of stakeholder buy-in for a strategy that focuses on mitigating risk while forgoing the opportunities created by uncertainty. Research from both stakeholder and discursive perspectives (Cornelissen, Durand, Fiss, Lammers, & Vaara, 2015) can therefore make important contributions to understanding of strategy under uncertainty, and clarify its role as both a sense-making *and* sensegiving process (Gioia & Chittipeddi,

1991; Rouleau & Balogun, 2011). While we emphasized the critical importance of symbolic activities and sensegiving for shaping, future research should consider sensegiving more generally as a central process in managing uncertainty.

Strategy Making Under KU as Temporal Work

Knight (1921: 313) emphasized the temporal dimension of strategy making under uncertainty when he defined “the knowledge problem” of uncertainty as the “future being different from the past” and “the solution” (i.e., the strategy) as relying on “the future being like the past.” His argument points to the interconnectedness of temporally embedded understandings *and* the potential discontinuities among the realities they connect. A key implication of this insight is that cross-temporal understandings are integral to decision making under uncertainty, yet cross-temporal sensemaking is fraught with ambiguities (Ravasi, Rindova, & Stigliani, 2019).

Strategy research to date has offered limited insights on this issue, as strategic decision-making processes are viewed as largely atemporal (Beckert, 2016). To reconcile the atemporal understanding of strategic decision making with the fundamental argument that strategy under uncertainty evolves as more information and knowledge becomes available, recent strategy research has developed several different lines of reasoning. A contingent approach has focused on different stages of industry evolution and the related changes in technological, market, ecosystem, and institutional uncertainties and the strategies for managing each type (Moeen et al., 2020). Another approach has emphasized the need for explicit attention to temporal strategic choices such as timing, sequencing, and pacing (Bingham & Eisenhardt, 2011; McDonald & Eisenhardt, 2020). A third approach has focused on temporal work (Kaplan & Orlikowski, 2013), understood broadly as processes through which actors connect the past, present, and future. Such processes include mental time travel and storytelling (Cattani et al., 2018), narrative weaving (Dalpiaz & Di Stefano, 2018), rhetorical reconstruction (Dalpiaz et al., 2016; Suddaby, Coraiola, Harvey, & Foster, 2020), and cross-temporal sensemaking (Ravasi et al., 2019). Collectively, these studies suggest that future research on strategy under uncertainty would benefit from systematic study of temporal issues, such as temporal horizons, temporal orientations, as well as temporal agency at the leadership and organizational levels of analysis (Pontikes & Rindova, 2020).

To this emerging body of work, our framework provides a theory of different epistemologies and their implications for understanding how past knowledge informs discovery processes within an adapting posture, and how imaginative future projections inform the design of different market interactions and exchanges within a shaping posture. These ideas point to the importance of contrasting existing approaches to strategic analysis that have relied on robust past data and analytical procedures to generate predictions and forecasts about the future, with creative processes involving mental time travel, scenario construction, and imaginative projections (Cattani et al., 2018; Ravasi et al., 2019; Suddaby et al., 2020). For example, the construction of multiple scenarios brings into focus issues across different time horizons, including the choice of shaping, adapting, or switching between postures, as well as imaginative generation of possibilities. If such temporal work (Kaplan & Orlikowski, 2013) is crucial to the success of strategies formulated under uncertainty, this further supports our recommendation for strategists to embrace and normalize the use of different epistemologies to pursue knowledge of both the actual and the possible.

CONCLUSION

We set out to develop a theoretical framework of strategy making under uncertainty that responds to Knight's (1921: 199) injunction that to understand uncertainty "some inquiry into the nature and function of knowledge itself is necessary." To this end, we focused on the paths and possibilities for knowledge generation, rather than on knowledge limitations, and on the different approaches to knowledge generation when firms adopt shaping versus adapting postures. Our arguments foreground the diversity of intentions, epistemologies, and knowledge modalities from which strategists can look into the unknown to see or create opportunities. We hope that our framework—with its emphasis on both the knowledge of the actual and of the possible—is helpful to researchers working from diverse theoretical and methodological perspectives to significantly expand the research agenda on strategic agency under conditions of uncertainty.

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Violina P. Rindova (rindova@usc.edu) is the Captain Henry W. Simonsen Chair in Strategic Entrepreneurship at the Marshall School of Business, University of Southern California. She studies how meaning-making and interpretation affect value creation and attribution in markets. She investigates the socio-cognitive processes through which firms build and sustain positions of advantage and create new market opportunities.

Hugh Courtney (h.courtney@northeastern.edu) is professor of international business and strategy and former Dean at Northeastern University's D'Amore-McKim School of Business. He received his PhD in economics from the Massachusetts Institute of Technology. His research focuses on competitive dynamics and business strategies in highly uncertain business environments.



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