



Visionary, engineer, and experimenter: Three forms of entrepreneurship in the quest for product–market fit

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Abstract

Research summary: Entrepreneurship unfolds under uncertainty, which complicates entrepreneurs' efforts to align idea, action, and environment to reach product–market fit. To illuminate how entrepreneurs perform such alignment, we complement the theory-based view and its focus on cognitive uncertainty with a discussion of behavioral uncertainty. We propose that entrepreneurs face four types of uncertainty: (1) uncertainty about the state of their environment (state uncertainty), (2) uncertainty about the interpretation of environmental cues (perception uncertainty), (3) uncertainty about the feasibility of turning an idea into a tangible product (execution uncertainty), and (4) uncertainty about the effect of their action in the environment (effect uncertainty). To mitigate these forms of uncertainty, entrepreneurs engage in idea–environment (entrepreneurs as visionaries), idea–action (entrepreneurs as engineers), and action–environment (entrepreneurs as experimenters) alignment. Each of these alignment strategies is associated with benefits and constraints in mitigating the uncertainty discussed. Our paper thus generates new insights into the nature of uncertainty and its effective mitigation in the quest for product–market fit, a critical precursor of success in entrepreneurship.

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Managerial summary: Entrepreneurship succeeds when product and market are aligned. We map two sources of uncertainty that stand in the way of reaching product-market fit. Agentic uncertainty concerns the entrepreneur: interpreting signals (perception uncertainty) and making the idea work (execution uncertainty). Environmental uncertainty concerns the market: what state the market is in (state uncertainty) and how the market will react to products (effect uncertainty). Entrepreneurs can mitigate these uncertainties via three complementary strategies: (1) idea-environment alignment (“visionary” scanning the environment), (2) idea-action alignment (“engineering” to prove feasibility), and (3) action-environment alignment (“experimenter” testing to learn what sells). Each alignment strategy yields benefits and costs toward reaching product-market fit. In combination, they accelerate product-market fit—a critical driver of success in entrepreneurship.

KEYWORDS

active inference, entrepreneurship, product-market fit, theory-based view, uncertainty

1 | INTRODUCTION

Entrepreneurs operate at the intersection of the known and the unknown, whereby uncertainty dissuades entry and undermines success in entrepreneurship (O'Brien et al., 2003; Shane & Venkataraman, 2000). Reaching product-market fit—the point at which a business idea generates persistent demand in a market—is widely regarded as a pivotal milestone in the uncertain entrepreneurial process and a key precursor to success (Gimmon & Levie, 2021; Kauffmann_Foundation, 2021; Zellweger & Zenger, 2022).

From the viewpoint of the theory-based view (TBV), entrepreneurs mitigate uncertainty and progress toward product-market fit by generating causal theories about what may be in demand, testing premises, and updating or abandoning theories with the goal of finding value. Entrepreneurs who adopt this approach emulate principles of scientific inquiry and Bayesian inference (Chavda et al., 2024; Felin, Gambardella, & Zenger, 2024; Zellweger & Zenger, 2023), and consider that the quest for product-market fit is foremost a cognitive challenge (Camuffo et al., 2020; Ehrig & Schmidt, 2022).

However, entrepreneurship scholars have long pointed out that entrepreneurship involves “three loci” or a “triadic account” of uncertainty, reflecting uncertainty of idea, action, and environment (e.g., Davidsson, 2015; Townsend et al., 2018, p. 667). This line of work stresses that business ideas are designed artifacts whose value is contingent on whether an idea and its practical instantiation in the form of a product effectively relate to external conditions (Berglund, 2021; Jovanovic, 1982; Sergeeva et al., 2022; Simon, 1996). What is called “action” refers to the practical instantiation of an idea, encompassing the behavioral process of production and its tangible outcome, that is, the product.

From this perspective, the TBV's focus on cognition may be too narrow because it underappreciates the role of action and behavioral forms of uncertainty. In our paper, we thus seek to complement the TBV and integrate



cognitive and behavioral forms of uncertainty to develop a comprehensive typology of uncertainty and related mitigation strategies. We do so by drawing from active inference, a learning process rooted in the Bayesian brain hypothesis (Clark, 2013; Friston, 2010; Griffiths & Tenenbaum, 2009; Hohwy, 2013), which models how actors combine causal reasoning and action to mitigate uncertainty and pursue strategies that adaptively fit the environment (Clark, 2013; Friston, 2010; Griffiths & Tenenbaum, 2009). Complementing the TBV with insights from active inference produces a principled and comprehensive view of both the cognitive and behavioral uncertainty that entrepreneurs face and points to generic alignment strategies through which entrepreneurs can mitigate these different forms of uncertainty and make progress toward product–market fit.

Our paper makes two contributions to the literature (e.g., Agrawal et al., 2021; Felin, Gambardella, & Zenger, 2024; Gans et al., 2019). First, we shed systematic light on the nature of uncertainty in entrepreneurship (Milliken, 1987; Packard et al., 2017; Ramoglou & McMullen, 2024). We classify uncertainty along two dimensions: whether it is cognitive or behavioral in nature, and whether it is located at the environment or the entrepreneur. Crossing these dimensions yields four types of uncertainty. Cognitive uncertainty comes in the form of (1) *state uncertainty*, which captures entrepreneurs' limitations in grasping the true state of an opaque environment, and (2) *perception uncertainty*, which accounts for uncertainty from entrepreneurs' biased interpretations of environmental cues. In turn, behavioral uncertainty manifests as (3) *execution uncertainty*, or uncertainty about the feasibility of turning an idea into a functional product, and (4) *effect uncertainty*, hence uncertainty about the effect of proposing a novel product in a market. While state and effect uncertainty are located at the environment, perception and execution uncertainty are located at the entrepreneur. Our typology integrates thus-far disparate perspectives of uncertainty at the nexus of idea, action, and environment (Milliken, 1987; Packard et al., 2017; Townsend et al., 2018).

Second, we introduce three generic alignment strategies through which entrepreneurs can mitigate the uncertainty standing in the way of product–market fit (cf., van den Steen, 2017). First, idea–environment alignment occurs when entrepreneurs akin to *visionaries* carefully analyze and explore the environment and develop innovative novel ideas about what might be in demand (Csaszar & Levinthal, 2016; Gans, 2025a; Posen & Levinthal, 2012). Second, idea–action alignment ensures the internal consistency of an idea and its enactment, whereby entrepreneurs akin to *engineers* seek to design a practical instantiation of an idea in the form of a functional product (Berglund et al., 2020; Berglund & Dimov, 2023; Sarasvathy, 2003). Finally, with action–environment alignment, entrepreneurs akin to *experimenters* focus on rapid feedback generation to develop products that actually sell (Kerr et al., 2014; Ries, 2011; Shepherd & Gruber, 2021). Visionary, engineer, and experimenter each mitigate two of the four types of uncertainty discussed and contribute toward product–market fit via enhanced foresight for visionaries, feasibility for engineers, and flexibility for experimenters. However, each of the three alignment strategies also comes with constraints, namely in the form of randomness in the product, market, and idea, respectively. We further propose that the alignment strategies' relative contribution toward product–market fit varies with the uncertainty mix encountered in a specific situation. In sum, our paper advances recent discussions on how entrepreneurs progress toward product–market fit and, in doing so, provides a behavioral extension of the TBV and builds a bridge between the TBV, design, and lean perspectives of entrepreneurship.

2 | UNCERTAINTY IN THE TBV AND OPPORTUNITIES FOR ADVANCEMENT

Rooted in pragmatism, the TBV suggests that under uncertainty, entrepreneurs start with forming value-creation theories and thereby come up with a practical imagination of what may be a valuable future solution to a problem currently observed (Zellweger & Zenger, 2022). Entrepreneurs thus first exploit the opaque state of the environment by utilizing the “generative aspects of cognition” (Felin, Gambardella, & Zenger, 2024, p. 298) to imagine a novel type of business idea (Rindova & Courtney, 2020). Rather than emphasizing the cognitive limits of human information processing or information asymmetries between entrepreneurs and clients (Felin, Gambardella, Novelli, &

Zenger, 2024), the TBV highlights entrepreneurs' capacity to generate novel theories, even in presence of information homogeneity (Felin & Holweg, 2024).

The TBV depicts entrepreneurs' theories as causally structured mental models (Gary & Wood, 2011) that encapsulate the necessary premises or major contingencies for a business idea to solve a problem in the environment (Ehrig & Schmidt, 2022; Pearl & Mackenzie, 2018). From this viewpoint, "a strategy is not a detailed plan of action; it is a plan of action boiled down to its most essential choices and decisions. It is minimal with a maximal effect" (VAN DEN Steen, 2017, p. 2616). The TBV then calls entrepreneurs to test the premises underlying their theories, recognizing that the environment is the ultimate judge of an idea's value. However, the problem with testing theories is that doing so is often fraught with errors because of noise in feedback signals, which may result in the premature abandonment of valuable ideas or the pursuit of low-value or outright worthless ideas (Csaszar et al., 2023).

When feedback from testing challenges an idea, entrepreneurial theories then need to be refined or even discarded. In updating their theories, entrepreneurs must balance exploiting those aspects that work with maintaining methodic doubt about the temporal stability of their theories' validity across the evolving environment (Camuffo et al., 2024). Entrepreneurs thus need to maintain openness to question their theories (Ehrig & Schmidt, 2022) and, in refining their theories, must balance underfitting from adhering to their original ideas and overfitting from tuning their ideas to the feedback they garner (Zellweger & Zenger, 2023).

In sum, the TBV focuses on the cognitive challenges and uncertainty that pervade the entrepreneurial process: an uncertain environment creates opportunities for novel ideas while leaving their value in doubt, testing contingencies generates feedback whose validity is prone to errors, and responding to that feedback raises concerns about over- or underreacting. This process of inquiry prioritizes reasoning over action and parallels principles of Bayesian inference that describe how entrepreneurs optimally update their subjective priors upon receiving new information (Agrawal et al., 2026; Chavda et al., 2024). The TBV thus places a pronounced emphasis on cognitive forms of uncertainty as well as on cognitive strategies to address this uncertainty—namely the formation, testing, and updating of theories.

The TBV's concern with cognition contrasts with the observation in the broader entrepreneurship literature about a tripartite locus of uncertainty, "where actors, actions, and environments are all frequently described as 'uncertain'" (Townsend et al., 2018, p. 667). From this viewpoint, uncertainty is situated at the nexus of the entrepreneur's idea, their action in terms of producing a working product, and the environment, whereby these three loci of uncertainty coexist and coevolve (Davidsson, 2015; Jovanovic, 1982).¹ The design-based perspective of entrepreneurship, for instance, highlights the enactment and transformation of an idea into a tangible product (Berglund, 2021; Dimov, 2016), stressing "the difference between an idea in the mind and a thing in the world" (Sergeeva et al., 2022, p. 693), and the feasibility problems that may make an idea impractical (Sarasvathy, 2003; Wu & Knott, 2006). Relatedly, the lean startup perspective also emphasizes action—here, in the form of rapid feedback generation from clients (Ries, 2011). In lean startup, the focal concern is a product that sells because even a well-thought-out idea may prove worthless when exposed to a market (Shepherd & Gruber, 2021). In lean startup, testing ideas through use of minimum viable products is an effective means to find value under uncertainty even if such testing fails to comply with strictly causal reasoning and learning. All that counts is the presence or absence of client demand. After all, customers do not buy theories but products.

In sum, we see a need and an opportunity to complement the TBV's focus on cognitive uncertainty and uncertainty-mitigation strategies with the role of behavioral uncertainty and related uncertainty mitigation. We thus seek to show how entrepreneurs mitigate both cognitive and behavioral uncertainty since they coexist, coevolve, influence each other, and are ultimately inseparable (Kozyreva & Hertwig, 2021; Packard et al., 2017).

3 | TOWARD A COMPREHENSIVE VIEW OF UNCERTAINTY IN ENTREPRENEURSHIP

Our considerations so far suggest that we need a view of uncertainty that accounts for how entrepreneurs reason and act and that accommodates uncertainty manifesting at the intersection of entrepreneurs' idea, action, and



environment (Foss & Klein, 2012). To advance toward this goal, we complement the TBV with insights from active inference, a theoretical framework rooted in the cognitive sciences that describes how agents reason and act to achieve adaptive fitness in uncertain environments. At its core, active inference suggests that to maximize adaptive fitness and chances of survival in a demanding environment, entrepreneurs seek to minimize the gap between their expectations about the state of the environment and their encountered observations from acting in it (Da Costa et al., 2020; Friston et al., 2009). Active inference extends theory-based and scientific perspectives of entrepreneurship by formalizing how cognition and action jointly reduce uncertainty.

From this viewpoint, entrepreneurs develop “generative models [i.e., theories], capturing the causal relations between observable outcomes, the agent's actions and hidden states” (van de Maele et al., 2024, p. 10). Entrepreneurs thus make causal predictions based on priors that serve as intuitive theories about a strategy's (i.e., business idea's) value in the environment (Clark, 2013; Seth, 2021). When entrepreneurs recognize something in the environment, such as an unsatisfactory solution or an unmet need, they infer the likely causes of what they observe and act in line with their predictions to gather evidence on whether their theories are valid or not (Tenenbaum et al., 2006; Tenenbaum et al., 2011).² When entrepreneurs encounter observations that deviate from their predictions after acting in the world, they experience prediction errors or surprise, which they then seek to reduce in the future by refining their theories (Friston et al., 2017). Minimizing surprise in active inference is equivalent to maximizing the predictive power and, ultimately, the fitness and value of a theory or business idea in the environment (Hohwy, 2016). In line with Bayesian updating, active inference postulates that entrepreneurs' theories are adjusted as new information emerges, especially information that challenges their ideas, revealing that they have suboptimal fitness in the environment (Chavda et al., 2024; Clark, 2015). While the TBV describes belief revision as updating theories in response to evidence, active inference goes further by formalizing how action itself generates the evidence needed for revision. Entrepreneurs thus do not passively receive feedback but actively produce it through product deployment and market engagement.

This process of active causal inference is a continuous cycle of calibrating ideas and products to the environment, whereby product–market fit captures the degree of alignment between a business idea, the action of producing it, and the environment. Maximizing the alignment of idea, action, and environment and hence trying to maximize product–market fit is equivalent to minimizing the surprise inherent in how entrepreneurs reason and act in the latent environment. Figure 1 illustrates this process of aligning idea, action, and environment.

In sum, active inference provides a powerful lens to highlight how cognition and action combine toward reaching product–market fit. The resulting causal inferential process depicted in Figure 1 complements the TBV's focus on cognitive uncertainty with behavioral aspects of uncertainty, whereby cognitive and behavioral uncertainty manifests at both the entrepreneur and environment levels, resulting in four types of uncertainty (see Table 1).

3.1 | State uncertainty

State uncertainty, in line with Milliken's (1987) definition, is uncertainty regarding the true state of the environment and captures the difficulty of inferring the environment's latent state. With state uncertainty, the source of uncertainty is external to the entrepreneur (Milliken, 1987). It encapsulates the idea that entrepreneurs are unable to develop a full understanding of the environment given its vast and dynamic topology, which is shaped by a multitude of changing actors and unpredictable technological, customer, institutional, and societal trends. To a large extent, conceptualizations like “unknown unknowns,” “unknowable futures” (e.g., Ramoglou, 2021), and “irreducible uncertainty” (e.g., McGrath & MacMillan, 2000) are rooted in the observation that state uncertainty severely complicates entrepreneurship and can never be fully mitigated (Furr & Eisenhardt, 2021; Posen & Levinthal, 2012). High state uncertainty makes the environment opaque and thus hard to predict, consistent with Milliken (1987, p. 136), who suggested that managers “experience state uncertainty when they perceive the organizational environment, or a particular component of that environment, to be unpredictable.” The multitude and interplay of such unpredictable

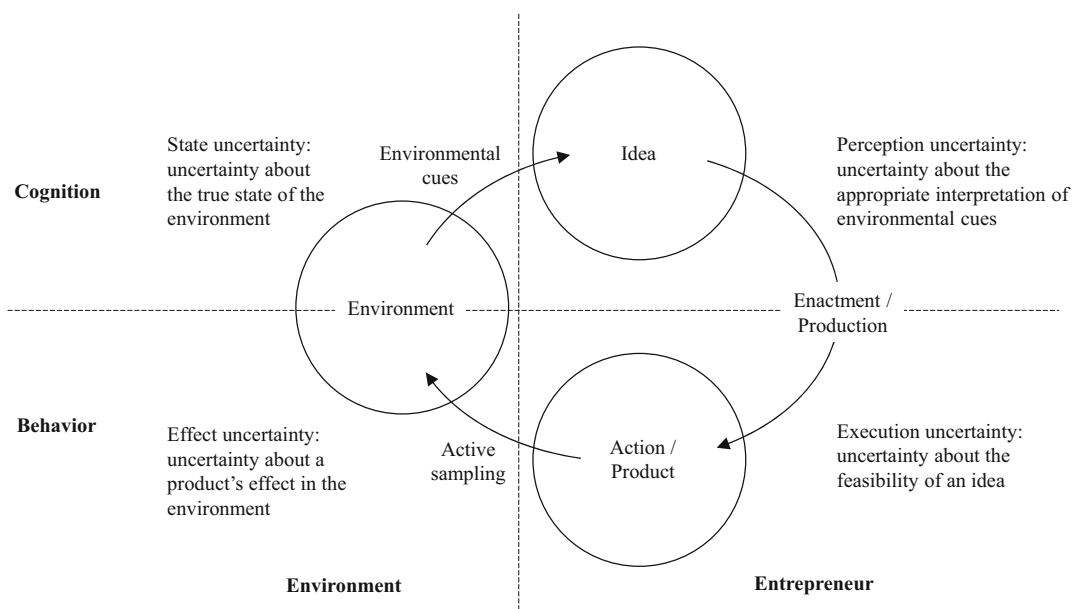


FIGURE 1 Active inference in entrepreneurship.

TABLE 1 Cognitive and behavioral uncertainty at the environment and entrepreneur levels.

	Environment Environmental uncertainty	Actor/entrepreneur Agentic uncertainty
Cognition Cognitive uncertainty	<i>State uncertainty</i> Uncertainty about the true state of the environment	<i>Perception uncertainty</i> Uncertainty about the appropriate interpretation of environmental cues
Behavior Behavioral uncertainty	<i>Effect uncertainty</i> Uncertainty about effect of a product in the environment	<i>Execution uncertainty</i> Uncertainty about the feasibility of an idea

exogenous forces implies that the state of the environment cannot be directly observed (Bryan et al., 2022) and can at best be inferred (Chen et al., 2018; Townsend et al., 2018).

As an illustration, consider Kodak's effort to navigate the shift from film to digital photography (Vinokurova & Kapoor, 2025). Kodak developed the first digital camera prototype in 1975, yet the timing of mass-market adoption proved unknowable: digital camera sales did not surpass those of film cameras until 2002. When Kodak subsequently pivoted to inkjet printing to monetize the growing volume of digital images, the launch of Apple's iPhone in 2007 disrupted the photography ecosystem from an adjacent industry, undermining both standalone cameras and at-home photo printing simultaneously. The opacity of the environment's trajectory left Kodak unable to find a path to product-market fit.

3.2 | Perception uncertainty

Perception uncertainty captures entrepreneurs' constrained ability to appropriately read environmental cues. Perception uncertainty is a consequence of subjective beliefs and selective perceptions at the entrepreneur (Savage, 1954;



Shackle, 1949), such as from overconfidence, imprinted beliefs, biased preferences, or organizational filters. These idiosyncratic beliefs and perceptions limit how effectively the environment is sampled and interpreted (Denrell & March, 2001; Wood et al., 2014). The environment is inappropriately understood when entrepreneurs disregard, overweight, underweight, or perhaps invent environmental cues. Because entrepreneurs do not perceive the environment directly but perceive “only images mentally constructed from sense stimuli” (Angus et al., 2023, p. 1165), perception uncertainty reflects the possibility that an entrepreneur's reading of environmental cues diverges from what the environment actually signals (Åstebro et al., 2014; Cooper et al., 1988). Thus, with perception uncertainty the misalignment between idea and environment may not only arise because the environment is hidden (state uncertainty) but because entrepreneurs selectively sample the environment and their interpretations thereof are subjective. Since what entrepreneurs perceive is not the true state of the environment, it is possible for an entrepreneur to be highly certain (low perception uncertainty) even under high state uncertainty and vice versa.

Dean Kamen, the inventor of the Segway Personal Transporter, illustrates how imprinted beliefs can distort the reading of environmental cues (Kemper, 2003). Before developing the Segway, Kamen had built the portable insulin pump and the iBOT wheelchair—medical devices whose adoption depended on clinical efficacy and regulatory approval. This track record shaped a subjective conviction that technological superiority suffices to create demand. Kamen developed the Segway in secrecy, prohibiting his marketing team from conducting market research (Kemper, 2003). However, he overlooked that commuters are acutely price sensitive, and alternatives serve short-distance mobility at a fraction of the Segway's price. Hence, the Segway's failure was not due to an unknowable environment (state uncertainty) but rather to the entrepreneur's interpretation thereof (perception uncertainty).

3.3 | Execution uncertainty

Execution uncertainty captures uncertainty about the feasibility of an idea and thus accounts for the fact that the imagination of an idea does not guarantee its practicality (Fitzsimmons & Douglas, 2011; McKelvie et al., 2011). Execution uncertainty captures arguments advanced in design perspectives on the difficulties of turning an idea into an operational product (Berglund, 2021; Dimov, 2016; Simon, 1996). Entrepreneurs may simply lack the means to turn an idea into reality. Even when entrepreneurs wield control over substantial resources, they may lack the know-how to effectively use and deploy those resources in an effective manufacturing program or recipe. Additionally, the challenge for entrepreneurs may not just be orchestrating resources to produce an envisaged product but also overcoming the hurdles and setbacks that arise as an idea materializes (Sarvasvathy, 2003). In sum, execution uncertainty captures the problems entrepreneurs encounter when attempting to produce a practical instantiation of an idea.

Consider the case of Theranos, which promised to run hundreds of diagnostic tests on a few drops of blood taken from the finger (Abelson, 2016, April 24). Apparently, blood samples from the finger differ in composition and are susceptible to contamination, clotting, and measurement noise. Also, running many diagnostic assays simultaneously on small volumes of blood appeared to be analytically unreliable (U.S._SEC_complaint, 2018). Theranos' production of such a device was severely undermined by various execution problems that undermined the feasibility of the idea, and ultimately product–market fit.

3.4 | Effect uncertainty

Finally, effect uncertainty is uncertainty regarding the environment's response to an entrepreneur's action (Chen et al., 2018). Effect uncertainty thus centers on ambiguity regarding the effective introduction of products in markets, recognizing that even carefully crafted products may not generate the predicted uptake (Rindova & Courtney, 2020). To address effect uncertainty, entrepreneurs have been advised to carefully test key premises or prototypes of their novel products in the environment before they fully commit to their production (Blank, 2013;

Shepherd & Gruber, 2021). Unlike state uncertainty, which arises from challenges tied to inferring the state of the environment, effect uncertainty arises from ambiguity about the results produced by entrepreneurial action, that is, the introduction of a product into a market. State uncertainty is thus truly exogenous to entrepreneurs, while effect uncertainty manifests only once an entrepreneur acts such that effect uncertainty, despite being a type of environmental uncertainty, is endogenous to entrepreneurs. Even if the environment is well understood (low state uncertainty), there may still be surprises about how clients, competitors, or regulators respond once a novel product is introduced (high effect uncertainty).

As an example, consider the case of IKEA. The company tried to introduce the same type of glassware to the U.S. market that was successful in its European stores. Many drinking glasses were considered too small for U.S. consumers, who prefer large cups, leading U.S. customers to feel the glasses were “children's size” (Milne, 2013, November 28). Hence, IKEA encountered surprise regarding the effect its products generated in the U.S. market, which undermined IKEA's quest for product–market fit in the United States.

3.5 | Coexistence of state, perception, execution, and effect uncertainty

Our four-part typology of uncertainty clarifies that the environment is uncertain cognitively when there is opacity about its true state yet is also uncertain behaviorally since its latent nature complicates foretelling the effectiveness of action in it. Moreover, entrepreneurs are uncertain cognitively since their interpretations of environmental cues may be biased, yet they may also be uncertain behaviorally when there is doubt about whether their envisioned ideas are feasible. State and effect uncertainty operate at the level of the environment, while perception and execution uncertainty operate at the level of the entrepreneur. Together, the four uncertainty types outline the full set of conceivable uncertainty when uncertainty manifests at the environment and entrepreneur levels and is cognitive and behavioral in nature.

These four types of uncertainty coexist in entrepreneurship, as outlined in Figure 1. To illustrate this coexistence, consider the hypothetical example of an entrepreneur who believes in the value of a new sort of sugar-free candy for elderly people with type 2 diabetes. The idea may be informed by an aging population and the concomitant rise of diabetes problems in society, an assessment of the state of the environment that seems plausible but whose veracity likely varies with the nutritional habits among the elderly in the regional market (state uncertainty). The idea's perceived value is further shaped by how the entrepreneur interprets signals from the environment, perhaps strongly weighting optimistic forecasts about market size given demographic trends while underweighting trends toward healthier lifestyles (perception uncertainty). Further, the enactment or production of this idea may prove to be unexpectedly difficult given problems with taste, bite resistance, and color (execution uncertainty). Finally, the rollout of the first batch of candy may have proven to be a great success, but there could be uncertainty about whether this first success is a reliable signal for the idea's value beyond the market to which the entrepreneur has personal access (effect uncertainty). This example highlights the parallel occurrence of the four types of uncertainty, which together characterize the pervasive nature of uncertainty in entrepreneurship and complicate the alignment of the *what* (the idea), the *how* (the action), and the *where* (the environment) in reaching product–market fit. These observations lead to Proposition 1a and 1b:

Proposition 1a. *Uncertainty in entrepreneurship can be captured by four first-order types: state, perception, execution, and effect uncertainty.*

Proposition 1b. *State, perception, execution, and effect uncertainty are negatively related to product–market fit.*



4 | ALIGNMENT STRATEGIES FOR UNCERTAINTY MITIGATION

A critical insight from the above considerations is that business ideas do not have standalone but contingent quality, and their value is defined in terms of “whether [their] internal character relates to [their] external environment in functional ways” (Berglund, 2021, p. 2667). The value of a business idea is thus situated at the nexus of the idea, the action required to turn it into a product, and the environment. This reasoning aligns with Simon (1996, p. 5), who suggested that effective design always “involves a relation among three terms: the purpose or goal [the idea], the character of the artifact [the idea's enactment in the form of a product], and the environment in which the artifact performs [the market].” Hence, producing a high-value business idea requires intervention at the nexus of aligning an idea, the action of producing it, and a market in parallel, recognizing that “patterns or structures arise from interactive processes and cannot be reduced to their constituent parts” (Anderson et al., 2012; Sergeeva et al., 2022, p. 694). Reflective of this integrated view, VAN DEN Steen (2017, p. 2627) concluded that the best strategy “optimally combines internal and external alignment.”

While most entrepreneurs recognize how important it is to ensure alignment between an idea, the action of producing it, and the environment, it is harder to know how to intervene in this tripartite nexus (Grégoire et al., 2010). An ideal strategy keeps an eye on all three elements since the one-sided optimization of an idea or product, especially when disregarding the environment, will prove ineffective in mitigating uncertainty (Dimov, 2007). To tackle this complexity, we suggest that entrepreneurs should assess “what is uncertain” (McKelvie et al., 2011) and, depending on the uncertainty mix encountered, should rationally emphasize one or another of three alignment strategies, while recognizing that all three are in principle needed for full alignment: (1) idea–environment alignment, whereby entrepreneurs akin to visionaries focus on matching an idea to the environment; (2) idea–action alignment, whereby entrepreneurs akin to engineers focus on matching an idea and its practical instantiation in the form of a product; and (3) action–environment alignment, whereby entrepreneurs akin to experimenters focus on matching a product with the environment (see Figure 2). The logic connecting uncertainty types to alignment strategies follows from the epistemic focus of the individual alignment strategies: Alignment by visionaries is cognitive in nature and thus addresses state and perception uncertainty. Alignment by engineers targets coherence of idea and product and thus addresses perception and execution uncertainty. Finally, alignment by experimenters seeks behavioral feedback from a market and thus addresses execution and effect uncertainty. We thereby define the value of an alignment strategy in terms of the reduction in the different types of uncertainty and, by implication, the improvement in product–market fit the strategy produces. In the following we develop propositions that summarize the nature of the three alignment strategies and formulate related corollaries generating testable empirical implications.

4.1 | Idea–environment alignment: Entrepreneurs as visionaries

Idea–environment alignment focuses on external alignment—that is, on ensuring that an idea matches the environment. This alignment process is focused on proactive exploration of the current and future state of the environment. When focusing on idea–environment alignment, entrepreneurs actively seek new information to generate an innovative and novel, and perhaps contrarian, business idea (Felin & Holweg, 2024; Friston et al., 2017). Entrepreneurs act as visionaries to track emerging market and technological trends, engage in compassionate and exploratory customer interviews to uncover pain points, and attend to weak signals from adjacent fields to envision new resource combinations, all of which enable them to generate ideas that promise to produce significant demand (Felin, Gambardella, Novelli, & Zenger, 2024; Kim & Mauborgne, 2014; Rindova & Courtney, 2020). Entrepreneurs as visionaries thus learn by scoping the environment and then refine their priors and problem frames. They engage in forward-looking abduction about what could be (Foss & Klein, 2012) and are predominantly concerned with mitigating state and perception uncertainty. They thus seek to mitigate uncertainty surrounding the current and future state of the environment to ensure the appropriate interpretation of environmental cues and hence solely focus on mitigating cognitive

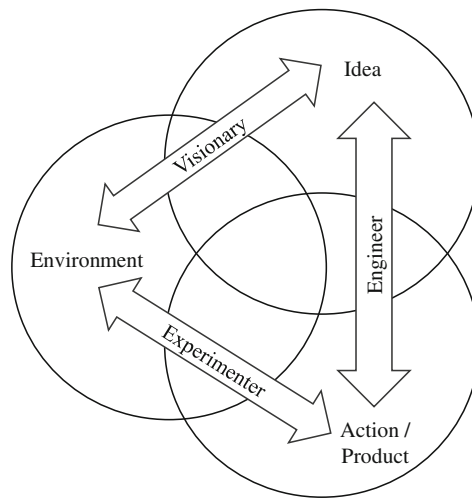


FIGURE 2 Strategies to align idea, action, and environment. We treat the degree of overlap between the circles in Figure 2 as the extent to which idea, action/product, and environment are aligned and the different types of uncertainty are mitigated. The higher the overlap of the three circles, the higher the fitness of the focal entrepreneur's thinking and acting in the environment, resulting in enhanced product-market fit.

forms of uncertainty. Therefore, entrepreneurs as visionaries uncover overlooked opportunities for value creation before others see them, relying on their superior skill to spot what is going on in the environment and their capacity to logically translate these observations into compelling ideas (Kier & McMullen, 2018; Kirzner, 1979).

4.1.1 | Strategic advantages

When acting as visionaries, entrepreneurs benefit from enhanced foresight about what will be in demand in markets given their deep engagement with trends and their awareness of the emergent nature of the environment. Trying to break free from current interpretations of where the environment is headed and inspired by out-of-the-box thinking that focuses on future possibilities (Ramoglou & McMullen, 2024; Ramoglou & Tsang, 2016), visionaries are well positioned to come up with innovative ideas.

Entrepreneurs as visionaries also likely benefit from enhanced resource access and employee commitment because resource providers such as employees will self-select into these entrepreneurs' visions and commit to joint endeavors. An important benefit of acting as a visionary should thus be commitment and alignment around one's vision in terms of a clear strategic root choice that motivates idea-specific investments and strong effort by resource providers (Gartenberg et al., 2019; VAN DEN Steen, 2017). The vision proposed, defined as a strong belief about the right course of action for a venture (cf., VAN DEN Steen, 2005), serves as a credible commitment because it clearly establishes the venture's ultimate goal (Rotemberg & Saloner, 1994, 2000). The vision functions as a binding objective that also helps align and coordinate downstream choices derived from the entrepreneur's vision (Wuebker et al., 2023). This strategic reliability contributes toward product-market fit because others want to join and provide resources and put effort into the undertaking.



4.1.2 | Strategic constraints

Idea–environment alignment disregards the action necessary to turn an entrepreneur's vision into reality. Entrepreneurs as visionaries suffer from a lack of understanding about what action is required to implement their visions, which leaves execution uncertainty unaddressed. Also, visionaries have little insight into what results their action will produce in the environment, failing to address effect uncertainty. Visionaries are thus likely to miss out on the information gains from enacting and testing their imaginative prophecies in the real world. For example, visionaries may correctly predict the advent of a new technology and propose an idea that picks up this technology. However, they may often lack the skills to enact their ideas and produce tangible results. Because their alignment is limited to idea and environment, visionaries' weakness lies in a lack of understanding about the feasibility of their ideas and the effect of related products in markets. In colloquial terms, visionaries frequently “fail to deliver,” as evidenced by the randomness of the products they ultimately come up with.

4.1.3 | Contingencies

Visionaries' concern with mitigating state and perception uncertainty is likely particularly valuable in reaching product–market fit when these two types of uncertainty are pronounced, such as in newly emerging markets where multiple future states are conceivable. For instance, in a period of marked technological uncertainty multiple product architectures may coexist, and a dominant design has yet to materialize. Industry standards are unsettled, and market-selection processes have not yet converged on a single configuration, making investments risky but potentially transformative (Romanelli & Tushman, 1994). We suggest that under such conditions characterized by high state and perception uncertainty, the visionary alignment strategy should be particularly valuable in reaching product–market fit. Proposition 2 and Corollaries 2a, 2b, and 2c summarize the nature, strategic advantages, strategic constraints, and contingencies of the visionary alignment strategy:

Proposition 2. *Entrepreneurs as visionaries progress toward product–market fit by mitigating state and perception uncertainty, yet their efforts are constrained by execution and effect uncertainty.*

Corollary 2a. *Entrepreneurs as visionaries benefit from strategic foresight, innovative product ideas, and commitment from resource providers.*

Corollary 2b. *Entrepreneurs as visionaries are limited by ineffective execution of their visions and by the lack of feedback from the environment.*

Corollary 2c. *Visionary alignment should be particularly valuable in newly emerging markets, or markets with pronounced state and perception uncertainty.*

4.2 | Idea–action alignment: Entrepreneurs as engineers

Idea–action alignment is concerned with the coherence of an idea and its enactment in terms of a functional product. Acting as engineers, entrepreneurs are engaged in the practical instantiation of ideas and hence the transformation of intangible ideas into tangible products (cf. Berglund & Dimov, 2023). Concerned with the effective execution of their ideas, engineers tend to hold selective and idiosyncratic views about what environmental cues are relevant and how they should be interpreted, such as what customer problems to solve, product features to implement, or production processes to adopt. They search for a close match between the functionalities

they deem critical and their disciplined implementation in a product. Accordingly, entrepreneurs as engineers focus on the production of the functional mechanisms through which their products operate (Berglund et al., 2020), trying to maximize the internal coherence of reasoning and acting (Friston, 2010; Martignoni et al., 2016). As engineers, entrepreneurs learn via constraint discovery and error diagnosis in the production process, whereby they gain deep insights into a select part of the environment, which reduces perception uncertainty. Deducing “what must work” reveals whether the envisaged product can be produced and where obstacles may lie (Berglund & Dimov, 2025) such that entrepreneurs as engineers should also be strong at reducing execution uncertainty. For entrepreneurs as engineers, the main worry is whether they have the know-how, tools, and methods to turn a self-chosen idea into a product that works. Their concern is with the application of industry best practices, advanced technology, and the latest production methods since the primary goal for them is moving from planning to execution (Ghemawat & Levinthal, 2008).

4.2.1 | Strategic advantages

A critical benefit of the engineering approach is laying out a reliable practice for producing a product (Berglund et al., 2020; Dimov, 2016). As engineers, entrepreneurs thus ensure the feasibility of their products—namely, that their envisioned ideas can actually be built and delivered. An engineering mindset typically comes with specialized insights into a subset of some market, and forces entrepreneurs to confront the technical and organizational hurdles that stand in the way of realizing a product, which produces discipline in these entrepreneurs' work and accelerates learning from constraints and bottlenecks (Hannah & Eisenhardt, 2018). This concern for feasibility also pushes entrepreneurs toward reliable solutions that can be documented and reproduced by others as part of a replicable production process. The internal alignment of idea and product should also support entrepreneurs' capacity to communicate and explain their ideas' inner workings to others (Sloman & Lagnado, 2015).

4.2.2 | Strategic constraints

A one-sided focus on idea–action alignment comes with persistent state and effect uncertainty. An engineer's approach to entrepreneurship is insufficiently informed by developments in the wider environment beyond the immediate context in which the engineer operates such that “the external alignment is no better than random” (VAN DEN STEEN, 2017, p. 2627). Entrepreneurs as engineers are likely prone to engaging in persistent product optimization while losing sight of a compelling value proposition that is attractive to a wide number of clients and not just the engineers themselves or their immediate personal network (Gruber & Tal, 2017). These entrepreneurs' concern for careful execution should motivate them to deepen the internal fit between an idea and its production but at the cost of external fit or alignment with the environment (Siggelkow, 2011). Entrepreneurs as engineers are thus likely to often end up with sophisticated yet also overcomplicated products. In colloquial terms, such entrepreneurs risk coming up with “a product in search of a market.”

Furthermore, the investments engineers make into realizing their ideas, such as skills and technologies, are often idea specific and cannot be easily redeployed. Hence, heavy investments into execution may result in these entrepreneurs becoming entrenched with (overly) specific ideas, which could engender strategic inertia since they are locked into costly and perhaps irreversible paths (Ghemawat, 1991). Similar to founder imprints that lock in organizational paths (Baron et al., 1999), we expect entrepreneurs as engineers to lock in what they consider to be a valuable product. Ex post alignment with the environment should thus be costly for entrepreneurs as engineers. To make matters worse, for these entrepreneurs, a lack of external alignment may be challenging to detect and may be downplayed once detected because the internal fit of an idea and action can be kept intact even though the environment fails to align, providing a false sense of certainty (Siggelkow, 2002).



4.2.3 | Contingencies

Engineers' concern with mitigating perception and execution uncertainty should be particularly valuable when these two types of uncertainty prevail, such as in deep tech industries. In such industry contexts, the primary challenge is not about whether a certain product will be valuable—it *will* be, but only once the (technological) hurdles are overcome. For instance, quantum computing has foreseeable value across a wide range of applications. What stands in the way of creating this value is the removal of bottlenecks around exact use cases and the production of a fully functional quantum computer.

Proposition 3 and Corollaries 3a, 3b, and 3c summarize these considerations:

Proposition 3. *Entrepreneurs as engineers progress toward product-market fit by mitigating perception and execution uncertainty, yet their efforts are constrained by state and effect uncertainty.*

Corollary 3a. *Entrepreneurs as engineers benefit from gaining expert insights into subsects of markets, ensuring the feasibility of their ideas, and learning through the removal of bottlenecks.*

Corollary 3b. *Entrepreneurs as engineers are constrained by ignorance of the state of the environment and by strategic inertia.*

Corollary 3c. *Engineer alignment should be particularly valuable in deep tech industries, or markets with pronounced perception and execution uncertainty.*

4.3 | Action–environment alignment: Entrepreneurs as experimenters

Finally, entrepreneurs as experimenters prioritize strong alignment between a product and the environment. Garnering rapid feedback from potential clients, entrepreneurs as experimenters should excel in reactive learning from feedback that is collected “here and now.” For example, a new product launch might reveal unexpected customer preferences, prompting an entrepreneur to redesign features with the goal of maximizing demand with the feedback providers (Packard & Clark, 2020). The strength of experimenters thus lies in their agility, lean information generation, and rapid pivoting (Shepherd & Gruber, 2021). Moreover, the hallmark of experimenters is their bias toward action, trial-and-error learning, and their openness to challenging feedback to uncover what works and sells without spending significant resources on trying to predict the state of the environment (Blank, 2013). Hence, entrepreneurs as experimenters run with whatever product is available to them and try to figure out whether it sells, which counters execution and, in particular, effect uncertainty.

The main goal for experimenters is not to *be* right but rather to find out what *is* right—that is, what sells here and now. As experimenters, entrepreneurs learn from active sampling of the environment and from the data a product generates in a market. Hence, when acting as experimenters, entrepreneurs inductively try to find out what generates traction in markets considering that the environment is so uncertain and dynamic that its *ex ante* analysis is of little value. Also, a preference for action over planning, an openness to surprises, and a willingness to “leave the building” to engage with clients are likely important skills of experimenters.

4.3.1 | Strategic advantages

In line with the promise of lean startup, experimenters quickly develop an understanding about what clients like or dislike about a product, rooted in the conviction that clients know what is of value best (Felin, Gambardella, Novelli, &

Zenger, 2024; Ries, 2011). In turn, experimenters benefit from enhanced accuracy of their ideas because their predictions about what will work in the environment closely match the feedback they generate from acting in the environment. Experimenters likely seek ongoing interaction with the environment, in particular with the target market, and are likely open to pivoting to rapidly increase product-market fit. Their responsiveness to challenging feedback, along with their openness toward questioning their own ideas, should in turn lead to enhanced strategic flexibility.

4.3.2 | Strategic constraints

However, experimenters' lack of engagement with longer-term trends and the future state of the environment and their lack of concern with the design- and technology-related hurdles involved in crafting a high-value product likely leave state and perception uncertainty unaddressed. Their ideas and actions are likely to frequently be shortsighted and lack coherence of reasoning and acting. Experimenters' reliance on trial-and-error learning and local search can lead to myopic learning because their ideas and actions are misaligned with hidden market dynamics or long-term trends that customers are unable to articulate themselves since they may be overly entrenched in current paradigms (Felin, Gambardella, Novelli, & Zenger, 2024; Gavetti & Levinthal, 2000). As a result, experimenters may settle on locally accurate yet across time and contexts unreliable views of the environment. They are thus likely to be prone to promoting underperforming products because learning processes based on immediate performance feedback often lead to costly oscillations (Denrell et al., 2004). Unreliability is also a problem for experimenters because their strategic flexibility may disenfranchise stakeholders. These stakeholders may withhold support and investments due to these entrepreneurs' unreliability or withdraw once they realize that experimenters' ideas are largely random (McDonald & Gao, 2019).

A particular challenge for experimenters thus lies in the fact that to find high-value ideas, it is insufficient to accurately predict what works here and now. Signals derived via experiments are often noisy, which calls entrepreneurs to weight those signals; however, this weighting will be random in the absence of a causal theory whose underlying assumptions are tested in a market (Parr et al., 2022; Puranam et al., 2015). An example of an experimenter is a startup founder who tweaks their product without fully understanding their target market's underlying trends and latent needs. In this way, experimenters may achieve some degree of success through quick wins. However, their shortsightedness is likely to lead to problems in scaling ideas and, hence, to ideas that do not reliably fit broader markets. In consequence, experimenters risk pursuing poorly conceived and thus random ideas (Chen et al., 2024; Felin, Gambardella, Novelli, & Zenger, 2024).

4.3.3 | Contingencies

Experimenters' focus on mitigating execution and, in particular, effect uncertainty should be particularly valuable in reaching product-market fit when these two types of uncertainty are pronounced, such as in consumer markets. For instance, in the fast fashion industry, concerns over long-term trends and feasibility issues are less of an impediment toward reaching product-market fit. Rather, in this context, it is critical to quickly learn how colors and shapes resonate with local customer tastes. In a similar way, rapid feedback generation should be highly valuable in reaching product-market fit under high levels of environmental velocity (Brown & Eisenhardt, 1997; Neckebrouck & Zellweger, 2024).

Proposition 4 and Corollaries 4a, 4b, and 4c summarize these considerations:

Proposition 4. *Entrepreneurs as experimenters progress toward product-market fit by mitigating execution and effect uncertainty, yet their efforts are constrained by state and perception uncertainty.*



Corollary 4a. *Entrepreneurs as experimenters benefit from strategic flexibility, rapid information gains, and improved short-run predictive accuracy about what is in demand.*

Corollary 4b. *Entrepreneurs as experimenters are constrained by strategic shortsightedness, myopic learning, and unreliable ideas.*

Corollary 4c. *Experimenter alignment should be particularly valuable in consumer markets, or markets with pronounced execution and effect uncertainty.*

In sum, each alignment strategy targets two forms of uncertainty: Visionaries mitigate state and perception uncertainty while trying to answer the question “What is a valuable new idea?” However, in doing so, visionaries likely produce promising ideas that never get realized. Engineers mitigate perception and execution uncertainty given their focus on feasibility in narrow markets and try to answer the question “Can we build it?” With this focus, though, engineers end up with products in search of a market. Finally, experimenters mitigate execution and effect uncertainty with a focus on answering “Will this sell?” However, experimenters likely make products that fail to scale. Table 2 summarizes the characteristics, strategic benefits, constraints, and contingencies of the three alignment strategies.

5 | DISCUSSION

A large body of work finds that the presence of uncertainty complicates entrepreneurial entry (O'Brien et al., 2003) and poses challenges to new venture success (McKelvie et al., 2011; Shane & Venkataraman, 2000). Deepening our

TABLE 2 Entrepreneur as visionary, engineer, and experimenter.

Entrepreneur as	Visionary	Engineer	Experimenter
Focus of alignment	Idea–environment	Idea–action	Action–environment
Epistemic focus	Abduction: <i>What is a valuable new idea?</i>	Deduction: <i>Can we build it?</i>	Induction: <i>Will this sell?</i>
Uncertainty mitigated	State and perception uncertainty	Perception and execution uncertainty	Execution and effect uncertainty
Required skills	Ability to recognize trends and overlooked possibilities in the environment	Technical know-how to design a practical instantiation of an idea	Ability to engage with the environment to rapidly collect feedback
Strategic advantages	Foresight, innovative ideas, and commitment from resource providers	Feasibility, specialized insights into a submarket, disciplined execution, removal of bottlenecks	Flexibility, rapid information gains, and product with traction in current market
Strategic constraints	Ineffective execution of vision, and lack of feedback from the environment. <i>A promising idea that never gets realized</i>	Ignorance of the state of the environment, and strategic inertia. <i>A product in search of a market</i>	Strategic shortsightedness, myopic learning, and unreliable ideas. <i>A product that fails to scale</i>
Contingencies	Effective under high state and perception uncertainty, such as in newly emerging markets	Effective under high perception and execution uncertainty, such as in deep tech industries	Effective under high execution and effect uncertainty, such as in consumer markets

understanding about the nature of uncertainty on one hand and uncertainty-mitigation strategies on the other hand thus promises large rewards. We worked toward these two goals by analyzing the TBV, which sees uncertainty and its mitigation as a primarily cognitive challenge. We complement the TBV with a discussion of the behavioral aspects of uncertainty and related mitigation strategies by drawing from the literature on active inference, a framework from the cognitive sciences that describes how humans learn and maintain adaptive fitness (Friston, 2010; Parr et al., 2022). Active inference highlights that entrepreneurs need to combine reasoning and action to counter uncertainty and ensure the fitness and value of their products in markets (Hohwy, 2016). This conceptualization of entrepreneurship as an inferential learning process to align idea, action, and environment charts a path that is consistent with what has been described as the tripartite account of uncertainty (Davidsson, 2015; Gali et al., 2024; Simon, 1996). We thus provide a foundation for how entrepreneurs effectively combine forward-looking abduction (what entrepreneurs imagine to be of value), inside-looking production (what entrepreneurs then produce), and backward-looking induction (what entrepreneurs find sells) (Packard et al., 2017; Townsend et al., 2018). These insights lead to two contributions to the entrepreneurial strategy and TBV literatures (Felin, Gambardella, & Zenger, 2024; Gans et al., 2019; Zellweger & Zenger, 2023).

5.1 | The comprehensive nature of uncertainty in entrepreneurship

Our study sheds additional light on the comprehensive nature of uncertainty encountered in entrepreneurship. We agree with Milliken (1987, p. 135), who concluded that “there is a need to be much more precise in defining, using, and measuring the construct of environmental uncertainty,” yet hasten to add that this need pertains also to agentic uncertainty, or uncertainty at the level of the entrepreneur. A comprehensive perspective of uncertainty thus accommodates uncertainty at the level of the environment *and* the level of the entrepreneur and recognizes its cognitive *and* behavioral nature.

Accordingly, we propose four types of uncertainty: (1) state uncertainty, which is uncertainty about the state of the environment; (2) perception uncertainty, which is uncertainty about the interpretation of environmental cues; (3) execution uncertainty, which is uncertainty about the feasibility of turning an idea into a functional product; and (4) effect uncertainty, which is uncertainty about the effect of a product in the environment. While several authors have highlighted the variegated nature of uncertainty (e.g., Packard & Clark, 2020; Ramoglou, 2021; Sergeeva et al., 2021), the literature still misses an integrated perspective of uncertainty that accommodates both the environmental and agentic levels as well as its cognitive and behavioral nature.

5.2 | Alignment strategies to mitigate uncertainty in the quest for product–market fit

We introduce three complementary alignment strategies through which entrepreneurs can mitigate the four types of uncertainty and thereby progress toward product–market fit—visionary, engineer, and experimenter alignment. Visionaries prioritize alignment between an idea and the environment, relying on abductive reasoning to identify novel opportunities to mitigate state and perception uncertainty. Their strength lies in enhanced foresight, innovative ideas, and resource mobilization, but they risk weak execution and a lack of market feedback. Engineers focus on aligning an idea and action through deductive reasoning about technical feasibility, thereby mitigating perception and execution uncertainty. They produce technically sound products yet without a clear market. Finally, experimenters emphasize alignment between a product and the environment, using inductive learning based on customer feedback to counter execution and effect uncertainty. While this approach enables flexibility and rapid information gains, it leads to short-termism, myopic learning, and difficulties in scaling.

Our paper highlights the contingent value of the three alignment strategies in reaching product–market fit: visionary alignment is effective under high state and perception uncertainty, such as in newly emerging markets;



engineer alignment is effective under high perception and execution uncertainty, such as in deep tech industries; and experimenter alignment is effective under high execution and effect uncertainty, such as in consumer markets. We link the different forms of uncertainty to alignment strategies and thereby show why assessing “what is uncertain” in a specific situation matters. Doing so informs the emphasis of an effective uncertainty-mitigation strategy in the pursuit of product–market fit (McKelvie et al., 2011).

Our study reaches beyond Grégoire et al.'s (2010) work by highlighting the interplay of cognition and action in recognizing valuable business opportunities. Similarly, our study clarifies that it is not enough for entrepreneurs to focus on cognitive fitness alone (Martignoni et al., 2016) because for them to be in sync with the environment, they also need to achieve behavioral fitness by turning ideas into functional products and by introducing products into markets. Cognition and action are complementary epistemic approaches, and both are required to come up with a product that reliably solves a market problem. In this way, our paper builds a bridge between theory-based, design-based, and lean perspectives of entrepreneurship (Berglund & Dimov, 2025; Felin & Zenger, 2009; Ries, 2011). For the scientific approach to entrepreneurship, our analysis clarifies that acting scientifically encompasses not only the cognitive work of forming, testing, and updating theories but also the behavioral work of engineering functional products and experimentally validating them in markets.

Taking a step back, visionary, engineer, and experimenter alignment cast novel and integrated light on various metaphors for how entrepreneurs reason and act. The alignment strategies we introduce correspond to three complementary epistemic dogmas in entrepreneurship (Quine, 1951): namely, theory generation, mechanism construction, and empirical validation. Rather than referring to alternative types of entrepreneurs, the visionary, engineer, and experimenter constructs represent distinct yet complementary modes of reducing uncertainty, each “paying its way” (Rorty, 1979) under particular combinations of uncertainty while being collectively necessary for sustained value creation under profound uncertainty.

5.3 | Opportunities for future research

Future research could operationalize the four uncertainty types and test the propositions we outline. Researchers may also explore what, beyond the uncertainty mix encountered, motivates entrepreneurs to adopt one of the three alignment strategies, with educational backgrounds or preferences for thinking versus acting perhaps playing a role. Moreover, researchers could explore how entrepreneurs perhaps change their alignment strategies over time, possibly starting as visionaries, turning into engineers, and finally acting as experimenters as various forms of uncertainty are progressively mitigated. Also, it seems promising to study how the alignment strategies may be combined for comprehensive team-level learning efforts.

Finally, our theory of uncertainty and alignment in the pursuit of product–market fit can be explored via simulations (Davis et al., 2009; Ryan & Lippman, 2003). Researchers could model an entrepreneur's beliefs and the environment as competing generative models (Friston et al., 2017) and measure alignment as the statistical distance between them. Visionary alignment would capture how closely the entrepreneur's beliefs about the environment match its true state, engineer alignment would capture the gap between the entrepreneur's intended product and what can be built, and experimenter alignment would capture how well the entrepreneur's predictions about market responses match actual outcomes. Product–market fit could then be assessed as realized out-of-sample predictive performance (Burton & Obel, 2004; Kiebel et al., 2008; Smith et al., 2022).³ This blueprint enables direct tests of our propositions and lends itself to exploring various sequences and combinations of alignment strategies. For instance, because the relative salience of the four types of uncertainty likely shifts as a venture progresses (early-stage ventures typically confront pronounced state and perception uncertainty, whereas execution and effect uncertainty gain prominence later), we expect benefits in the sequential deployment of the alignment strategies across the venture life cycle.

5.4 | Practical implications

Our paper makes entrepreneurs aware of the types of uncertainty they are likely to encounter. The alignment strategies represent actionable levers to mitigate the different forms of uncertainty, with benefits and constraints and with contingent value depending on the uncertainty mix encountered. We thus provide a toolbox for assessing and mitigating uncertainty and thereby increase entrepreneurs' chances of reaching product-market fit.

5.5 | Limitations

Product-market fit is necessary but insufficient for value creation; unit economics as well as the size and the growth of markets matter as well. It remains, however, that alignment of a product and a market is a critical milestone for value creation in entrepreneurship (Grégoire et al., 2010). One may argue that particularly novel ideas proposed by entrepreneurs are sometimes placed in a state of *misalignment* with prevailing conditions. Nevertheless, to create customer demand and economic value at scale, entrepreneurs must ultimately align an idea, its production, and a market (Chavda et al., 2024), whereby principles of Bayesian inference remain valid even under stark uncertainty (Friston, 2023; Gans, 2025b; Sloman & Lagnado, 2015). One may also argue that not just products but also markets may be created such that a market is brought closer to a product and not the product tuned to the market. However, any product will ultimately have to succeed in a market irrespective of who created this market.

6 | CONCLUSION

We introduce a comprehensive perspective of uncertainty and deduce distinct strategies entrepreneurs can adopt to mitigate uncertainty. We thus provide novel insights into how entrepreneurs increase their effectiveness in coming up with products that generate traction in markets and produce value. We hope entrepreneurship scholars and practitioners alike consider our insights to be valuable for their thinking and acting.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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ENDNOTES

- ¹ In our paper we use "action" when emphasizing the behavioral activity of producing or enacting the envisaged idea, and we use the term "product" when emphasizing the concrete outcome of the production process.
- ² Active inference contrasts with Kauffman's (1989) NK landscape, which is well suited for capturing how alternative forms of action are correlated (Gavetti & Levinthal, 2000). However, NK models are limited in addressing the pervasive role of uncertainty, particularly how it can be mitigated and the respective roles of cognition and action therein (Davis



et al., 2007). Active inference also contrasts with reinforcement learning (Sutton & Barto, 2018), which requires human-designed rewards to accomplish desired outcomes and hence “is a heuristic approach that does not follow from the principles of probability theory” (Mathys et al., 2011, p. 2). In contrast, active inference provides a self-supervised learning process rooted in the Bayesian brain hypothesis (Clark, 2013; Hohwy, 2016; Oaksford & Chater, 2007; Seth, 2021), which describes agents as engaged in trying to minimize future prediction errors, an information quantity also called free energy (Friston, 2010). Free energy measures the discrepancy between an agent's predictions about the world, derived from the theories the agent holds about the world, and the sensory signals they receive from acting in the world, reflecting how well the agent's theories align with the external environment (Friston et al., 2017).

- ³ Technically, alignment can be operationalized via Kullback–Leibler (KL) divergence (Kullback & Leibler, 1951), a measure of the distance between two probability distributions, defined as $KL(P \parallel Q) = -\sum P(i) \log(Q(i)P(i))$. Let A denote an observation model (how hidden states generate observable data) and B denote a transition model (how states evolve over time), with subscripts env for the true environment and $agent$ for the entrepreneur's beliefs. Let π_{value} denote the action plan that would be optimal given the entrepreneur's beliefs and $\pi_{feasible}$ denote the plan constrained by what is technically feasible. Then, visionary alignment = $KL(A_{env} \parallel A_{agent})$, engineer alignment = $KL(\pi_{value} \parallel \pi_{feasible})$, and experimenter alignment = $KL(B_{env} \parallel B_{agent})$. Lower KL values indicate closer alignment and higher fitness (Smith et al., 2022).

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