

OPPORTUNITY-AS-HOLOGRAM: REAL OR ARTIFICIAL IN ENTREPRENEURSHIP

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ABSTRACT

Entrepreneurship must necessarily involve actions under uncertainties. How is opportunity discovered and perceived that will eventually trigger and stimulate entrepreneurial action? An ongoing conversation in entrepreneurship concerns the clumsiness in the definition of opportunity – whether discovered or created, objective or subjective. Can opportunity exist independently, as a pre-existing object, even without being observed by any actors? Or is opportunity subjectively and socially constructed? Are they real or artificial? This paper articulates opportunity as a holographic representation that provides cues and signals to alert entrepreneurs to act. We attempt to explain how opportunity-as-hologram inspires and motivates entrepreneurial action. The proposed opportunity-as-hologram construct (or holographic opportunity) is representationally valuable as it embraces the various definitional variations and clarifies the opportunity concepts underpinning entrepreneurship. Central to this paper are the re-casted perspectives on opportunities by addressing the major conceptual issues at the core of entrepreneurship theories. The three views – discovery, creation, and actualisation of opportunities – can be valid and mutually non-exclusive in holographic terms. This paper explores implicate and explicate orders and quantum theory concepts theorised by physicist David Bohm. This conceptual construct of holographic opportunity contributes to the ongoing dialogues on the opportunity, improves the conceptual clarity of opportunity, and opens new research and practice possibilities.

Keywords: propensity, complexity science, implicate order, explicate order, holographic representations

INTRODUCTION

Entrepreneurship is about the enactments of opportunities. Opportunity, by itself, does not contribute to venture creation without action. An important debate in entrepreneurship features the objectivity and subjectivity of opportunity. The discovery view suggests that the opportunities are objective. The creation focus on the subjectivity of opportunity. McBride and Wuebker (2022) discuss whether entrepreneurial opportunities are ontologically subjective or can be epistemologically objective. According to them, both questions are affirmative “yes” (McBride & Wuebker, 2022). The usefulness of opportunities to instigate and motivate action is crucial, whether opportunities are considered objective or subjective. The need to take action is paramount in entrepreneurship. When there is no action, there is no venture.

McBride and Wuebker (2022) argue that everything we explore, reflect and theorise in entrepreneurship involves social entities. In this case, opportunities are considered social entities. Therefore it is imperative to understand what constitutes a social entity that makes it real and objective (observer-dependent). Finally, it is critical to distinguish these social phenomena from the physical phenomena that have distinct objective existences (observer-independent). To McBride and Wuebker (2022), the observer-independent, physically existing entities are objective, and their existences are independent of any observation by agents.

On the other hand, observer-dependent entities like opportunities are subjective as they rely on their existence in the social construction by the entrepreneurs. As an example, the COVID-19 pandemic impacts the entire global economy, and this is an objective fact independent of any observers or actors. In a study to understand the impact of COVID-19 on the financing decisions of SMEs in Vietnam, Vo et al. (2022) found that the risk perception of COVID-19 significantly influences bank loan financing decisions. The risk perception is observer-dependent. The cognitive activity in making that risk assessment mainly depends on the decision-maker engaged in that activity. In this case, it is critical to differentiate observer-independent physical phenomena from observer-dependent social phenomena (McBride & Wuebker, 2022). Here, we argue that the observation of the holographic opportunity falls into the observer-dependent categorisation.

Entrepreneurs are portrayed as alert economic actors (Kirzner, 1973; 1979; Tang et al., 2012) attracted to opportunities (observer-dependency) by searching, connecting, and evaluating the information surrounding the potential opportunities (Tang et al., 2021). In this case, the potential in the opportunity is unactualised, pending effective action. Ramoglou and Tsang promote the actualisation approach

by theorising “opportunities as unactualised propensities” (2016, p. 410). Opportunity actualisation is as unknown as the future but is often assumed to be known ex-ante (Ramoglou, 2021). To a reasonable extent, the alert and enterprising entrepreneurs may only believe in the prospects and potentials of the opportunities and the ventures’ success. They are unlikely to know the prospects, potential or possible success with any certainty. The outcomes of any opportunistic exploit cannot be known beforehand, and therefore they are ineliminably unknowable (Ramoglou, 2021). Ramaglou (2021) argues that despite the uncertainty of the outcome, there exist knowable and recognisable opportunity ingredients that form the opportunity beliefs. Here, we argue that the opportunity ingredients are essentially the abstracted information from the environment. Based on their sensemaking of these ingredients, entrepreneurs form holographic opportunities, strengthening their beliefs.

Since 2000, Shane and Venkataraman’s (2000) opportunity, existing objectively waiting to be discovered, dominates entrepreneurial dialogues. Although the view that entrepreneurial opportunities exist as a discoverable phenomenon influences the entrepreneurship theory and takes centre stage, other competing ontological narratives come to the fore. Alvarez and Barney’s (2007) creation approach takes the view that opportunities are created through economic actors, particularly “how actors and contexts are co-created through an interactive and emergent process” (Garud et al., 2014, p. 1177). Ramaglou and Tsang’s actualisation approach theorise opportunity as latent and a propensity that exists independently of the actors, “in the form of unmet or possible market demand that can be actualised into profits” (2016, p. 413). Ultimately, any promising reward must be contingent on actions taken by the entrepreneurs in response to the opportunity at the appropriate time. “It is the subsequent human actions, driven by the level of entrepreneurial energy that will lead to the myriad of possible venture pathways” (Leong, 2020, p. 196). Leong argues that “opportunity, through the opportunity beliefs of the entrepreneur, morphs and changes according to how the entrepreneur interprets the information and signals surrounding the opportunity. Although the opportunity is central to our understanding of entrepreneurship, generalisable findings that explain how opportunity emerges and how it influences and lures entrepreneurs to act remain elusive” (Leong, 2021, p. 2150021-1).

Here, we theorise holographic opportunity in a flux-like process and unpack the concept of opportunity as a multi-dimensional construct that can evolve and change over time. Holographic opportunity is not static and unchanging but undergoes iterative morphs as information becomes available or is made known to the entrepreneurs along the venture process. The accrued experiences of the entrepreneurs, in the process, co-develop the holographical representation

of the opportunity. Therefore, the various phenomenological perspectives of entrepreneurship need a more embracing and flexible conceptual framework that considers timing in actions and uncertainty in the venture's origination and emergence.

Dimov (2011) views the current conversations on the opportunity as “theoretically exciting but empirically elusive” (p. 57). Grappling “with the unbearable elusiveness of entrepreneurial opportunities” (Dimov, 2011, p. 57) has led to an “opportunity war” (Ramoglou & Gartner, 2022) in the entrepreneurship research field. The lack of conceptual/construct clarity and fragmented definitions of opportunity befuddle entrepreneurship scholars. Foss and Klein (2005; 2010; 2012) even call for abandoning the opportunity construct. They argue that uncertainty is the central plank in entrepreneurship and innovation but is absent from most opportunity-based dialogues (Foss & Klein, 2020).

“Although some researchers argue that the subjective or socially constructed nature of opportunity makes it impossible to separate opportunity from the individual, others contend that opportunity is an objective construct visible to or created by the knowledgeable or attuned entrepreneur. Either way, a set of weakly held assumptions about the nature and sources of opportunity appear to dominate much of the discussion in the literature” (McMullen et al., 2007, p. 273)

Clearly, a more embracing model needs to be articulated to describe opportunity fundamentally that can bring about more complementarities than contradictions in the definition. Here, we conceptualise opportunity as a hologram, a mental projection, not an objective construct that is visible or an observable physical embodiment. The holographical representation of opportunity changes with incipient information presented by the external environment and the accrued experience of the entrepreneurs. Situated in significant uncertainty and ambiguity, entrepreneurs are constantly in a sensemaking and sensegiving mode. “To cope with these uncertainties, the entrepreneurs must develop a vision or mental model of how the environment works (sensemaking) and then be able to communicate to others and gain their support (sensegiving)” (Hill, 1995, p. 1057). We argue that the holographical representation of opportunities, a form of mental model, is perceived as arising in a flux of events and processes. The discussion section explores the implicate/explicate order in the holomovement, the holograms, and active information related to the entrepreneurial venture process.

These premises stimulate the critical research question – what is within the opportunity that motivates action? Bohm's (1980) wholeness and implicate/explicate order are applied in this entrepreneurial discussion. We use Bohm's

concepts to clarify how opportunities emerge and evolve at the level of individual entrepreneurs' sensemaking and sensegiving.

This view of holographic opportunities has important implications for entrepreneurship. First, it offers a new lens through which opportunities are observed from the embedded information forging beliefs that drives the entrepreneurial actions. This lens provides a valuable perspective on the concept of opportunities. Instead of arguing about the semantics or its ontological and epistemological objectivity or subjectivity, it provides a helpful tool for scholars, in particular practitioners, to appraise the information in the holographic opportunity such that it must finally be the information in the holographic opportunities that motivate them to action.

LITERATURE REVIEW

What are the Problems in the Definitions of Entrepreneurial Opportunity?

What exactly is the promise of entrepreneurship (Venkataraman et al., 2012b) or the promise of the opportunities in particular? Despite criticism by Davidsson (2021) to ditch the discovery-creation approaches or Foss and Klein's (2005; 2010; 2012) call to abandon the opportunity construct, we argue that opportunity is still a crucial conceptual anchor in entrepreneurship research. Davidsson (2021) argues that the concepts in the Shanian discovery and Alvarez Barneyan creation approaches are beset with a logical challenge, time-relevant paradoxes and theoretical dilemmas. Therefore, their continued references "would constrain future entrepreneurship research" (Davidsson, 2021, p. 1).

As a theory and a practice, entrepreneurship has relied on the abstract (based on the creative view) and actual (based on the discovery view) instantiation of the opportunity to develop it as a conceptual anchor for entrepreneurship research. Opportunity is formed at the interface between the entrepreneurs and their environments or in Shane and Eckhardt's individual-opportunity nexus (Eckhardt & Shane, 2010; 2003). What happens in the individual-opportunity nexus? What are the exchanges in the nexus that instigate action? The operationalisation part in the nexus is missing.

Here, we suggest that the holographic opportunities' informational value is the key instigator of entrepreneurial action. A later section discusses how this information is implicated and explicated in a flux process. The holographic opportunity construct transforms as entrepreneurs acquire new knowledge and information.

The entrepreneurs' creative information processing and integration generate many possibilities at the nexus. Such manifestations of possibilities are constantly altered with new insights. The causative information effect and the information value are the main drivers of action. This paper offers a conceptual framework on how the mental visualisation model of the holographic opportunity can build a more robust explanation of entrepreneurial action and how causal inference of information can be integrated and used in action theories. Finally, we conclude how entrepreneurs instantaneously connect this active information in the holographic opportunity, and everything eventually comes together to make sense.

The emergence of opportunities is time sensitive. "Entrepreneurial success presupposes conditions of opportunity" (Dimov, 2011, p. 59), but "one is overwhelmed by irreducible doubt about whether one's current endeavours constitute an opportunity. The ultimate judgment lies in the future and cannot be dissociated from what is yet to come and become known" (Dimov, 2011, p. 60). This is the clumsy part in the definition of opportunity concerning time. When is opportunity deemed as an opportunity? The time sensitivity of opportunity is missing in the discovery and creation approaches.

At what point in time is an opportunity to be deemed an opportunity? Is it when its profits are actualised or when a venture turns profitable? But, on the other hand, if the opportunity enacted fails (with execution failure) with wasted resources and effort, does it still constitute an opportunity? Or, let's say the initial opportunity belief turns out to be a false positive, is it still deemed an opportunity despite wasted resources and motion (Leong, 2021).

The second clumsy definitional part is what is being discovered? This conundrum persists since the pioneering research of Shane and Venkataraman (2000), where they highlighted two pertinent queries: (a) why do entrepreneurial opportunities exist? and (b) why do some discover them while others do not? "Opportunities are constellations of favourable, agent-independent, external circumstances" (Davidsson, 2021, p. 2), yet not observable and discoverable in the same way. Is it an issue of alertness or interpretation? Kirzner (1979) described opportunities as being discovered by alert entrepreneurs. We argue that alert entrepreneurs find the information encoded within the opportunities, subjectively interpret, and make sense of it. The interpretation and sensemaking of the information drive the direction of the venture (Bhowmick, 2015; Hill & Levenhagen, 1995; Weick, 1995).

The central theme of the Shanian (2003) discovery view is the individual-opportunity nexus, where the opportunities are independently existing in agent-independent external circumstances. Implicitly, the existence of opportunity precedes discovery/exploitation (Eckhardt & Shane, 2010). The information value of the opportunity depends on the interpretation by the different observers. Not all observers interpret the same information in the same way at the same time; hence, different responses are elicited.

Savolainen (2017) explores the “motivators for information behaviours by examining the nature of information need as a trigger and driver of information seeking” (p. 2). The information need becomes the trigger. This need drives the information-seeking behaviour of the alert entrepreneurs. The same information need is “a driver that keeps the information-seeking process in motion” (Savolainen, 2017, p. 2).

Alvarez and Barney (2007, p. 15) view opportunities as “created, endogenously, by the actions, reactions, and enactment of entrepreneurs,” so opportunities are not known *ex-ante* and are “in-the-making” in the process of social construction. This is the third part in the definitional clumsiness of opportunity – opportunity is not known until they are created at the end. From the creation view, the opportunity is the endpoint of the venture, to be known after the creation, and thus the opportunity is not a trigger to the venture. The opportunities cannot be understood from the beginning, and from the creation view, opportunities only exist after they are enacted in an iterative process of action and reaction. In this view, “with respect to the formation of new opportunities creation theory assumes that entrepreneur’s actions are the essential source of these opportunities... and in acting, they form opportunities that could not have been known without the actions taken by these entrepreneurs” (Alvarez & Barney, 2007, p. 15). “When entrepreneurs act to exploit these socially constructed opportunities, they interact with an environment – the market – that tests the veracity of their perceptions. But, of course, the market is, itself, a social construction, formed out of the perceptions and beliefs of numerous other individuals” (Alvarez & Barney, 2007, p. 15). So, the problem of timing in the making of these opportunities becomes problematic.

Similarly, other concepts like opportunity creation, effectuation and bricolage describe value creation and the role of entrepreneurial action in those processes. A core claim in effectuation is that the “actors can create a variety of effects when they attempt to exert influence over the things they can control, e.g., their current means” (Welter et al., 2016, p. 7) and “focus on selecting between possible effects that can be created with that set of means” (Sarasvathy, 2001, p. 245). Effectuation’s endpoint is indeterminate and is focused on the current set of means and what

can be done with those means to craft a yet-to-be-determined future endpoint (Welter et al., 2016, p. 7). Undergirding this is the capacity of the entrepreneurs to understand the flow of information in the environment (knowing the set of means) and be able to use this information to construct a plausible opportunity to capitalise on. Bricolage emerges as an entrepreneurial behaviour by making do with what is on hand (Lévi-Strauss, 1966; Stinchfield et al., 2013), by creating something from nothing (Baker & Nelson, 2005) or combining resources in the creation of economic value (Baker & Nelson, 2005). Baker and Nelson focus on resource consolidation to survive and grow in the face of resource constraints (Baker & Nelson, 2005). Entrepreneurs go about their resource construction by deriving information from the environment. However, there is an issue of timeliness of information and availability of resources in the environment that is missing in such discussion. The effectual and creation logic or causal reasoning in discovery relies on information for meaningful performance and exploitation, but the timeliness of information and resources needs addressing.

Given the clumsiness and elusiveness in the definition of entrepreneurial opportunity, this paper re-contextualises and anchors opportunity as a hologram. Such portrayal of opportunity addresses the problem by reflecting on the usefulness of the hologram and by elaborating on how to make the artefact empirically accessible. The accessibility is crucial as the information must make sense to entrepreneurs promptly (in the right place, at the right time), motivating them to action. Information is an essential ingredient to socially construct and create opportunity—the active information signals potentialities. “The signal has a positive specific effect on the receiver and influences behaviours by changing their “information state” and subsequent strategies” (Leong, 2021, p. 2150021-7).

This paper initiates a dialogue about entrepreneurial opportunities by situating information within the construct of opportunities. As more information is encoded within the opportunity construct, it influences entrepreneurial behaviours and actions by changing their information state. Holographic opportunity, therefore, evolves with changing information state.

On a Quantum Level, Wholeness and Implicate Order Concepts and Their Relevance to Entrepreneurial Theories

Bohm’s (2002) worldview is about movement and flux. Past events are enfolded and then explicated in a continuous flux flowing into the future. The notion that all is flux, the unit of inquiry here, implies that any “describable event, object, entity, etc., is an abstraction from an unknown and undefinable totality of flowing movement. This means that no matter how far our knowledge of the laws of physics

may go, the content of these laws will still deal with such abstractions, having only a relative independence of existence and independence of behaviour” (Bohm, 2002, p. 62). To Bohm (1980), everything is changing in a flux-like movement. “That is to say, what is the process of becoming itself, while all objects, events, entities, conditions, structures, etc., are forms that can be abstracted from this process” (p. 61).

Process as flux

Holomovement is a cornerstone of Bohm’s interpretation of quantum mechanics. His view of an undivided wholeness where everything is in a state of becoming culminates in a universal flux. Wholeness is a dynamic “wholeness-in-motion” in which every part of the wholeness moves together in an interconnected and interrelated process (Storoy, 2014). In the undivided wholeness, Bohm’s (1980) universal flux is dynamically implicated with active information connected to processes and events. Entrepreneurial venturing can be observed from a perspective of a “world-tube.” Bohm (1980) describes the world-tube as an infinitely complex structure with movements centred in a region indicated by the boundary of the tube. “The new form of insight can perhaps best be called undivided wholeness in flowing movement. This view implies that flow is, in some sense, prior to the ‘things’ that can be seen to form and dissolve in this flow” (Bohm, 1980, p. 14). The stream of consciousness with definable forms of thoughts and ideas emerges and dissolves in the flux like ripples, waves and vortices observed in a flowing stream (Bohm, 1980). Inherent in any flowing movement is the observed instability. Some thoughts recur and persist in the stream of consciousness, while others are evanescent (Bohm, 1980). Those thoughts that recur and persist are likely triggers for entrepreneurial actions. While they may not comprehend the undivided wholeness-in-motion (universal flux), they can abstract sufficient information necessary for sensemaking and action.

In a way, the entrepreneurial process can be seen from the perspective of a flowing movement punctuated by events like catastrophes, pandemics or lucky breaks. The ongoing impact of COVID-19 in the domain of entrepreneurship is a good example, and Giones et al. (2020) offer “research-based evidence and associated insights focused on three perspectives (i.e., business planning, frugality, and emotional support) regarding entrepreneurial action under exogenous shock” (Giones et al., 2020, p. e00186).

“Not only is everything changing, but all is flux” (Bohm, 1980, p. 61). The appearance of a COVID-19 pandemic is an exogenous shock that emerges from the flux unpredictably and, as a result, causes uncertainty. “The best image of

process is perhaps that of the flowing stream, whose substance is never the same. On this stream, one may see an ever-changing pattern of vortices, ripples, waves, splashes, etc., which have no independent existence as such. Rather, they are abstracted from the flowing movement, arising and vanishing in the total process of the flow” (Bohm, 1980, p. 61). The last pandemic was SARS (severe acute respiratory syndrome). It emerged in November 2002, originating in Guangdong, China, but the epidemic was contained within seven months of its first occurrence (Cherry & Krogstad, 2004). “Within 11 weeks from the first SARS case in Hong Kong, it had spread to an additional 27 countries or special administrative regions. The mini pandemic peaked during the last week of May 2003, and the last new probable case was on July 13, 2003” (Cherry, 2004, p. 262). SARS appeared in 2002 and vanished in 2003 in seven months. These events were all part of the flux that emerged unpredictably and arose like ripples. Entrepreneurs can only deal with them as they arise, with limited or missing information. Facing existential threats from the pandemic, some businesses thrive (healthcare, logistics, e-commerce sectors, etc.) while others are decimated (hospitality, restaurants, retailers, etc.). Those that thrive and prosper rely not on unmet demands but because they deliver necessary services with pandemic disruptions (Mishra, 2021).

Bohm argues that any “object” or, in the case of a pandemic, is only a relatively independent abstraction from the total flux. This view indicates that reality is not entirely describable by any set of ultimate substances. “So one will not be led to suppose that all properties of collections of objects, events, etc., will have to be explainable in terms of some knowable set of ultimate substances. At any stage, further properties of such collections may arise, whose ultimate ground is to be regarded as the unknown totality of the universal flux” (Bohm, 2002, p. 62). This, in a way, describes the uncertainty in the flux change, but entrepreneurs need only to abstract enough information for action. McMullen and Dimov (2013) explain the logic of causal relationships as “identifying essential sources of information at critical junctions...contributing to higher tolerance for decision uncertainty and ability to act in the context of missing information” (p. 1487).

Most empirical studies of entrepreneurship premise on a linear model occurring in a fixed or single point in time (Dimov, 2011), but the flux concept can present a theoretical model depicting the entrepreneurial journey’s nonlinearity, uncertainty, and unpredictability explicitly transpiring over time. Through the COVID-19 and SARS analogies, we clarify the conceptual implications of events and how entrepreneurs navigate uncertainty in a world-tube.

Implicate and explicate order

Bohm (2002) explains the emergence of a new order in his coined implicate and explicate order. Simply put, implicate means “to fold inward.” He illustrates with television broadcast where the visual image is codified into a time order and is carried by the radio wave in an implicate order. The receiver’s purpose is then to explicate this same order by unfolding it as a visual image (Bohm, 2002). Thus, it is a recursive movement of the implicate-explicate routine. Hence, to generalise the concepts of implicate and explicate orders, it simply features the “wholeness-in-motion.” The recursive movement involves folding inwards and then unfolding outwards. The holomovement is such that the implicate order becomes explicate in the preceding moment, and the explicate order becomes the implicate in the next moment. This iterative process continues to create the holomovement.

The holomovement describes the movement of “undivided wholeness” or “wholeness-in-movement,” where everything moves together in an interconnected process (Bohm, 1980).

Hologram

The hologram is Bohm’s metaphor for describing the structure of the implicate order. Holography is a composite of wave interferences. When wavelengths of light of different frequencies interfere, a new pattern emerges. In Figure 1, the sum of the sinusoidal waves produces the emergent new pattern in complex vibration.

Therefore, a hologram is a dense information storage that reveals the total content, in principle extending over space and time, is enfolded in the movement of waves in any given region (Storoy, 2014). “So the relationship of each moment in the whole to all the others is implied by its total content: the way in which it “holds” all the others enfolded within it” (Bohm, 2002, p. 263). The hologram contains information about the interactions enfolded into every part of the structure. Every region in the structure is wholly determined by the overall configuration of the interference patterns (Storoy, 2014), giving rise to the complex vibration shown in Figure 1.

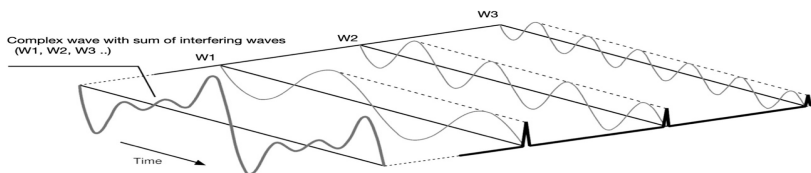


Figure 1. Illustration of complex wave showing the sum of interfering waves. (Fernandez, 2022)

Active information

Though wholeness, in its totality, may be unintelligible, it “can be understood in terms of the concept of a particle whose motion is guided by active information” (Bohm, 1990, p. 280). The basic behaviour of particles and movement organisation is through common pools of information (Bohm, 1990). Suppose it is shown that the particles move independently at a higher temperature with quantum potential (Bohm et al., 1987). Bohm uses an analogy of a ballet dance in which all the dancers, guided by a common pool of information in the form of a score, can move together in a similar organised and orderly way to go around an obstacle and re-form their pattern of movement (Bohm, 1990).

This may be illustrated in terms of the phenomenon of superconductivity. Now, at ordinary temperatures, electrons moving inside a metal are scattered in a random way by various obstacles and irregularities in the metal. As a result, there is a resistance to the flow of electric current. At low temperatures, however, the electrons move together in an organised way and can go around such obstacles and irregularities to re-form their pattern of orderly movement together. Thus they are not scattered, and the current can flow indefinitely without resistance (Bohm, 1990, p. 280).

Bohm further adds that the “ballet-like” behaviour in superconductivity is akin to that of an organism than that of a mechanism.

“Indeed, going further, the whole notion of active information suggests a rudimentary mind-like behaviour of matter, for an essential quality of mind, is just the activity of form, rather than of substance. Moreover, a similar mind-like quality of matter reveals itself strongly at the quantum level, in the sense that the form of the wave function manifests itself in the movements of the particles” (Bohm, 1990, p. 281).

DISCUSSION

Entrepreneurship as a journey can be analogically described by Bohm’s “undivided wholeness in flowing movement” or “wholeness-in-motion” (Bohm, 2002, p. 14). Gartner, Bird and Starr suggest entrepreneurship is a process of emergence (Gartner et al., 1992). Alert and risk-bearing entrepreneurs scan, search, associate, connect, evaluate, judge (Tang et al., 2012), and enact on opportunities. This paper advocates that holographic opportunities emerge from the flux, whether discovered, created or actualised. In the three instances, opportunities have

to emerge. In scanning and searching, entrepreneurs abstract atomistic forms, perceiving potentialities (represented by the holographic opportunities) from the total undivided whole to make sense of a flowing movement. They are unable to grapple with the complexities in the undivided whole. Hence, entrepreneurs must cope with significant ambiguity in the entrepreneurial journey over time (Hill, 1995). Sensemaking turns uncertainty and ambiguity into situations that can serve as a springboard into action (Weick et al., 2005). In the flowing movement with the wholeness-in-motion, sensemaking is central to determining entrepreneurial behaviour. “Sensemaking is central because it is the primary site where meanings materialise that inform and constrain identity and action” (Weick et al., 2005, p. 409).

Finally, it is about sensemaking in an indeterminate flux flow with holographic opportunities stirring and motivating entrepreneurs to action; each wave in the flux represents an emergence. Gartner et al. (1992) similarly suggest that entrepreneurship is a process of emergence and connections, a fruitful metaphor. We are familiar with the daily observation of how water flows and comfortable with the flow/flux nature of water “rather than the equivocal realities that are the stuff of entrepreneurship. Much of the task of generating theory about entrepreneurship will be in understanding both worlds: emerging and existing, and in thoughtfully probing how connections between these two worlds can be made” (Gartner et al., 1992, p. 27). “The acting as if” is a powerful metaphor for inspiring entrepreneurs to think in terms of flux, of flow that they are all familiar with in everyday lives.

Entrepreneurial Flux in Uncertainty and the Holomovement

Bohm’s worldview is where movement is fundamental, and “in quantum mechanics it is discontinuous, not causally determinate and not well defined” (Bohm, 2002, p. xviii). “Movement is most evident to experience and observation” (Bohm, 2002, p. 19). The wholeness is incomprehensible, but the meaning of the parts or specific episodes can be informed by sensemaking. This is congruent with Sandberg and Tsoukas’s clarification that sensemaking consists of “specific episodes, is triggered by ambiguous events, occurs through specific processes, generates specific outcomes, and is influenced by several situational factors” (Sandberg & Tsoukas, 2015, p. S6).

“The holomovement is undefinable and immeasurable” (Bohm, 2002, p. 191). The vastness of the wholeness is too much for an entrepreneur to comprehend – from the intricacies of causal relationships between objects and agents to the complexities with embedded hierarchical relationships of all the involved entities, objects, agents and artefacts.

“Uncertainty constitutes a conceptual cornerstone for most theories of the entrepreneur... thus the amount of uncertainty is considered to be the barrier between prospective entrepreneurs and entrepreneurial actions... The addition of a new construct (in some cases motivation and in others knowledge) significantly alters our understanding of the role that uncertainty plays in preventing entrepreneurial action” (McMullen & Shepherd, 2006, p. 133).

Townsend et al. (2018) add that the “the identification, description, and operationalisation of uncertainty as a construct continue to exhibit conflicting definitions, tautological measures, and unwitting conflation with more precise constructs along the spectrum of ignorance and unknowingness” (p. 659).

According to Bohm (2002), even knowledge, too, is a process and is an abstracted part of the total flux in the holomovement, “but if all is flux, then every part of knowledge must have its being as an abstracted form in the process of becoming so that there can be no absolutely invariant elements of knowledge” (p. 63). They are all connected. Townsend et al. (2018, p. 660) call for an urgent need to research further “(i) to disaggregate extant conceptions of uncertainty, (ii) identifies and explicates the nature of knowledge problems that have been subsumed errantly by uncertainty, and (iii) explores alternative models of action that entrepreneurs use to mitigate this array of knowledge problems.”

In Bohm’s terms, the disaggregating, identifying and explicating of knowledge is an abstraction from the wholeness-in-motion. The abstraction from the wholeness is organised in a quantifiable dimension, measurable or at least accessible to the entrepreneurs. They can mitigate this array of knowledge problems and make sense of the circumstances. To further understand this state of “unknowingness” beyond the concept of uncertainty, explicitly addressing the issue of knowledge problems: ambiguity, complexity and equivocality (Townsend et al., 2018). Lack of knowledge (asymmetrical information) of the “undivided wholeness in flowing movement” is due to entrepreneurs’ lack of cognitive capacity or bandwidth to comprehend the vastness of causal, interlinked, and interlaced relationships. The dynamic complexity, which involves the interactions between the variables over time, brings chaos and uncertainty. In Figure 1, the illustration shows the interaction of variables with the summation of parts. Each of the sinusoidal wavefunctions represents a variable existing in the entrepreneurial system. These variables can be the actions of heterogeneous agents such as competitors, imitators, suppliers, funders, promoters, customers and myriad other social relations or availability of material resources. The final sum of the sinusoidal wavefunctions represents the wholeness-in-motion where the wavefunctions interfere, and the resultant

interaction (producing constructive or destructive actions) is equal to the sum of the individual disturbance/interference. A complex wave is made up of all the interfering waves.

Therefore, the entrepreneurial journey is a process in varying states of uncertainty over time. In uncertainty, it can also be viewed as a “flowing movement” (Bohm, 2002, p. 254). Understanding the critical boundary conditions of uncertainty as an analytical construct, Townsend et al. (2018) explore entrepreneurial actions under complexity, ambiguity, and uncertainty situations. An unknowable future can grip entrepreneurs and stymies actions (Huang & Pearce, 2015). An unknowable future stems from not knowing how the path ahead is in the making. The uncertainty in the initial condition to the uncertainty in the emerging event can be debilitating to entrepreneurs. Still, entrepreneurs must be risk-bearing and underwrite these risks to expect failure.

“Path creation entertains a notion of agency that is distributed and emergent through relational processes that constitute phenomena. From this perspective, initial conditions are not given, contingencies are emergent contexts for action, self-reinforcing mechanisms are strategically manipulated, and lock-in is but a temporary stabilisation of paths in the making” (Garud et al., 2010, p. 760).

Garud et al. (2010) use the concept of the path with initial conditions and contingencies as emergent contexts for action to describe how entrepreneurs adapt and adjust with a self-reinforcing mechanism to “lock in” temporary stabilisation of path-in-the-making. This conceptualisation implies that the paths are non-deterministic and nonlinear, perpetually in a path-in-the-making state. This strongly resonates with the flowing movement concept. In a way, flowing movement entertains a notion of agency where the agency (entrepreneur) participates in the movement observing the emergent through the relational processes that constitute the phenomena. The new order’s emergence is indeterminate, generatively arising from, and causally related to, a prior order. Vergne and Durand discuss path dependence to describe a process that connects the past to the future in an abstract way by disentangling process (with “history matters”) and outcome (Vergne & Durand, 2010).

Lichtenstein’s (2014; 2020) generative emergence addresses new order emergence and how new entities are created. He offers a new framing of organisations as dynamic states across all levels within the structure of the organisations. Emergence arises from change and transformation; while change generally refers to altering

existing structures, emergence refers to creating new structures. In Lichtenstein's descriptions, there are four distinct phases in generative emergence. The phases are (a) disequilibrium organising and stress; (b) experiments and amplification to a critical threshold; (c) emergence of a new entity; and (d) stabilising the new system into a dynamic state (Lichtenstein, 2020). The pattern from the state of disequilibrium to the state of stabilisation of the new system (the perpetual disequilibrium-stabilisation cycle) is the same as the iterative implicate-explicate order patterning out holomovement. The holomovement is recursively implicating and explicating. New emergence is continually manifesting from this recursive action in the movement.

Gartner's emergent descriptors of "being, circulate, emerge, emergence, emergency, emergent evolution, equivocal, found, founder, genesis, and variation" (Gartner, 1993, p. 231) influence our visual conceptualisation and to think about such phenomena in real terms as happening in business venturing. Similarly, Gartner's descriptors can characterise the holomovement (the totality of the flux). It can direct entrepreneurs' thoughts and actions while situated in uncertainty by going with the flow and accepting variations and changes as fundamental aspects of business venturing.

For example, the volatilities of cryptocurrencies and stocks (traded in exchanges) are conditional on investors' beliefs. Therefore, the volatilities give rise to uncertainty. These beliefs arise from their perception of value and opportunities. The prices are subject to a perpetual disequilibrium-stabilisation cycle, and investors, through information in the opportunity, take their investment positions (to buy or sell) according to these beliefs. Ahmed et al. (2022) conclude that there is evidence of "cointegration on volatility grounds between cryptocurrencies and the emerging market stock indices" (p. 1). This leads to an important question on the social construction of the value of these cryptocurrencies and stocks, all observer-dependent phenomena in the holomovement. In this case, many observers are involved in the volatilities of cryptocurrencies and stocks. Each will bet in either direction based on their cognitive states and interpretation of the holographic opportunity. All these actions contribute to the holomovement where the emergent trend is the total of all the positions taken by each observer.

Implicate and Explicate Order in the Entrepreneurial Process

This paper advances a new model to describe the entrepreneurial phenomenon with the implicate and explicate order. To implicate means to fold inwards; to enfold past experience and prior knowledge to contain the sum of all the entrepreneurs' past. "Most research on organisational experience is consistent with behavioural

learning theory, which argues that organisations learn from experience” (Rerup, 2005, p. 451). Therefore, the value of prior entrepreneurial experience and past knowledge is enfolded in the implicate order to be explicated in a new emergence. The implicate order carries the sum of the entrepreneurs’ past from experience to knowledge and, in the light of current situational contexts, shifts and moves in a way that will explicate into a new path to pursue the opportunity. Therefore, the implicate and explicate order is like the perpetuating waves causing the movement in the processual holomovement. The enfoldment and unfoldment of the implicate order generate and extend the entrepreneurial pathway and process. In Bohm’s words, “everything implicates everything” (Bohm, 2002, p. 197).

Information and Uncertainty

Entropy and the lack of information (uncertainty) can be used interchangeably. As the entrepreneurs move along the entrepreneurial journey over time, they are embedded in an entropic process and are situated in a state of uncertainty, lack of order or predictability. “Entropy and information are very closely related. In fact, entropy can be regarded as a measure of ignorance” (Gell-Mann, 1995, p. 218). Entropy is a thermodynamic quantity. The second law of thermodynamics says that entropy increases over time with a lack of order or predictability, gradually declining into disorder.

With increasing disorder, uncertainty becomes more pronounced. Uncertainty “emerges when one has less information than the total information required to describe a system and its environment” (Karmeshu, 2003, p. 1). Uncertainty can be manifested in many forms arising from random fluctuations, information asymmetry, perception issues or even cognitive ability for sensemaking.

Struggling entrepreneurs must deal with these random fluctuations, incomplete information, inaccurate perception and vagueness. Over time, as the entrepreneurial process complexifies, it also turns chaotic.

“The ultimate destiny of any start-up company is difficult if not impossible to predict. Consequently, the process of picking winners continues to challenge, baffle, and mystify private investors and venture capitalists who seek to extract profits, government policymakers responsible for the promotion of economic development, business professionals who become involved with new enterprises in the hope that they will eventually become paying clients and corporate managers who support spin-out companies to reach new market niches. Few of those hands-on in the start-up have a clear picture of what the future portends” (Smilor & Feeser, 1991, p. 165).

Thus, the entrepreneurial process persists to be chaotic and disorderly; it complexifies as it grows and therefore is hard to comprehend and predict. “In this context, chaos is presented as essentially a creative process, and entrepreneurs play a primary role both as chaos-makers and as initiators of adaptive responses to chaos induced by external events” (Russell & Faulkner, 1999, p. 411). The entrepreneurs need to assess the uncertainties with the available and knowable information from the chaos and estimate the best course of action.

Entrepreneurs exert physical and mental energy and use all means available on-hand in the production process to transform into value - products and services with intrinsic utility; “some energy (human effort) is given off in the form of loss since, in the last instance, value is nothing more than an idea that becomes a tangible reality in the form of a marketable good or service” (Rodríguez & Cáceres-Hernández, 2018, p. 76). Entrepreneurs actively search and respond to market signals with actionable strategies to transform potentiality (real or imagined) into actuality.

In the meantime, no more effective weapon can be used by both champions and opponents of the second law than indefatigable endeavour to follow the real purport of this law to the utmost consequences, taking the latter one by one to the highest court of appeal—experience. Whatever the decision may be, lasting gain will accrue to us from such a proceeding, since thereby we serve the chief end of natural science—the enlargement of our stock of knowledge (Planck, 2013, p. 124).

Finally, for entrepreneurs to have lasting gains, the enlargement of the stock of knowledge and information, including experience, must be a prerequisite.

Holographic Opportunity, Real or Artificial

The active information in the opportunity is holographically projected to alert entrepreneurs who recognise the potentiality within the seed of opportunity. Entrepreneurs’ responses to the active information vary with their prior experiences and knowledge. The active information projection’s intensity, clarity, and frequency are critical to shaping subsequent entrepreneurial actions. This explains why some individuals are likelier to pursue the opportunities or be lured by the potential profits (McMullen & Shepherd, 2006). The value of the hologram in this context is that it signals to the attention of the entrepreneurs, but of course, the hologram is, nonetheless, an artefact by any description. Its primary function is to create a static record or “snapshot” and project it holographically for recognition. Identifying opportunities under uncertain conditions while interacting with other heterogeneous agents from competitors, imitators, and suppliers to clients adds

to entrepreneurship's complexity. Entrepreneurs "must bring a certain level of awareness and alertness to recognise the correct signals and respond appropriately despite noise and distractions surrounding the market. Opportunities arise from information asymmetries, with potential stakeholders differing in the amount and accuracy of the information they have, and their interpretation of this information" (Leong, 2021, p. 2150021-3).

Entrepreneurs' challenges are potentially exacerbated by information asymmetry between them, the resource holders and the environment (Zott & Huy, 2016). The abstraction of the limited information by the entrepreneurs is due to their limited cognitive capacity. Information affects the opportunity's recognition, evaluation and development (Ardichvili et al., 2003). Signalling, in retrospect, impacts the informational structure of markets, triggering entrepreneurs to specific actions by the lure of profit. "Major factors that influence this core process of opportunity recognition and development leading to business formation include: (1) entrepreneurial alertness; (2) information asymmetry and prior knowledge; (3) social networks; (4) personality traits, including optimism and self-efficacy, and creativity; and (5) type of opportunity itself" (Ardichvili et al., 2003, p. 106). All these factors are but abstractions of "undivided wholeness in flowing movement" (Bohm, 2002, p. 14).

Research Implications

The implicate-explicate order in the holomovement or the flux perspective is based on a relational ontology that involves the entrepreneur as part of the explicate/unfolding in the flux that emerges as events. Selden and Fletcher re-contextualise the entrepreneurial journey as an emergent hierarchical system of artefact-creating processes made of events (Selden & Fletcher, 2015). From their process perspective, the emerging and unfolded events can be explained from the endogenous dynamics of prior patterns in the phase just before the emergence. This enfolded phase contains historically and contextually rich, embedded experience/knowledge stock/information. The flux flow representing the entrepreneurial process is such that the implicate order becomes explicated (by unfolding), and the explicated order becomes the implicated (enfolding). This iterative sequence of implicate-explicate ordering forms the flux. The implicate-explicate order in the flux describes the emergent sequence of phases/events, dependent on prior enfolded phases/events. Such contingent interactions and the changing phases (from implicating to explicating to implicating and so on) of the flux constitute emergence outcomes. These emerging generative outcomes enable and constrain subsequent events.

Entrepreneurs operating within the complex flux containing enablers and context-sensitive constraints have to abstract information from the holographic opportunities and act on them through effectuation, causation or bricolage (Fisher, 2012), all the time being part of the flux. “Opportunities, beyond the initial articulation of venture ideas, lack such self-propelling mechanism” (Dimov, 2011, p. 66). Holographic opportunity signals entrepreneurs to action. “Signalling, for its part, impacts the informational structure of markets, triggering entrepreneurs to specific actions by the lure of potential profits” (Leong, 2021, p. 2150021-3). The contingency emergence brought about by the triggering event (recognising the holographic opportunity) is enacted by reinforcing mechanisms like effectuation, causation, bricolage, or other means. The inevitable emergence from the entrepreneurs’ determined action will be laid out as an “unfolding story that needs to be told in its entirety” (Dimov, 2011, p. 66).

Entrepreneurship, hence by definition, is profiteering through asymmetric market transactions and such asymmetries unfold before the entrepreneur over time. In a way, the entrepreneurial unfolding story is a journey of opportunity discovery through holographic projection. The holographic opportunity contains the asymmetrical information that triggers entrepreneurial action. Entrepreneurs can contemplate only a finite range of possibilities and cannot envisage the universe of possible quantum states. Operating under the influence of external entropic pressures and uncertainty, alert entrepreneurs pick signals from the information to decide on their best bet. Ng, who is an ex-GIC CIO (Singapore’s sovereign fund), cite aptly, “I like to say that all of us are guessing... But some of us are guessing with the benefit of experience and an understanding of what is going on, and others guess blindly” (Bloomberg, 2022).

Information has, within it, worthy embodiments that need discovery and sensemaking. After all, the contingent actions are triggered from signals/information in the holographic opportunity, at least enough to let the entrepreneurs bet on their next course of action.

Limitations and Future Research Direction

This research provides an umbrella structure and frames existing theorisations of opportunity under a hologram/flux construct using Bohm’s quantum interpretation. The aim is to cast entrepreneurial dialogues to one with scientific correspondences to make a fundamental shift in entrepreneurship perspectives – away from the ongoing opportunity wars (Ramoglou & Gartner, 2022; Wright & Phan, 2020) and sharpen the views of the complexity and variations with hologram/flux metaphors. The ultimate thrust of the research is not to aggravate the fault lines in the existing

opportunity wars by sharpening their differences but to bring in a unifying framework to hold these divisive themes together to explain entrepreneurial phenomena better.

There are limitations to this research as it relies on a quantum interpretation to discuss classical, realist and everyday phenomena. First, we discuss the issue of implication and total correlations where “everything implicates everything” (Bohm, 2002, p. 197) with the entrepreneur put in front and centre (agency-centricity) of the phenomenon. It may be challenging to distil a manageable operable set of dependent and independent variables that can meaningfully apply across the venture creation process. Second, the inter-dependency, correlated relationships and histories between agents and artefacts make it hard to derive generalisable emergence effects. Or, from another angle, it is challenging to isolate contributory impacts attributable to the entrepreneurs’ actions. Lastly, we attribute that the holographic opportunity stimulates and sustains entrepreneurial actions. What is it that sustains and motivates entrepreneurial actions? What operationalised mechanism inspires the movement and motion towards pursuing the holographic opportunity? At best, the holographic opportunity signals and the representational value of the information inspires action. Hence, future research can explore if there is any intermediating variable involved like entrepreneurial energy? There is considerable detailed research of empirical and conceptual nature relating to entrepreneurial passion (Cardon et al., 2013; Cardon & Kirk, 2015; Collewaert et al., 2016; Gielnik et al., 2015). “Entrepreneurial passion is conceived as an experienced construct conceptualised as the interaction of intense positive feeling and identity centrality associated with venture outcomes defined as opportunity recognition, venture creation/growth and threshold performance” (Iyortsuun et al., 2019, p. 1133). Iyortsuun et al.’s research “reveals that the link between entrepreneurial passion and venture performance is distal” (Iyortsuun et al., 2019, p. 1133). Future research can explore if the notion of entrepreneurial energy and venture performance can be distally closer. Since this paper explores the concept of flux, further research can be organised to derive the energy-flux operator valid for all phases and stages of business venturing since this operator must sustain and motivate entrepreneurial action.

CONCLUSION

This paper hopes to open new discussions and dialogues using quantum-like logic to discuss uncertainty, time (linking the past to the future), knowledge, asymmetrical information, and opportunity, which are core tenets in entrepreneurship. There is tremendous potential for the holomovement or flux metaphor to describe the

entrepreneurial process and opportunity as the holographic artefact with embedded information. The flux perspective affords a view of the entrepreneur navigating through the flux in an implicating-explicating order, formulating opportunity-as-holographic artefact and at the same time capturing value/bidding profit through determined action of which the outcome is shaped (but is not determined by the entrepreneur).

The notion that the holomovement can describe the entrepreneurial journey as an emergent hierarchical nested system of artefacts created through the implicate-explicate orders with the emergence of triggering events like the opportunity-as-holographic artefact has important implications for future directions in the research of entrepreneurship as a flux. The significance of this flux with implicated past and explicated future primarily centres entrepreneurial journey as a unit of analysis and shift the dialogue from a process perspective described by McMullen and Dimov to one involving a “shift from a language of variables and values to a language of boundaries...shift from a language of things to a language of relationships” (Venkataraman et al., 2012, p. 25) and finally to shift the discussion of the entrepreneurial journey to entrepreneurial flux.

So, the question of whether the opportunity is real or artificial should be firmly addressed. Sarasvathy (2003) connects Herbert Simon’s “Science of the Artificial” and advances entrepreneurship as a science of the artificial (Sarasvathy, 2003). Venkataraman et al. (2012) ask, “Whither the promise?” and suggest moving forward with entrepreneurship as a science of the artificial. Here, this research concludes with two crucial conclusions. One, entrepreneurs are immersed in the flux and are one with the flux. The entire environment is part of the flux. According to Gartner (1985), two views of the environment are developed in organisation theory literature. Environmental determinism is one perspective where the environment is an outside set of conditions to which the organisation must adapt. It takes an inside-out perspective; the environment is treated as external and needs reactions and responses. The other view is the strategic choice where the environment is a reality that organisations co-create by their selective perceptions (Gartner, 1985). Here, we differ since we advocate that entrepreneurs are neither in an inside-out nor an outside-in perspective, but they are a part of the flux in an immersive experience. As Bohm (2002) describes the implicated relationships where “everything implicates everything” (p. 197), the entrepreneurs, the environment, and other agentic involvement (stakeholders) are all related one way or another, laterally and hierarchically, except that we cannot possibly grapple with the immense information on the inter-relationships and inter-dependence between the agents and artefacts. Second, we advance the notion of the holographic opportunity as an epistemic object with multiple instantiations.

These instantiations are manifested as mental projections that may not be real yet. Such instantiations can be social construction in the entrepreneur's mind during the discovery, creation and actualisation process. "There is no more "real thing" that one may find by reaching beyond such manifestations" (Berglund & Glaser, 2021, p. 19). The intent and belief of the "real thing" provides the impetus to entrepreneurial action. Such manifestations, as they unfold phenomenally in an entrepreneurial flux process, more or less are abstract representations that inspire and motivate entrepreneurs to action. While McBride and Wuebker (2022) argue that the beliefs constitute the idea for an opportunity, we further add that the implicated information in the holographic opportunity provides the ingredients to form those beliefs. After all, entrepreneurs are alert economic actors constantly searching, connecting, associating and evaluating information in the abstract epistemic holographic opportunity.

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