INTRODUCTION

Ideas have been central to human history. They are at the heart of our scientific and technological achievements (Kuhn, 1962), our artistic endeavors (Gardner, 2011), and our ability to move through the situations of everyday life (Weisberg, 2006) as well as the less ordinary problems we face (Weaver, 1948). Arguably, ideas are so fundamental to our humanity that we cannot conceive of our existence without them. Ideas have therefore been discussed by philosophers, psychologists, and political and legal scholars since the beginnings of their respective disciplines.

In most organizations and organizational research, ideas are similarly central. Ideas drive change, and therefore organizational performance and survival (Amabile, 1988; Kanter, 1988). Since Guilford's (1950) seminal paper on the psychology and measurement of creativity, ideas have become a central unit of analysis in organizational creativity, and inquiry for many areas of organizational research. The subdisciplines of research on brainstorming, creativity, innovation, knowledge creation, design, networks, entrepreneurship, and creative work, all of which aim to study how something new comes to exist in the world, have grown around understanding the role and consequences of ideas, and the processes through which ideas arise (e.g., Guilford, 1950; Amabile, 1988; Sutton & Hargadon, 1997; Burt, 2004; Nonaka, 1994; Fleming, Mingo & Chen, 2007; Grimes, 2018). However, it is not always clear what scholars mean when they use the word 'idea' (cf. Inie & Dalsgaard, 2017; Sukhov, Magnusson, & Netz, 2019). Ideas are understood as the *outcome of a creative process* (Amabile, 1988)—that is, the result of purposeful effort towards generating some form of novelty (Ford, 1996; Lingo & Tepper, 2013;

Grimes, 2018). However, the concepts of 'creativity' and 'ideas' are often used interchangeably, where creativity is a process that produces ideas, and ideas are, tautologically, the products of a creative process (e.g., Litchfield, Gilson, & Gilson, 2015; Unsworth, 2001). Research has often taken an 'I know it when I see it' approach, deeming it self-evident when and whether something is an idea (e.g., Runco & Chand, 1995: 252). Researchers typically explain what they mean by a *high-quality* or *highly creative* idea (often one high in novelty and usefulness, e.g., Litchfield et al., 2015), without defining what they mean by an idea in the first place.

This lacuna in the literature has been noted by others. For example, Inie and Dalsgaard (2017: 393) point out that design ideas "are commonly used as an indicator of success of design methods and processes, yet it is very rarely defined what precisely constitutes 'an idea', and how such an idea manifests itself to the researcher". Similarly, Sukhov, Magnussen, and Netz (2019) note that, "Despite the existing body of literature on the front end of innovation, there is surprisingly little written about the definition of an idea" (2019: 30). Although both of those papers seek to remedy the problem with a definition or typology, their discussions are focused on the domains of design and innovation, respectively. Given the breadth of usage and research about ideas across multiple fields in organizational research, the lack of a common definition or framework remains to be fully resolved.

The goal of the present paper is to address the question: *what is an idea?* This question is pressing, because without agreement on this core construct creativity research risks "the error of assuming that two or more phenomena… are identical merely because they bear the same name" (Thorndike, 1904: 2), which may affect the reproducibility of research results (Lilienfeld &

Strother, 2020). Ideas in prior studies have included very diverse output, such as concrete creative products like drawings (Harvey, 2013; Ward, 1994), songs (Long-Lingo & O'Mahony, 2010), new ventures (Grimes, 2018), and patents (Singh & Fleming, 2010); abstract representations like concepts for a new type of restaurant (Goncalo & Staw, 2006), solutions to problems, like ways to address a series of corporate human resource issues (Shalley, 1995); and high-level shifts in perspective, like moving to a fundamentally new technology (Anderson & Tushman, 1990) or new categories of knowledge (Tsoukas, 2009). All of these outcomes have been treated as ideas for the sake of building theory and testing hypotheses, but they vary substantially in terms of their properties, as well as in the way they are studied. In addition, studies may disagree on whether the same thing is an example; for example, some studies consider new ways of understanding existing knowledge or products (e.g., that medical IV bags could be modified for use in shoe design) as ideas (Hargadon & Bechky, 2006), but others do not (Harvey, 2014).

In other words, simply because multiple studies call something an idea does not mean that they actually study the same phenomenon. Consider, for example, a television show—where would we look for ideas here? A broad review suggests that different literatures may identify different aspects of the show as ideas: brainstorming studies may view the concept behind the show as an idea generated and elaborated in response to a task or prompt (e.g., Berg, 2019); studies of creative work may suggest that an idea is the script for a specific episode that emerged through interactions in the writer's room and during rehearsals, as it is enacted during the recording of the show (e.g., Sawyer & DeZutter, 2009); and innovation studies may consider a new genre of television to be an idea that resulted from combining diverse knowledge (e.g., Taylor & Greve, 2006).

The boundaries of ideas are thus often drawn inconsistently – not only across studies, but also across literatures, with the same concept being considered an idea in one literature, but not in another. For example, creativity and brainstorming research have often focused on ideas that are relatively abstract and early-stage representations of cognitive concepts that can be communicated to researchers in a simple statement, such as suggestions for a new type of restaurant (Goncalo & Staw, 2006) and ways to improve one's university program (Rietzschel, Nijstad, & Stroebe, 2010). This means that they often ignore more distant outcomes that have been recognized by adjacent disciplines as primary units of analysis, including more concrete outcomes of creative processes like songs (Long-Lingo & O'Mahony, 2010), and discard less proximal parts of the process that may be instrumental for identifying and understanding the new idea, such as metaphors like 'electric wires' used by a chemist to help collaborators make sense of an unknown material (Biscaro & Comacchio, 2018); synthesized frameworks from which ideas can spring (Harvey, 2014); and high-level shifts in perspective (Anderson & Tushman, 1990; Tsoukas, 2009).

Such inconsistency in the conceptualization and operationalization of ideas fragments our understanding of the concept, resulting in a cascade of three core problems for the organizational literature. One problem is that it leads researchers to ask different questions and treat ideas differently in their studies, so that different paradigms emerge for studying ideas. Returning to the example of a television show, concepts can be captured, and compared with one another, and so researchers could ask creators to write or share a list of concepts and ask judges to assess their inherent creativity. Each concept can be treated as a distinct entity, separate from other concepts on the list. The process for eliciting those ideas implies that they originate in the creator's mind.

In contrast, an enacted script cannot be so easily elicited or captured as it requires context. Scripts originate in writers' and actors' interactions with each other and with the material, and derive their value from the content, how they are enacted, and an audience's response. The point at which the script stops evolving is unclear, as it is shaped during writing, rehearsal, and acting; moreover, one scene or piece of dialogue may require an understanding of story or character from a previous episode to understand. Researchers would thus need to observe the development of a script as it emerged over time during creative work. Differences in where and how ideas originate and the way researchers observe them mean that studies of television show concepts versus studies of scripts are likely to produce different research traditions with fundamentally different understandings of what ideas are.

A second core problem follows from the existence of different paradigms for studying ideas: inherent conflicts develop between literatures, but because they exist within different traditions and researchers in each tradition hold implicit assumptions about ideas, those conflicts are rarely surfaced or addressed. This can be seen, for instance, in the way the creativity literature diverges on whether researchers should prioritize creative products or the processes that lead to them (Simonton, 2003; Cronin & Loewenstein, 2018; Drazin et al., 2009). Whereas ideas as an outcome (e.g., Fleming, Mingo & Chen, 2011; Uzzi & Spiro, 2007) and the processes involved in dealing with ideas during creative work (e.g., Obstfeld, 2005; Lingo & O'Mahony, 2010; Tsoukas, 2009) have both garnered substantial research interest, those literatures often fail to speak directly to one another, so that the processes that emerge from studies of creative work do not mirror the process assumed or implied by studies of creative outcomes. Similarly,

creativity is seen both as a routine problem-solving act that produces everyday solutions and insights or as a qualitatively distinct activity that results in radical departures from the status quo (Madjar et al., 2011; Tushman & Anderson, 1996; Kaufman & Beghetto, 2009); but there is little research on how to reconcile those views.

That fragmentation leads to a third core problem, which is how to develop practical interventions to help the generation, development, or implementation of ideas. To follow our earlier example, a concept for a television show will benefit from different kinds of support, elaboration, and feedback than a concrete draft for a plot twist or a sketch for a storyboard (Perry-Smith & Mannucci, 2017). The processes involved in these different ideas probably draw on different traits, skills, and expertise, and are thus likely to be stimulated by different states, contexts, or interventions. For example, Smith (1998) classified the "active ingredients" of 172 idea-generation techniques into broad categories. Whereas some categories may be helpful for the generation of all kinds of ideas, others—like using physical objects as stimulation materials or refraining from stating the problem at the outset of a process—may only apply in certain settings. Organizational practices aimed at stimulating idea work thus lack a clear and coherent body of knowledge to draw on.

The purpose of our review, therefore, is to systematically explore and integrate research across communities where ideas are central. We will build a core definition of ideas, trace how ideas are used across organizational subdisciplines, and offer ways for researchers to move towards a more consistent and holistic understanding of the construct. To do so, we draw on literatures where a critical mass of scholars discusses ideas in a substantive way, even if they use

different conceptual language to refer to and describe ideas (Cronin & George, 2020).

Specifically, we review the study of ideas in the subdisciplines of creativity, brainstorming,

creative work, innovation, entrepreneurship, knowledge creation, networks, and design thinking

(see Table 1 for an overview of literatures reviewed). Although these 'idea-centric'

subdisciplines are concerned with developing or producing ideas, ideas are not always made

explicit or measured in studies. For example, a study on creative work may investigate how

teams collaboratively develop ideas, but use a measure of collaboration as the dependent

variable, rather than ideas themselves. Moreover, even when ideas are focused on, results

typically revolve around some aspect of ideas (e.g.,quantity) rather than the nature of the ideas

themselves. As such, we focus not on the findings of studies per se, but on how ideas are

conceptualized, as evidenced by how ideas are treated or observed.

[Insert Table 1 here]

We will first trace the historical roots of the concept of ideas and induce a working

definition of ideas as *provisional, communicable representations*. We develop this definition

through a chronological review of how the usage of ideas has evolved from a technical term in

philosophy to recently becoming the domain of creativity and innovation, such that idea is now

almost synonymous with *new* idea. In the second section, we test the validity of the working

definition in current organizational research on ideas, and in doing so highlight that, while the

conceptualization of ideas as provisional, communicable representations is prevalent in research

today, there are two distinct ways in which ideas can act as representations, be provisional, and

be communicated. To explain these two interpretations, we introduce the metaphor of wave-

particle duality. We show that some researchers adopt a *particle view*, in which ideas are discrete entities with independent existence, while others adopt a *wave view*, treating ideas as emergent, continuous, and highly dependent on context. Methodologically, these two views are incompatible as they lead to fundamentally different research questions, which in turn require fundamentally different methods. Conceptually, however, the two views are complementary, in that capturing "the totality of the phenomenon" (Bohr, 1927, cited in Holton, 1968) requires studying ideas from both views, with each view contributing unique information and insights. Recognizing this complementarity, along with the methodological incompatibility of the wave and particle views, provides the basis for surfacing and reconciling conflicts in the literature and expanding our understanding of ideas. We address the implications of this duality for future research across organizational studies.

A HISTORICAL OVERVIEW OF IDEAS

Theorizing about ideas has a tradition almost as old as philosophy itself, but usage of the term has evolved over the centuries. To make sense of the diverse use of the term *idea* across disciplines today, we review the concept across time periods and domains from early philosophy to modern psychology, to derive a general working definition that encompasses the breadth of the concept. Although philosophers and other scholars have disagreed (and sometimes still disagree) on the question of what ideas are, our review reveals three successive developments in thought about ideas that give rise to our definition - with ideas moving from being conceptualized as *representations* in classical philosophy, *provisional* in modern philosophy and finally, *communicable* in early psychology. Thus, ideas stand for something (like a concept,

8

category, object, property, action, etc.), but are not the thing itself; they are neither absolute nor unchangeable; and they have the potential to lead to some utterance, description, or action. This definition captures the essence of ideas; yet our review will subsequently show that it is also broad enough to accommodate a variety of interpretations and approaches to ideas.

The Concept of Ideas in History

Ideas in classical philosophy: ideas as representations. Ideas were viewed by early philosophers as *mental representations of objects of cognition or perception* i.e., the mental state or concept corresponding to an object, rather than the object itself. Ideas in early antiquity were considered to be eternal and to occupy a separate plane of existence. For example, in philosophizing about the relationship between reality and the way people think about reality, Plato's theory of Ideas (or Forms) addressed questions concerning how people perceive reality, how it is possible to think about objects other than through direct perception, and the relation between thoughts and external reality (e.g., Urmson, 2006; Russell, 2009). The Platonic Idea of a 'cat' is separate from the (or indeed any) physical cat we encounter, and the Idea is argued to be more real, more grounded fundamentally in reality, whereas the particular cats we may counter are considered imitations or imperfect exemplars of the Idea. Thus, a Platonic Idea is different from our common contemporary understanding of the word idea as a thought or a notion in the mind; instead, an Idea is closer in meaning to what we would understand today as *ideals* (Urmson, 2006). In fact, the English word idea is a transliteration of the Greek word ἰδέα (*idea*, 'form, pattern') (OED, 2021). For instance, it is the Idea of beauty that makes it possible for us to

regard any particular picture as beautiful (Boas, 1974: 543). Thus, early understandings of ideas emphasize that they are not the thing we perceive, although they are related to it.

While ideas were initially seen as eternal, ideal objects that occupy a separate plane of existence, they became linked more to human thought and perception in later antiquity and the Middle Ages (Boas, 1974; Urmson, 2006; Russell, 2009) For example, Aristotle argued that our ideas or concepts are abstractions *derived* from the real world (Blackburn, 2016). In a significant modification and development of the Platonic view, ideas came to be understood as the thoughts of God, paving the way for ideas to be broadly understood as cognitive. For example, Peter Abelard, a 12th-century French scholastic philosopher, argued that Platonic Ideas occupy the divine mind as patterns of creation and are, in fact, God's concepts (Russell, 2009). From here, the understanding of ideas extended to include all human thoughts about concrete things or actions. Ideas were understood as the mental form, representation, or even a plan of something that exists or can exist in the external reality. For instance, Thomas Aquinas noted that "the word 'idea' implies that there is a form thought about by an agent who intends to produce an external object that resembles it. A builder, for instance, first has the form of a house in mind, which is a sort of idea of the house to be made out of matter" (Nevitt & Davies, 2020: 339). Aquinas' use of the word 'implies' suggests that this non-divine and concrete meaning of idea as a form or plan in (human) thought already was in common use by then.

When the word idea moved into the French and English vernacular in the 16th and 17th centuries, it was used to refer to both an exemplar or pattern and a thought in the mind in lay usage as well as by philosophers. The term "mental image" (Urmson, 2006) captured the view

that an idea was a direct image in the mind that corresponded to some external object - the

mental picture we have in our minds when we think *about* something. An illustration of this is

René Descartes' description of ideas in *Meditations* (1641; in Urmson, 2006): "Some of my

thoughts are as it were the images of things, and it is only in these cases that the term "idea" is

strictly appropriate - for example, when I think of a man, or a chimera, or the sky, or an angel, or

God". The view of ideas as corresponding to external experience and reality was further

developed by the British empiricists, most notably John Locke, who said that "ideas are… the

immediate objects of our mind" (Locke in McRae, 1965). David Hume similarly thought that "all

our simple ideas are derived from impressions which exactly represent them" (Hume in Russell,

2009). This was known as the "image theory" of thinking, in which the mind was thought to be

furnished with its raw materials through perception (Blackburn, 2016). Correspondingly, we can

build new complex ideas, but only by recombining the basic elements that already exist

(Blackburn, 2016). Eventually, "image theory" was considered inadequate, as other philosophers

such as Descartes acknowledged our ability to have ideas about things we cannot directly

perceive, paving the way for the next major development in the conceptualization of ideas.

Modern philosophy: ideas as provisional. A major development in the

conceptualization of ideas was that they lost their absolute connotation, and instead took on a

more provisional aspect related to individual human thought. Ideas became increasingly

conceptualized as disconnected from direct sensory experience or its results, so that they no

longer corresponded to some external object, event, or category. Exemplifying this shift, Kant

described ideas as "a necessary concept of reason to which no corresponding object can be given

in sensation" (Kant in Urmson, 2006). As they became less tied to concrete reality, ideas were increasingly understood as *provisional possibilities*. There were hints of provisionality even in earlier writings – for example, Thomas Aquinas suggested that "there are as many divine ideas as there are ways of thinking about the divine essence" (Nevitt & Davies, 2020: 339), pointing out that different ideas about the same thing could exist, even in the mind of God. Thus, any idea is one of multiple possible ways for representing something, and many different ideas may exist about a particular object of cognition or perception (Borghi et al, 2017). At the same time, ideas could guide human action, being both abstractions derived from perception and the ends or purposes guiding them (Boas, 1974). For example, an artist may have an idea for a sculpture and what it should look like. In that sense, ideas were not final but a starting point for action. The notion of provisionality, in the sense of ideas being neither absolute nor objective representations, persists unto the current day—for example, we talk of a person's idea or conception, implying that the idea indicates that person's way of understanding (OED, 2021).

As ideas became central to the pragmatist school of philosophy in the United States in the late 19th century, they became strongly linked to action. For example, Dewey (1938: 109) wrote of ideas: "An idea is first of all an anticipation of something that may happen; it marks a possibility." As such, the notion of ideas as provisional representations had become firmly entrenched in philosophical thought, in the sense of ideas representing *possibilities* (e.g., for action). Further, Dewey (1938: 110) wrote that: "Every idea originates as a suggestion, but not every suggestion is an idea. The suggestion becomes an idea when it is examined with reference… to its capacity as means of resolving the given situation". This highlights the shift

from early debates on the metaphysics and/or nature of ideas (what Peirce called "pure ideas") to a focus on the *functionality* of ideas. Dewey's pragmatic theory of inquiry as action and ideas as tools for directing our activities continues to influence research on innovation and creativity today (e.g., Stark, 2009; Carlile, 2002).

       Early and present-day psychology: ideas as communicable. With the advent of experimental psychology, ideas further came to be understood as *communicable* mental products – representations that could be externalized, either verbally or nonverbally, that could be shared with others (Rothberg, 2004). This shift was driven by the advent of operationalism in psychology as well as the rising prominence of assessment psychology due to the two World Wars. This is partly due to methodology; for mental concepts to be empirically studied, they must be expressed or communicated somehow, even if just to the experimenter or to some other data-gathering device like a questionnaire. Similarly, the notion that ideas can act as a blueprint for behavior (as described by Thomas Aquinas) or spur on action (as described in the pragmatist school of thought) presupposes that ideas can be verbalized, drawn, or otherwise communicated.

       One decisive development in this regard was the advent of operationalism in psychology. Originating in physics in the early 20th century as the view that we can only know about any concept, process, or entity if we have a way of measuring it (Bridgman, 1927), operationalism became a dominant approach in psychology with the rise of the behaviorist tradition. Pitting itself against traditional psychological approaches like introspection, that relied on one's ability to report thoughts or sensations, behaviorism aimed to re-shape psychology by studying behavior without the need to resort to invisible or unobservable constructs or processes.

That overcame one of the complications of introspective psychology - it did not seem possible to isolate single ideas from what James (1890) called the stream of consciousness. In his seminal work *The Principles of Psychology*, William James (1890: 277) diverges from the earlier empiricist notion of ideas as he writes: "mental atoms or molecules [of consciousness] are what Locke called 'simple ideas'… it is often *convenient* to formulate mental facts in an atomistic sort of way… [but a] permanently existing 'idea'… is as mythological an entity as the Jack of Spades". Despite the move towards operationalism, adequate operationalization of such theoretical constructs has remained a crucial challenge for psychological research.

An important related development was the rising prominence of assessment psychology that followed the two World Wars. Psychometric development emphasized quantification and the development of reliable and valid measurements of previously intangible constructs such as intelligence and potential. The influence of this approach on the study of ideas is most visible in Guilford's (1950) seminal article, generally considered the starting point of modern creativity research. In the article, Guilford remarked that "definitions of an operational type are much to be preferred" (Guilford, 1950: 444) and suggested that creativity (and ideas) should be theorized and studied in terms of observable behaviors that would allow tests of the underlying factors and processes. He further argued that analysis or description of creativity in terms of, for example, genius, intuition, inspiration, incubation "tells us almost nothing about the mental operations that actually occur" (Guilford, 1950: 451); what is necessary is some way of studying the observable results or consequences of creative abilities or personalities. Guilford's psychometric approach, which was strongly oriented towards developing reliable and valid ways to quantify creative

ability and/or performance, has shaped much of the subsequent empirical and theoretical work on creativity, and many current measures of creativity are derived directly from his work.

Ideas in Creativity and Innovation

Today, the term idea is increasingly borrowed and discussed by organizational researchers in the narrower context of creativity and innovation. The ideas that organizational studies deal with are typically *new* ideas; that is, ideas that imply some novelty or change, such as new product ideas or ideas for organizational improvements. This aspect of novelty was implied by ideas being provisional, but only became a dominant characteristic of ideas in the 20th century, as ideas became more popular in everyday usage.

Following the economic expansion in the US after World War II, creativity and innovation (as opposed to traditional factors such as labor and capital) were identified as the drivers of this unprecedented economic growth (e.g., Solow, 1957). This had two consequences. The first was a surge of popular (business) writing that used ideas interchangeably with creativity, imbuing the term with a normative connotation lacking through most of history. In Alex Osborn's influential *Applied Imagination* (1963: 5), for instance, he frequently makes statements such as "agricultural ideas have made far richer the rich soil of our country" and "ideas are the keys to better employee relations". It is clear that the author is interested in and referring to only a subset of ideas: valuable, creative ideas – in other words, the kinds of ideas that are worth seeking (and studying) are new ideas.

The second, related consequence was that ideas came to be viewed as economic goods. This is perhaps best exemplified in the writings of economist Paul Romer (1992), who argued

that 'using ideas and producing ideas' are key strategies for economic growth. Similarly, in his controversial book *The Rise of the Creative Class*, Florida (2002: 37) claims that creative workers control "the means of production because it is inside their heads". This marked a shift in the language we use to discuss ideas – today it is taken for granted that one can use phrases such as "producing ideas" or "generating ideas", but the notion that ideas could be produced would have been a radical proposition before the aforementioned social and economic changes. Although the associationist school of philosophy, which we discussed earlier, allowed for the production of new ideas through the combination of existing, perception-derived ideas, the focus there was never on the production on new ideas in the sense of creative or innovative ideas – in fact, Godin (2015) argues that 'innovation' had a negative meaning of something undesirable for most of human history, and only became something to strive for in the course of the 20th century.

The rise of ideas as new ideas that are produced by people was accompanied (and perhaps made possible) by the development of intellectual property law and the intellectual changes underscoring it. The notion that it is the individual (rather than, say, a god, a force of nature, or a muse) who creates ideas, information, and technical principles only began taking root during the Enlightenment of the 18th century (Woodmansee, 1984). In Renaissance Venice, for instance, protection under the law for new printing techniques or images was granted on a first-come-first-served basis, instead of rewarding the "originator" (Nard & Morriss, 2006). Only towards the end of the century did a construct of "possessive individualism" evolve, wherein the author or inventor creates new ideas through her mental labor and is seen as the owner of her intellectual creation (Bracha, 2016: 3). The elevation of the value of ideas and the individual's

mind as being the source of creativity and innovation is also evident in other areas such as the emergence of conceptual art in the 1960s. Sol LeWitt, a prominent artist in the movement, argued that "in conceptual art the idea or concept is the most important aspect of the work… and the execution is a perfunctory affair" (LeWitt, 1968).

Working definition. In sum, having traced the evolution of the concept of ideas over time, we identify the three defining features of ideas: *Ideas are provisional and communicable representations.* Ideas are representations - they stand for something, such as a concept, a category, an object, or an action (or series of actions). Ideas are provisional, because they are changeable and subjective—they are not a matter of direct perception, nor of absolute truth. Finally, ideas are communicable - they can be communicated, shared, and/or enacted, for example in words, visually, in tangible form, or through actions. As outlined above, following a long historical evolution, ideas are now largely discussed in the context of creativity, innovation, and the production of knowledge in modern scholarly and popular discourse, such that they are a fundamental unit of study in organizational research. At this point, we therefore narrow our review to focus on the way ideas have been conceptualized and used in organizational research

REVIEW OF IDEAS IN ORGANIZATIONAL RESEARCH

We identified eight subdisciplines within organizational research concerned with the study of ideas, which we describe as 'idea-centered': creativity, brainstorming, innovation, networks, entrepreneurship, creative work, design, and knowledge creation. Broadly, research on creativity, brainstorming, innovation, networks, and entrepreneurship treats ideas as unit of performance or an input into a unit of performance (such as a final product or innovation) and

examines factors that facilitate or hinder that performance, whereas research on creative work, design, and knowledge creation treats production of ideas as the focus of individual or collective efforts and studies the idea work involved in the production of ideas. We provide a brief overview of the subdisciplines in Table 1.

Reviewing the subdisciplines reveals a puzzle. Across the subdisciplines, there is substantial consistency between our working definition of ideas as provisional, communicable representations, and the few available explicit definitions of ideas (see Table 2 for a selective set of definitions) and the nature of ideas as implied by their usage. It appears that the idea-centric subdisciplines agree in their understanding of ideas.

[Insert Table 2 here]

Yet, a number of studies scattered across those literatures also present different ways of interpreting the working definition. Thus, if we were to use the full breadth of studies that deal with ideas to test our working definition, we would find many cases where the dimensions of our definitions apply in more nuanced and varied ways than we would expect. While it may be tempting to dismiss those studies as not actually capturing ideas, the roots of alternative ways of interpreting what ideas are can be seen in early philosophical and psychological writing on ideas. For example, in medieval times there was no stark divide between mind and body, so that ideas were not understood as exclusively cognitive structures (see Glăveanu & Kaufman, 2019 for a discussion). Similarly, in early psychological work on creativity, Guilford (1967: 8) suggested that the form of an idea "depend[s] upon the media in which the person is working", implying a material aspect to ideas. Those alternative understandings seem to be resurfacing and becoming

increasingly prevalent in idea-centric subdisciplines. This compels us to reconsider how to make

sense of the nature of ideas in those studies. Our approach in this review is therefore to use those

studies to expand our understanding of the defining features of ideas. In the sections below, we

show how each element of the working definition – representation, provisional, communicable –

is present across the subdisciplines but interpreted in two distinct ways.

There is abundant evidence that ideas are considered **representations** in current

organizational research, as they are understood to stand for an object rather than the object itself.

The dominant view is that ideas are mental representations. For example, "An idea is an object of

thought... intangible, and evidenced indirectly. While an idea cannot be seen, it can be

represented, discussed and symbolized." (Rothberg, 2004: 1060). However, some studies explore

ideas that exist in physical or material form, such as a dancer's movement (Harrison & Rouse,

2015) or a designer's sketches (Stigliani & Ravasi, 2012). These are not considered to be mere

expressions of an idea, but the idea itself (Heracleous & Jacobs, 2008). This way of

understanding representations in a physical or embodied sense has recently gained momentum

with some strands of research, particularly studies of creative work (e.g., Biscarro &

Cammachio, 2018; Stigliani & Ravassi, 2018; Harrison & Rouse, 2015; Sutton & Hargadon,

1996).

Provisionality is strongly represented in explicit definitions of ideas, evidenced by words

like 'embryonic', 'suggestion', and 'initial', and the dominant use of novelty as a defining

characteristic. In most studies, ideas are provisional because they are early-stage or vague

representations that need to be elaborated with details (Berg, 2019; Finke et al., 1992).

Elaboration is sometimes proposed as one measure of idea quality (beside originality and usefulness). Yet, studies scattered across the subdisciplines explore how ideas remain provisional when individuals working together on an idea interpret the idea in different ways, such as occurs in cross-functional groups (e.g., Majchrzack, More & Faraj, 2012; Carlile, 2002; Drazin et al., 1999). Provisionality, in this case, arises due to lack of agreement about the idea, rather than the dominant understanding of provisionality as lack of finality.

Finally, explicit definitions indicate that ideas are **communicable**. Some refer to ideas as verbal descriptions, while others point out that they could be diagrams or even physical objects, implying that for the most part, ideas are communicable in that they can be transmitted from one person to another. Thus, definitions use words and phrases like 'textual pattern', 'represented', 'discussed', or 'narrative'. Rhodes (1961: 309) explicitly defines an idea as "a thought which has been communicated to other people in the form of words, paint, clay, metal, stone, fabric, or other material." In contrast, more recent work has described ideas as "creative material" (Uzzi & Spiro, 2005: 448), which can only be communicated through action and interaction. This parallels the notion of tacit knowledge, which has a personal and implicit quality that makes it hard to formalize and communicate, and is deeply rooted in action, commitment, and involvement in a specific context (Polanyi, 1966; Nonaka, 1994). From that view, ideas are procedures or schemas for actions that cannot be passed from one person to another; they can only be understood when another observes or responds to the idea.

In sum, the dominant view that emerges from reviewing current organizational research related to ideas coheres with the historical view of ideas as provisional, communicable

representations. However, a growing number of studies also challenge us to expand our understanding of those defining features, to incorporate material or embodied representations; that are provisional in the sense of being open to interpretation; and that can be communicated through action and interaction. The alternative interpretations of the characteristics may be particularly relevant in organizational contexts, where creative work is typically collective and may require that ideas are materialized to work on; where each person may hold different interpretations of an idea; and where ideas naturally evolve through interaction. Although this view is more dispersed than the dominant view, we argue that exploring both views provides an opportunity to deepen our understanding about the nature of ideas in organizational studies.

Introducing a Wave-Particle Duality Framework for Understanding Ideas

Our review uncovered that interpretations of the three defining features of ideas tend to cluster into two distinct groups. Studies that view ideas as mental representations tend to also treat ideas as unelaborated and transmittable; studies that view ideas as physical representations tend to also treat ideas as interpretable and communicated through action. To summarize and encapsulate these two views, we therefore introduce two broad ways of understanding ideas, each of which draws on different interpretations of the three defining features.

Ideas as particles and waves

The dominant view of ideas presents *ideas as particles*. In this view, ideas are treated as identifiable, discrete entities, such as specific mental representations or mental states, propositions or proposals, concepts or solutions, or sometimes even products like sketches or drawings. One could think of particle ideas as being studied like billiard balls, in that all balls

(ideas) are identifiable objects that can be counted, coded, judged, collected, and stored. One can arrange the balls into new patterns (e.g., a triangle, a circle etc.) , hit one ball with another and change their relative positions, but it is still possible to tell where each ball begins and ends. Similarly, 'particle ideas' may change and exist within a larger context, but they remain distinct entities. The particle view of ideas represents the dominant interpretation of the working definition – particle ideas are mental representations, provisional because they are tentative and require elaboration, and communicable in that their meaning can be retained during transmission.

Importantly, the particle view goes hand in hand with capturing and measuring ideas in a way that *makes* them act like particles. This is evident in, for example, brainstorming studies that ask participants to write down their ideas one at a time, but also in organizations, when people are asked to pitch their ideas to management (e.g., using suggestion boxes), or when a specific deadline is set for delivering ideas or concepts. Measuring creativity in terms of the quantity or quality of ideas requires the ability to identify individual ideas and their properties, which in turn leads to the creation or use of tasks and measures that elicit particle-like ideas. The modern ideas-as-particle approach is, as we discussed in the historical overview, entwined with a strong focus on quantitative measurement of ideas.

However, an alternative view that emerges when the dispersed studies from across the idea-centric subdisciplines are brought together, is that of *ideas as waves*. This view arises from a practice- and process-based approach associated with developing ideas. In the wave view, ideas are continuous and emergent over time, and embedded in actions and relationships. Studies in this vein emphasize that ideas cannot be recognized or understood without taking context into

account, with scholars arguing that ideas "have no independent existence in themselves [and are] nothing if not worked on" (Coldevin et al., 2018: 1371). Ideas exist, then, in ideating. Wave ideas are like the 'waves' performed by fans in a stadium, where the wave moves through the crowd, but is not any particular person. Indeed, if we focused on one person standing up and sitting down, we would not observe the wave at all. Waves cannot be understood by looking at one static position or moment; they can only be understood and described holistically and in motion. This can be seen in studies of creative work that describe how ideas change or are shaped as creators move through an interaction or performance (e.g., Sawyer & DeZutter, 2009; Harrison & Rouse, 2015). In contrast to the dominant 'particle' interpretation of the working definition, wave ideas present an alternative interpretation of the representation, provisional, communicable framework, with ideas represented through physical embodiments, being provisional because they can be interpreted in multiple ways, and communicated through action and interaction.

To bring these together in the context of current research on ideas, consider the following example. Imagine a group of friends discussing ideas for what they should do today. From the particle view, their suggestions for activities would constitute distinct ideas; for example, they could suggest that they see a movie, go for a meal, or go dancing. Each of those could be captured, coded, counted, and evaluated. One friend may then say "well, the weather is nice today." From the particle view, this would not be considered an idea, since it is not a response to the question of what to do. Yet, it may be intended by the speaker as a suggestion that they not do any of the previous alternatives and instead do something outside - and it may be immediately

followed by another member of the group saying "that's true, let's go play football at the park!" While the particle view would then capture this as a new and distinct idea, from a wave view it is less clear whether that second speaker had the idea or whether the idea actually occurred when the first group member commented on the weather - indeed, from a wave view the two cannot readily be distinguished. Now imagine that this group of friends regularly plays football at the park when it is sunny. In that case, the comment on the weather seems even more likely to constitute the specific suggestion, because all group members would likely interpret it the same way: the weather is nice, let's go outside and play football. Yet, it would be overlooked from a particle approach, because its meaning is not clear in the absence of contextual knowledge.

While we identify these two ways of thinking about ideas that are grounded in empirical research, it is important to note that they are not explicitly recognized as cohesive frameworks by the subdisciplines. A key challenge across the idea-centric subdisciplines of research is that researchers are not always cognizant of their assumptions about ideas. In addition, these two ways of thinking about ideas are not equally prevalent—the particle view dominates mainstream creativity and innovation research, and the wave view, although evident across several literatures such as studies of creative process and design thinking, is more dispersed.

An Integrating Framework for Understanding Ideas: Wave-Particle Duality

To make sense of these different conceptualizations and their interrelation, we draw on the metaphor of the *wave-particle duality* from quantum physics. Traditionally, the views of energy as 'waves' or 'particles' were thought to be mutually exclusive and in competition - i.e., energy (e.g., light) might be described either as a particle or a wave, and only one of the two was

thought to be accurate. However, theoretical and empirical work on quantum physics show that each view by itself is insufficient to fully describe the phenomenon, whereas together they do (also known as the Copenhagen interpretation of quantum physics; see e.g., Rychlak, 1993). This duality is often referred to in more general terms as *complementarity*, where "incompatible questions provide different views for understanding the world, and these different views are needed for a complete understanding of the world" (Bruza, Wang, and Busemeyer, 2015: 384). One particularly relevant aspect of this duality is the issue of methodology or measurement. Libben (2017: 53) points out that, "One of the most important early insights in quantum physics was that it is almost impossible to separate the method of observation from that which is observed." We argue that a similar duality and complementarity holds for ideas.

We propose that research to date supports viewing ideas as both particles—discrete entities with inherent features—and waves—processes that are entangled, contextualized, and inextricably connected. Both views fit with the definition of ideas as provisional, communicable representations, albeit in different ways. They are *phenomenologically complementary*, in that they both show a different part of the whole phenomenon and so are both necessary to understand it. Yet, the approaches are *methodologically incompatible, as* the two approaches focus on different aspects of the phenomenon of ideas, they ask different research questions, leading to different research approaches. These approaches thus draw on different ontologies of the world and research traditions. It is no surprise, then, that studies from the two different approaches seem to have little in common with each other and produce findings that often appear incompatible.

The Wave-Particle Duality of Ideas in Organizational Research

Although both views (particle and wave) are evident throughout the literature on ideas, they are not evenly distributed across subdisciplines. We found that the particle view is most evident in literatures on brainstorming, organizational creativity, networks, entrepreneurship, and innovation. While those literatures are diverse, they tend to address two broad topics. One is how ideas are generated and judged. For example, factors that increase the production of ideas during creative idea generation (e.g., Paulus, Larey, and Ortega, 1995; Rietzschel, Nijstad, & Stroebe, 2014); cognitive processes of entrepreneurs developing venture ideas (e.g., Perry-Smith & Coff, 2011); and how employee creativity is evaluated in organizations (e.g., Shalley & Gilson, 2004). A second topic is how ideas act as raw material or a starting point around which other processes occur. For example, these literatures consider ideas as a result of network structure (e.g., Capaldo, 2007) or occupying an advantageous network position (e.g., Burt, 2004); examine the identification of entrepreneurial market opportunities (e.g., Shane, 2012); and show how ideas are implemented and exploited through innovation processes (e.g., Laursen & Salter, 2006). These studies typically utilize deductive quantitative methodological tools, such as online or laboratory behavioral experiments in the case of brainstorming (e.g., Diehl & Stroebe, 1987; Paulus, Larey, and Ortega, 1995; Taylor, Berry, & Block, 1958); surveys, field studies, and experiments in the case of organizational creativity and entrepreneurship (e.g., Berg, 2019; Somech & Drach-Zahavy, 2013; Dailey & Mumford, 2006; Mueller, Melwani, & Goncalo, 2012); and patents, outcomes, or revenue data in the case of innovation and network studies (e.g., Lauren & Salter, 2006; Oldham & Cummings, 1996).

In contrast, the wave view can be found in a growing number of studies of creative work (Long-Lingo & O'Mahony, 2011; Harrison & Rouse, 2014; Sawyer & DeZutter, 2009), design (e.g., Stigliani & Ravasi, 2018), knowledge creation (e.g., Ewenstein & Whyte, 2007) and parts of the innovation literature (e.g., Garud et al., 2013). Compared to the particle approach, the wave approach does not share a clear paradigm and is more diffused across research areas. It therefore addresses a broader array of research questions, including how novelty is produced (e.g., Harrison & Rouse, 2015; Harvey & Kou, 2013), how new knowledge is created across disciplines or boundaries (e.g., Hargadon & Sutton, 1997; Bereiter & Scardamalia, 2014; Tsoukas, 2009), and the role of materials in the design process (e.g., Sutton & Hargadon, 1996; Ewenstein & Whyte, 2007). These studies have tended to be inductive and qualitative, and thus have often captured ideas in different phases of development and in different forms. They therefore evade consensus on a set of specific questions; yet they share a set of underlying understandings and implications about the nature of ideas that can be usefully contrasted with studies of brainstorming, organizational creativity, innovation, networks and entrepreneurship.

Our survey of the idea-centric literatures revealed four key topics on which the different research paradigms of the particle and wave approaches produce apparently contradictory implications about the nature of ideas: (1) the *boundaries* of ideas, (2) the *origin* of ideas, (3) the *location* of ideas, and (4) the *value* of ideas. As we will see, these four aspects of ideas are central to our analysis because they capture the duality in the way ideas are studied as well as the way they are dealt with in organizational practice. Representationality, provisionality and communicability are mutually linked in specific ways within these two views. For example, the

particle view that ideas can be transmitted unambiguously from one person to another implies that ideas have clear boundaries and fixed representational meanings. In contrast, a wave view that ideas are located in and contextualized by action and interaction implies that it is hard to define boundaries between ideas, that they cannot be separated from the process and context through which they emerge, and that their value thus depend on the domain they are in. These examples show that because the wave and particle view differ in how they think ideas exist, they have different answers to key questions the literature poses about ideas. We will review these differences in more detail below.

i. The boundaries of ideas

Ideas as discrete entities. Many studies observe or elicit and then count, evaluate, and compare ideas, which implies that ideas are discrete entities with clear boundaries and can be separated from one another. Describing these studies in terms of our working definition, ideas in these studies are distinct representations of, for example, identifiable products or ways of doing things, that can be communicated verbally or pictorially, with provisionality usually residing in the idea's novelty and tentativeness. For example, in the field of creativity, brainstorming studies usually count participants' ideas to derive measures of ideational fluency (Osborn, 1963). The fluency factor, as first theorized by Guilford (1950: 452), referred to the degree to which people were "capable of producing a large number of ideas per unit of time", and necessarily assumes that ideas can be counted individually and summed. Brainstorming was designed as an idea-finding technique in the highly applied context of advertising and organizational problem-solving, with the goal of coming up with tentative ideas as possible leads. In this line of research,

ideational fluency has traditionally been the dependent variable of interest (see Stroebe, Nijstad, & Rietzschel, 2010, for a historical overview). The experimental setup is such that participants are instructed to input their ideas in discrete spaces, for example writing down one idea per line on a page or per piece of paper (e.g., Rietzschel et al., 2006) and this way of capturing ideas assumes (and indeed, tries to enforce) that the boundaries between one idea and the next are clear, separating the ideas into meaningful, discrete entities. Another classic creativity task that approaches (and elicits) ideas as discrete entities is the Unusual Uses Task (Torrance, 1962), where participants are asked to generate as many unusual ways to use a well-known object (such as a brick or a cardboard box) as they can. The task was originally designed as an assessment instrument for people's creative potential, and in line with Guilford's (1950) suggestions for the operationalization of creativity, performance on the task is measured by counting and coding (e.g. for novelty) the uses generated. Many experimental studies on creativity use some variant of brainstorming or the Unusual Uses Task, thus treating ideas as discrete entities (e.g., Baer, 1988; Beaty & Silvia, 2012; Berg, 2019; Lindauer, 1990; Lissitz & Wilthoft, 1985; Rietzschel, De Dreu, & Nijstad, 2007; Silvia, Nusbaum, & Beaty, 2017; Van Kleef, Anastasopoulou, & Nijstad, 2010; Van Leeuwen & Baas, 2017).

The assumption that ideas are discrete entities is also evident in contemporary models of creativity, which typically represent ideas moving through a journey, resulting in mental representations that can then be elaborated, assessed, and implemented (Guilford, 1950; Amabile, 1988; Perry-Smith & Mannucci, 2017). For operations such as elaboration and

assessment to be applied to them, it must first be possible to identify something as an idea; i.e., the idea needs to be bounded, or drawing boundaries around ideas needs to be straightforward.

This is similar in the subdiscipline of organizational creativity, where novel and useful ideas are defined as the output of creative processes (Shalley & Gilson, 2004; Oldham & Cummings, 1996; Shalley et al., 2004; Woodman, Sawyer & Griffin, 1993). Studies typically use supervisory ratings on items that assume supervisors are able to quantify or count ideas, such as assessing if employees generated novel and useful ideas, tried new approaches, found new uses for something, or solved problems (e.g., Tierney, Farmer, & Graen, 1999). Alternatively, studies use measures of creative performance deemed to be more objective, such as patents or ideas submitted to an organization (e.g., Oldham & Cummings, 1996). For performance-oriented measures, researchers may also collect the actual ideas generated by employees or teams in order to count or rate them (e.g., Somech & Drach-Zahavy, 2013).

The pattern of treating ideas as bounded is also mirrored in research on innovation and networks, where patents, research papers, or new products are taken to indicate when ideas have occurred (e.g., Fleming, Mingo, & Chen, 2007; Uzzi & Spiro, 2005). For instance, in a study investigating the effects of being connected to collaborators who are not themselves connected to each other (i.e., occupying a brokerage position), Fleming and colleagues (2007) treat the categories that an inventor's patents are classified under as evidence of having new ideas and combinations of ideas. As another example, Simonton (2003) treats research papers as the dependent variable and argues that each paper has one core idea, even though many concepts, thoughts, and insights go into that idea. Entrepreneurship research also treats ideas as bounded.

Entrepreneurial ideas have been defined as templates for ventures, which form new relationships between opportunities and products or solutions, and which give direction to the venture (Bird, 1988; Shane & Venkataraman, 2000). Those templates can then be captured in the form of an entrepreneurial pitch (Clarke, Cornelissen, & Healey, 2019; Crilly, 2008) or an IPO prospectus (Martens, Jennings & Jennings, 2007).

Ideas as continuous. In contrast to the dominant view of ideas as discrete countable entities, research on design, knowledge creation, and in-situ studies of people engaged in creative work view ideas as intrinsically connected, and the boundaries between them fuzzy. In this work, provisionality strongly characterizes the boundaries of ideas, since the ideas are subject to continuous change. Communicability of ideas is also central in this line of research, since ideas often only take on form as they are transmitted between people. For instance, when group members propose and elaborate ideas in real time, the line blurs between the group's original vision, group members' suggestions, the integration of their comments, and the fully developed idea (Sutton & Hargadon, 1996). Combining existing ideas and building on ideas are key to the creative process (e.g., Kohn, Paulus, & Choi, 2011), but it is difficult to determine, for example, when an individual or group is building on an idea or is combining different ideas (Berg, 2014; Hagtvedt, Dossinger, Harrison, & Huang, 2019).

Moreover, it is often not possible to identify an idea in the beginning of a creative process, because creative output emerges over time through the interactions of group members (Hargadon & Bechky, 2006; Long-Lingo & O'Mahony, 2010; Sawyer & DeZutter, 2009). For example, Harrison and Rouse (2014) showed how, when dance groups collaboratively developed

choreographies, there was no unitary idea with clear boundaries. Rather, the final creative product (the choreography) was composed of segments of movements, suggestions, and interpretations of movement prompts – it was difficult if not impossible to point to a particular thing and identify that as the idea. This understanding of ideas is consistent with creativity research that adopts a process lens, where ideas are understood to continually develop, change, and evolve throughout the creative process or journey (Amabile, 1988; Lubart, 2001; Perry-Smith & Mannucci, 2017). Yet, it also goes further - whereas many creative process studies use a focal idea as the unit of analysis, the continuous nature of ideas means that drawing boundaries around something as a focal idea is itself a challenge. Correspondingly, rather than an idea moving through a journey, the idea is better thought of as the journey itself.

These studies imply that rather than having clear boundaries, ideas are continuous. Studies in this vein show that ideas evolve over multiple iterations (Harrison & Rouse, 2014; Harvey & Mueller, 2021), often linking with one another in a non-direct or non-obvious way (Hagtvedt et al., 2019) or in a way that integrates multiple ideas into a whole (Lingo & O'Mahony, 2010). This work also suggests that even when an idea seems to have reached a final, elaborated state—one that can be or is implemented—it is not necessarily complete or easily captured as a discrete entity, because its interpretive use in a new context is also part of its journey (Baralou & Tsoukas, 2015). Thus, studying ideas as continuous implies that attempting to capture an idea at any point in its journey will produce an underspecified version of the idea.

Studies from outside the core organizational work on creativity and innovation capture the continuous and evolving nature of ideas by focusing on places where people are working on

ideas, rather than trying to pinpoint the idea as a unit of analysis (Sawyer, 1992; Obstfeld, 2012).

For example, Obstfeld (2012) focuses on creative projects – the means (in this case

organizational routines) by which organizations pursue novelty, rather than the journey of an

idea. Since people are continuously changing what they are working on, it makes more sense to

capture these dynamics over the course of a project. Similarly, during a musical improvisation,

ideas can occur on different levels, ranging from single notes or even timbres of notes, to

rhythmic patterns, to melodic phrases, to broader musical styles, such as 'playing something like

Miles Davis might' (Sawyer, 1992), and an idea cannot be captured by any one of those elements

alone, because it takes shape through action and interaction. For example, one musician may

play a particular melodic phrase, but another musician may pick up on the rhythmic pattern

instead of the melody. Scholars adopting this view recognize that the idea is a continuous process

of combining all of these levels in a way that is "impossible to segment" (Sawyer, 1992; 258).

From this view, then, ideas are neither held within nor predictable by the parts from which they

emerge (Sawyer, 2000); ideas are not distinctly bounded from one another.

ii. The origin of ideas

   Ideas as originating at a particular moment. Corresponding to the notion that ideas are

discrete bounded entities (associated with a particle view of ideas), is the implication that there is

a specific point in time at which the entity begins to exist. Consistent with that, much of

creativity research studies how an act of generation brings an idea into existence. That question

implies that there *is* an identifiable moment in time prior to which the idea does not exist, and

after which the idea exists (and is readily recognizable as such). The moment at which the idea

comes into existence is thought to be the moment at which it becomes a communicable

representation. This view is evident in common metaphors used by scholars about ideas being

born (cf. Mainemelis & Ronson, 2006) or bringing ideas to life (cf. Berg, 2019). From this

perspective, an idea begins in a creator's mind and has no existence until the point at which it is

generated (Perry-Smith & Mannucci, 2017; Campbell, 1960). Research adopting this view

therefore emphasizes creators' cognitive creative thinking skills (cf. Amabile, 1996) and the

ways in which ideas take on their shareable form.

Psychological perspectives of creativity often view creative thinking as a type of

problem-solving (Parnes & Meadow, 1959) and these approaches imply that ideas are worked on

in the mind through mental processes and operations (e.g., Finke, Ward, & Smith, 1992). New

ideas are thought to be the result of combining existing mental elements (Koestler, 1965), for

instance combining the concepts of "kill" and "joy" to form the new idea of "kill-joy" (Mednick,

1962). From this view, there is a clear 'before' where mental elements have not been combined

and an 'after' where now a new idea exists. Cognitive models of idea generation (e.g., Nijstad &

Stroebe, 2006) also often assume that ideas are 'born' through a process of retrieving and

combining knowledge in novel ways. This is also evidenced by the inclusion of an incubation

phase in traditional models of creativity (e.g., Wallas, 1945), where the mind is thought to be

unconsciously forming associations before a point of illumination where "the promising idea

breaks through to conscious awareness" (Lubart, 2001: 296). Although those models

acknowledge the ongoing work of (possibly unconscious) cognitive processes in producing an

idea, they portray ideas as arising at one specific moment, such as when people suddenly achieve

a certain insight. This is captured in the oft-cited description of creative insight by mathematician Poincaré: "the idea came to me, with… brevity, suddenness and immediate certainty" (Poincaré, 1913: 182). These kinds of insights are studied experimentally with tasks such as the Duncker candle problem (Duncker, 1945). Typical of such 'insight problems' is that they require a restructuring of the problem before they can be solved (for example, in the candle problem, participants needs to change their interpretation of a box of tacks from a mere container to a potential platform), and that the solution arises suddenly (in an eureka moment) after an initial impasse (Sternberg & Davidson, 1995).

The nature of ideas as cognitions formed at specific points in time is also evident in organizational theories that deal with ideas. For instance, network research describes how brokers synthesize disconnected and diverse information into new mental representations (e.g., Burt, 2004). This stream of research emphasizes that good ideas will be generated when one occupies advantageous positions that allows access to diverse information. However, they do not directly examine or elaborate on the *process* of combining information or ideas and, indeed, many studies adopt existing paradigms and techniques from the brainstorming literature (e.g., Burt, 2004; Fleming, Mingo & Chen, 2007). Even though the gathering of information may take place over a period of time, the crystallization of an idea is still momentary. That ideas will appear in an instantaneous, categorical manner is also evident in the premise, adopted by some network studies, that ideas are formed through "reconfiguring known approaches" (Perry-Smith & Shalley, 2003: 90). In entrepreneurship research, the recognition of ideas or opportunities is similarly viewed as "discovered" when new information triggers some association with

complementary information one already possesses (Shane & Venkatramen, 2000) and the idea is suddenly recognizable. Finally, in innovation, ideas are seen as the result of recombination of conceptual and physical materials that were previously in existence (e.g., Nelson & Winter, 1982). This literature focuses on the search for existing materials rather than the process of recombination (e.g., Fleming, 2001), implying that if the materials or configuration of materials are right, the idea will 'click into place'. Thus, while ideas are often seen as the result of some combinatorial process or a process or reframing or redefining (parts of) the problem, they are thought to come into existence in a specific point in time - one moment the idea is not there, and the next moment it is.

Ideas as emerging over time. While the dominant view treats ideas as originating at a particular moment, other studies argue that there is no clear moment which marks the existence of an idea. Instead, these studies suggest that ideas emerge throughout the creative process and, hence, that they cannot be separated from the process of ideating. When looking back in time, it may be possible to identify a crucial moment in the rise of an idea, but in the process of working on ideas, each utterance or act provides a range of creative options with the potential to result in radically different end points (Sawyer, 2000; Tsoukas, 2009). As such, the communicability and provisionality of ideas are what shapes them throughout the process. For example, when a chef experiments with a technique for producing part of a dish, it may produce an unusual texture that triggers an idea for a new flavor to combine with the dish, and so be seen as the beginning of the idea for a new dish; equally, it may leave the food uncooked and inedible, but trigger a thought for a different technique to try; or it may produce no change to the dish at all. It is only in

retrospect that we can understand whether trying the technique was the beginning of an idea. Similarly, if a group member suggests, during a brainstorming session, "what if we thought about it this way?", we can only know whether that will be viewed as an idea if it turns out to be productive for the group. In our earlier example of 'the weather is nice', its status as an idea depends to a large degree on the other group members' reaction to it. Thus, viewing ideas as what exists at the end of the creative process implies that ideas are emergent throughout, where it is not possible to know whether something is an idea in the process; this in turn implies that it makes no sense to try to identify the particular moment when an idea comes into existence, or what it represents at that particular moment.

Ideas are emergent because they come together over time, so elaborations to the idea cannot be understood in isolation from the process. Even knowing all of the elaborations and additions in isolation cannot add up to a complete understanding of the idea without understanding how they unfolded over time (Cronin & Loewenstein, 2018; Tsoukas, 2009)—the sequence in which each elaboration and addition occurred, and the way that it responded to something that came before are all relevant to understanding the idea. This is evident, for example, when ideas are considered more complex discoveries or changes in perspective, such as scientific theories. Research on scientific discoveries (Ben-Menahem et al., 2013; Wuchty, Jones, & Uzzi, 2007) takes the idea as a final manifestation of a creative process where multiple thoughts, concepts, or associations may have been generated and one idea has been selected, or a set of smaller components has been integrated to form the idea. New knowledge, for instance, is thought to result from "building up a structure of ideas", as is the case with a theory or a complex

design (Bereiter & Scardamalia, 2014: 35). As such, this view suggests that we can only know an idea if we understand what came before, and indeed, after in the process.

The view of ideas as emergent implies that ideas are not reducible to component parts. Ideas can exist at different levels of complexity or completeness, but the relationship between ideas is not compositional – that is, one idea is not made up of recognizable constituents in the form of other (simpler) ideas. For example, Hagtvedt and colleagues (2019) showed that aspects of early ideas become input or inspiration for subsequent ideas which can then take on new directions. In this case, earlier ideas are provisional "stepping stones", but subsequent ideas are not a summation of earlier ideas. Consequently, ideas can neither be described as a mere combination of other ideas, nor as a holistic idea from the beginning whose parts are made clear through elaboration.

The view of ideas as emergent is evident in studies of how shifts in perspective or paradigm unfold over time. Indeed, the notion of shifting perspective (for instance, by shifting from one category or way of understanding to another) is fundamental to theories of how ideas are created and developed (e.g., Guilford, 1950; Duncker, 1945; Kuhn, 1962). For instance, when faced with the question of how to improve or redesign a hospital chair, a shift in perspective would be a new way to think about what a hospital chair could be - a shift, for example, from it being functional or convenient to being cozy or fashionable (Stigliani & Ravassi, 2018). Yet, in this approach, the notion to make a chair cozy or fashionable is not itself an idea; its 'idea-ness' comes from the way that it responds to what came before. A historical example, described by Hofstadter and Sander (2013), is Galileo's discovery of the moons of

Jupiter. The crucial idea, they argue, was not the observation of objects orbiting a distant heavenly body, but Galileo's novel representation of these objects as *moons* (i.e., as members of a category), a word that until then had only been used in a singular sense ('the moon'). It is thus Galileo's reframing (or invention) of a category that is the idea. Reflecting this view, some literature on creative cognition, design thinking, and knowledge creation is devoted to understanding how people and collectives shift between one way of understanding and another, and reframing problems is a core skill for creative thinking (e.g., Getzels, 1979; Reiter-Palmon & Robinson, 2009). That implies that both the frame and how it is changed are core to understanding the idea.

iii. The location of ideas

Ideas as having independent existence. The particle view assumes that ideas have independent existence, which means that they can be separated and distinct from the context in which they occur, and correspondingly can be owned and transferred. This relates strongly to the representational and communicable aspects of ideas: they can be written down, verbalized, drawn, or otherwise communicated in a form that lends itself to storage and possession. This is evidenced in research that explores the psychological and legal effects of ownership over ideas. Only if ideas have independent existence can they be owned by an individual who is not their creator. This is the premise of psychological experiences of ownership, which show how generating ideas is experienced as disclosing information about or aspects of oneself (Goncalo & Katz, 2019), and that psychological ownership affects how people adopt others' suggestions for change (Baer & Brown, 2012) and the extent to which they elaborate information (Knight &

Baer, 2014). Similarly, the premise of research on idea management (Vandenbosch et al., 2006) is that ideas can be treated like a collection of objects (e.g., Litchfield & Gilson, 2013). This further implies that ideas have existence and meaning in and of themselves that can be captured in the form of intellectual property such as patents or copyrights.

Having a source and allowing for ownership, ideas are often seen as items that are produced (e.g., by employees), which in turn means that it makes sense to attempt to stimulate, organize, and reward this production through managerial actions (e.g., Amabile et al., 1999; Baer, Oldham, & Cummings, 2003), just as is done for other forms of job performance and productivity. Thus, this view of ideas gives rise to management strategies aimed at measuring idea-generating productivity and necessitates a way to deal with idea ownership and the recognition of contributions. In addition, if ideas can exist independently, without necessarily requiring context to be understood, it implies that ideas can be stored, and can be transmitted between individuals, groups, and organizations. For example, research on scientific discoveries (Ben-Menahem et al., 2013; Wuchty, Jones, & Uzzi, 2007) takes an idea as a final manifestation of a creative process where the discovery can be written down or told to other researchers (e.g., Singh & Fleming, 2010). The view that ideas can be transmitted between people is perhaps most evident in network research, where ideas are conceptualized as moving through the network to different agents (e.g., Burt, 1992). Similarly, in the innovation literature, Sukhov (2019) suggests that an idea is a brief description of a solution that can be passed on to users, customers, other creators. This approach is also in line with work in brainstorming and other creativity experiments, where participants are typically asked to write down their ideas as a response to

questions on how certain things can be improved or how certain problems can be solved (e.g., Diehl & Stroebe, 1987).

Ideas as embedded in action and relationships. A growing body of work suggests that rather than having independent existence, ideas are embedded in actions and relationships. In other words, ideas cannot be understood without the (often interpersonal) context they are created in, from which they derive their meaning. Thus, in terms of our working definition, the representational aspect of these ideas is provisional as the meaning of these ideas is not fixed. Ideas more often take on their meaning at the moment that they are being communicated (i.e., expressed). For example, Sawyer and DeZutter (2009) suggested that 'parts' of an idea are distributed between collaborators. This does not mean that multiple people are directly involved in generating an idea as we may typically assume; rather, because ideas are embedded and contained in what came before, they are shaped by the social environment both directly—for instance, through conversation (e.g., Tsoukas, 2009; Sawyer, 2003; Harvey & Kou, 2013) and the way that creators interact with their materials (Ewenstein & Whyte, 2007)—and indirectly— for instance, by assumptions and paradigms (e.g. Csikszentmihalyi, 1999; Amabile, 1996; Drazin et al., 1999). Ewenstein and Whyte (2007: 698) describe how, in creating new architectural designs, the ideas are not located in a designer's mind as a concept, nor as an accumulation of sketches and illustrations, but rather emerge through "a conversation between the designer and the drawing". Similarly, Tsoukas (2009) describes how new understandings or new meanings emerge through dialogue, where (similarly to our earlier example of 'the weather is nice') it is the response in the context of an initial statement or utterance that contains the meaning, but not

41

the initial statement or the response itself. Being representations, ideas always carry some

meaning, but this meaning will often be revealed and moreover *shaped* by the conversation,

group interaction, the actions of those involved in the larger project, and so on, rather than being

a matter of a particular creator's intention as captured in a description.

From that view, ideas are procedures or schemas for actions, and so cannot be simply

passed from one person to another, but rather can only be understood when the other observes or

responds to the idea. The meaning is contained, or even created, in the interaction, the initial

action and the response together (Tsoukas, 2009). This parallels the notion of tacit knowledge,

which has a personal and implicit quality that makes it hard to formalize and communicate, and

is deeply rooted in action, commitment, and involvement in a specific context (Polanyi, 1966;

Nonaka, 1994). For example, in a study of improvisation in work teams, Vera & Crossan (2005)

discuss the exchange and building upon each other's ideas as central to group or team

improvisation. In this sense, ideas are distributed across different creators or parts of a system:

they are the concepts that can be combined, or the smaller insights that lead to the creative

breakthrough, but only when brought together through interaction.

Studies done from this view show that actions and interactions during creative work

change and shape what the idea is. For example, in an inductive study of perfume making,

Endrissat and Noppeney (2013) describe how a visual collage of pictures was used to capture the

emotion of 'trust' and used in developing the perfume. Rather than viewing the concept of trust

or the visual collage itself as the idea, the different responses of the group members to the visual

collage (for example, laurel leaves meaning a Sunday roast for one creative worker and the

Roman Empire for another) are part of the idea. That is, to understand what the idea is, one must look at both how people are relating to the collage and to each other, because only in those relations and understandings can the meaning of the idea be found. Further exemplifying this, Withagen and Van der Kamp (2018: 1) view creativity as "the discovery and creation of unconventional affordances (action possibilities) of objects and materials", defining ideas as representations of possibilities for action rather than cognitive concepts. Following that approach, research describes how aesthetic knowledge, derived through bodily sensations, becomes incorporated in creative work (Stephens, 2020; Sawyer, 2000). That sentiment is echoed in organizational research on design by Stigliani and Ravasi (2018: 749), who note that "the production of sketches, drawings, and prototypes not only is a way to represent provisional design ideas, but also central to how these ideas are developed intuitively in the first place". Heracleous and Jacobs (2008) similarly describe material ideas as 'embodied metaphors', arguing that embodiment shapes our experiences and perceptions, which in turn influences how we interpret more abstract entities.

Interestingly, because ideas need not be located (or even originate) in an individual's mind, some ideas can, contrary to conventional understanding, start out in a physical, material, or visual form and develop into a mental representation. For example, Stigliani & Ravasi (2018) describe how designers move from a 'mood', which may be captured in tangible representations on a mood board, to a mental concept encapsulating that mood. Scholars adopting this view suggest that there is something physical about these ideas themselves, or at least that there is no clear dividing line between the mental and embodied aspects of ideas, and that something crucial

43

about the idea occurs at the interface of the material and the person dealing with that material (Bechky, 2003; Carlile, 2002; also see Withagen & Van der Kamp, 2018). For instance, a dancer may move in a way that invokes the feeling of an animal (Harrison & Rouse, 2015). In doing so, the dancer's idea is the movement, and the movement represents a particular feeling, which in turn shapes our experience and how we interpret more abstract entities (Heracleous & Jacobs, 2008). This body of work has studied the interaction between creative workers and various material forms, including sketches, images, prototypes, mood boards, visual collages, physical movements and to performances (Biscarro & Cammachio, 2018; Stigliani & Ravassi, 2018; Harrison & Rouse, 2015; Sutton & Hargadon, 1996; Endrissat & Noppeney, 2013, Ravasi & Stigliani, 2018).

iv. The value of ideas

Ideas have inherent qualities. Organizational creativity is typically defined as "the production of new and useful ideas concerning products, services, processes, and procedures" (Shalley & Gilson, 2004: 34; see also Oldham & Cummings, 1996; Shalley et al., 2004; Woodman, Sawyer & Griffin, 1993). That literature is strongly output- or product-focused, because the value of ideas is thought to lie in their novelty and usefulness, which ultimately (it is hoped) translates into organizational performance and/or profit (e.g., Luo, 2014; Katila, 2002; West, 2002). This approach is strongly tied up with a particle view of ideas.

Studies in this tradition typically use consensus, expert ratings, or quantifiable output to judge the value of ideas, and the use of these methods assumes that an idea has some inherent qualities that can be observed or uncovered. The representational content of an idea can be

44

clearly communicated and this enables judgment or rating of the idea's provisional value. In other words, various aspects such as the originality, feasibility, or semantic content of ideas are attributes of the idea that can be measured – if not objectively, then at least with a high degree of intersubjective agreement (Amabile, 1982). In experimental research, ideas (such as those generated in a brainstorming task) are usually coded (e.g., for novelty, feasibility, or 'creativity') by multiple raters who are expected (and usually found) to substantially agree on different ideas' relative qualities. In organizational studies, supervisory ratings, or other measures of creative performance such as patents are considered to be adequate measures of ideas (e.g., Oldham & Cummings, 1996). The rating measures usually ask supervisors to indicate how often employees contribute creative ideas (e.g., Janssen, 2000). For performance-oriented measures, researchers may also collect the actual ideas generated by employees or teams (e.g., Somech & Drach-Zahavy, 2013) in order to count or rate them. Like experimental work on brainstorming, then, this research implicitly adopts a view of ideas as quantifiable 'products' generated by employees, the quality of which can be meaningfully assessed by raters who themselves are not part of the creative process. In innovation and network research, scholars often use quantifiable metrics such as patent counts (e.g., Katila & Ahuja, 2002), paper citations (Uzzi et al., 2013), and revenue (Uzzi & Spiro, 2005) as indicators of the quality of ideas.

More recently, researchers have shifted their attention towards what Zhou and colleagues (2019) call 'the receiving side of creativity', that is, the way people, teams, and organizations respond to, evaluate, select, or act upon ideas. These studies often compile a set of stimulus ideas to present to participants, with most using ideas as they would be (or actually were) generated

during typical idea generation tasks (e.g., Herman & Reiter-Palmon, 2011; Runco & Smith, 1992; Rietzschel, Nijstad, & Stroebe, 2006; Zhu, Ritter, Müller, & Dijksterhuis, 2017). In other studies, however, researchers have created stimulus ideas, and these tend to be somewhat more elaborated and well-described than those typically produced in idea generation tasks, which tend to be short (because participants are expected to generate as many as possible). Examples of this are Mueller, Melwani, and Goncalo's (2012) running shoe product idea, Dailey and Mumford's (2006) use of project proposals as ideas to be evaluated, and Berg's (2016) video recordings of ideas for new circus acts. These studies emphasize manipulating or varying input (i.e., the idea), implying that variation in quality stems from the ideas themselves and that in an ideal scenario with perfect information (i.e., no uncertainty), people would be able to discern the true value an idea possesses.

The qualities of ideas treated as constructed. While most research focuses on finding objective assessments of idea quality, asking the question 'what is the quality of an idea', an alternative approach views ideas as having no inherent quality and asks instead 'where is the value'. In this approach, there is an emphasis on the importance of systems and domain in understanding what an idea means and hence its value, as well as the view that an idea does not exist unless it is being evaluated (or at least observed).

As mentioned earlier, the provisionality of ideas in this approach is tied to their meaning and hence their quality. Scholars in this tradition are emphatic that something new has no meaning (and hence no specific 'quality' or value) without taking into account the old, i.e., what already exists in a domain (Csikszentmihalyi, 1998; Bailin, 1994). For instance,

Csikszentmihalyi (1999) proposed a systems model of creativity, arguing that what is recognized as a new idea is constructed through interactions between producer and audience; evaluation does not happen through individuals merely uncovering some inherent qualities of ideas, but through social systems making sense of and valuing products. In other words, asking about the qualities of ideas, such as their novelty and value, raises the question of, "relative to what?" Some authors also refer to novelty as a consequence (rather than a property) of ideas; for example, Sukhov and colleagues (2019: 29) mention that one function of ideas is to "trigger new associations and give rise to new ideas", and Proctor (1991: 225) mentions that ideas (or insights) "can lead to a restructuring of that problem and the development of further insights into the solution of the problem". Echoing this view, Harvey and Kou (2013) examined the evaluation of ideas not as a static moment of a decision point in the creative process, but as on-going and situated as an idea becomes collective (i.e., the collective idea exists) at the moment when they are evaluated. Similarly, Coldevin and colleagues (2018:1371) show how, in collaborative creative work, ideas are constituted on an ongoing basis by group members actively locating them in relation to other ideas or the broader domain, showing that "ideas of what to do were linked to ideas of what is worth doing". Further, addressing the question whether people are discerning or able to recognize their best ideas, Silvia (2008:141) points out that "I suspect that most creativity researchers, in their heart of hearts (or brain of brains), would agree that there is no gold standard for creativity", going on to argue that "Creative products probably do not have a true, innate level of creativeness", and recommending a focus on agreement rather than accuracy, with high agreement between self-ratings and other, external criteria, reflecting high

discernment. This again points to a more systems view of idea quality, where the quality of the idea is not thought to reside in the idea itself, but rather in what happens to an idea (for example in terms of appreciation or success) in the world.

Not only is the value of ideas determined by systems and domain, as we have argued above, but the value of ideas is also seen as changing across time as well as people. For example, Cronin and Loewenstein (2018) illustrated how the exact same statement can be part of one person's standard repertoire (and therefore not a new idea to them) but every time this person shares it with someone who has not heard it before, it can trigger new insight or revelations for them. In historical case studies of collaborative creative work, Farrell (2001) shows that artistic styles that did not seem creative at first (or that were even rejected outright) can, over time, come to be considered creative. For example, this was the case with French Impressionism, which was initially derided as being common or uncultured compared to the fine art of Old Masters. The inverse is also often true, with ideas deemed creative at one point becoming the new status quo. For example, Cirque du Soleil pioneered a modern format of circus that was seen as radical in its time and was even used as the case study for how to come up with groundbreaking organizational strategies (Kim & Mauborgne, 2014), but the very same format is today seen as "tired" (Vincent, 2015). These examples show that the value and meaning of ideas can be extremely fluid.

AN ILLUSTRATION OF THE WAVE-PARTICLE DUALITY FRAMEWORK

Particles and Waves on the Receiving Side of Creativity

Having discussed the way in which the boundaries, origin, location, and value of ideas differ in research adopting a wave or particle view of ideas, this section aims to illustrate the use and limitations of each view. We discuss two examples from our own research on the 'receiving side of creativity' (Zhou et al., 2019): a study on idea selection in brainstorming groups (Rietzschel, Nijstad, & Stroebe, 2006), and a study on idea evaluation in healthcare policy groups (Harvey & Kou, 2013). After a long period of prioritizing idea generation, research attention has recently begun to examine how individuals and groups receive creators and creative ideas. This includes judgements about the novelty and usefulness of ideas, decisions to accept or reject ideas, forecasts of the success of ideas, and choices regarding the implementation of ideas (for a review, see Zhou et al., 2019). A foundational assumption of this stream of research is that there is a target (usually an idea) that can be evaluated, selected, or implemented (Zhou et al., 2019). Thus, research to date has predominantly taken a particle view of ideas.

Limitations of the particle view: An example. One example of studying the receiving side of creativity from a strong particle view is the study on idea selection by Rietzschel, Nijstad, and Stroebe (2006). In this work, the main question was whether the lower productivity of interactive as compared to nominal brainstorming groups would affect the quality of idea selection. The results showed that nominal and interactive groups performed similarly, and both at chance level – i.e., groups did not select ideas that were more original and feasible than their average generated idea.

The particle view is highly evident in several aspects of this work, with the research question and method both strongly informed by a particle view of ideas as discrete entities that

could be elicited, counted, coded, and subsequently compared along specific dimensions by use of standardized procedures and materials. For example, in terms of location, ideas are treated as discrete entities, as evidenced by selection taken to consist of making a choice out of previously generated ideas. The operationalization of generation and selection performance was aimed at coding ideas as individual entities; participants were instructed to generate ideas and then make a selection from their ideas; ideas were to be written down on sheets of paper divided into separate sections to facilitate identification and counting of individual ideas; participants received a specific problem for idea generation ('how can education at the Department of Psychology be improved?') and ideas were only counted and coded as ideas if they provided an intelligible answer or solution to that question. The strong particle nature of the study may have limited our findings in several ways. For example, because we were interested in the creative value of ideas as they were generated and selected (that is, value as a stable characteristic of particle ideas), participants were not given opportunities or options to re-define the problem, unless this was accompanied by an idea that the researchers could clearly code. Thus, if a participant would have written down a general question like 'what is education for?', we might have not counted or coded this idea, and in fact might even have been a bit annoyed at the participant for 'not following instructions'. From a wave view, however, such a question would have been particularly interesting, because it represents a re-framing of the problem in a fundamental way (if we want to improve education, it does make sense to think about which goals education is supposed to serve). Given that creativity is often thought to crucially depend on the ability to

question fundamental assumptions of one's task or problem, this kind of behavior should be seen as interesting, rather than a complication.

Moreover, since we only wanted to count unique (i.e., non-overlapping) ideas, two variants of the same idea (such as 'more practical elements during lectures' and 'practical demonstrations during lectures') might have been considered identical and in that case would be counted only once. However, from a wave view it would be interesting to see how (and why) these two versions of the 'same idea' arose (for example, this could reflect a kind of elaborative linking of ideas; e.g., Hagtvedt et al., 2019). Thus, such 'errors' would have been an interesting opportunity for further inquiry.

Finally, on a more fundamental level, the issue of selection effectiveness is somewhat dubious from a wave view, since (at least in the way it is usually studied) it reduces effective selection to maximizing scores on some specific dimensions. From a wave view, however, the question is not so much under which circumstances participants make the *best* selection, but rather how people may make *different* selections under different circumstances, and *how* (or why) these different selections come about. For example, one of the assumptions behind the study was that people would be making a selection from their previously generated ideas (which was what we instructed people to do); yet, in practice, several groups wrote down ideas on their selection sheet that contained elements of multiple previously studied ideas. A wave-oriented researcher would probably have been particularly interested in these kinds of changes and developments to ideas as they unfolded through the creative process. In fact, Glăveanu (2014) argues that the separation of generation and implementation of ideas is a false dichotomy, where

in reality the two go hand in hand as new ideas emerge through the process of implementation. Studying this using a strict particle approach, in this view, fails to do justice to a phenomenon that has inherent wave characteristics.

Limitations of the wave view: An example. Harvey and Kou's (2013) study of the role of idea evaluation in healthcare policy groups explores the receiving side of creativity from a wave view. That paper uses an inductive methodology to study how evaluation is situated in the ongoing interactions between group members during discussions of new ideas. A key finding of the paper was that groups evaluate ideas *throughout* generative processes—for example, by comparing them with one another as they are generated, by choosing to discuss them in detail as they occur, and even by allowing them to fall out of the group discussion. The paper concludes that collective creative processes are not all well described by the idea-generation-centric sequence of the creative process and proposes an evaluation-centric alternative.

The wave view is evident in the paper's conceptual foundation, methods, and contributions. By tracing the discussion of ideas over group discussion, the paper assumes that ideas are emergent. Even though we were motivated by the wave insight that evaluations are embedded in a group's discussion of ideas, we were still influenced by the dominant particle tradition to treat ideas discrete. This was evidenced in the way we analyzed the data, by tracing ideas from when they first arose in a group meeting until discussion about the idea was resolved. One of our early observations was that it was exceptionally difficult to tell where any idea began, or to capture with regularity the way the idea changed over time. We dealt with this by focusing on how group members interacted with the idea (e.g., did they build on the idea or disagree with

it) and theorized about the nature of interactions, consistent with the wave approach. Thus, a key conclusion of the paper is that generation and evaluation are deeply entwined, so that one cannot be understood without the other, nor without the context of the group discussion.

Although the wave approach was productive for uncovering new insights about collective creativity, it also obscured differences that may have existed in the content of the idea and the way that the form of the idea changed. For instance, because we treated the origin of ideas as emerging over time rather than originating in a particular moment, we could not also capture snapshots of ideas at given points along the process. As such, we could not say whether, in the course of integrating ideas, group members drew on different mental categories to produce ideas or whether a final proposed idea actually integrated knowledge from members. Groups also discussed ideas that existed in different forms—in some cases, their proposed solutions were technological products; in others, they were recommendations to change regulation; in still others, they were new processes for delivering healthcare—but we did not capture those.

Complementarity between the two studies. As we have illustrated, *both* views come with inherent limitations. For the 'receiving side of creativity', the particle approach is often appropriate as ideas being represented to evaluators will often be at a point where they do have clear boundaries and independent existence (e.g., a video of a performance). In other cases, however, generating ideas and judging them are intermingled (Harvey & Kou, 2013; Harvey & Mueller, 2021). This means that even within a group that is working on a seemingly unitary idea, because the idea is embedded within the group's ongoing interaction and relationship, the same idea can be experienced in different ways by different group members. In that case, treating ideas

as particles would produce a set of challenges, because it is not clear which interpretation of an idea is being evaluated, selected, or otherwise responded to, and to what extent this interpretation incorporates only a response to the idea as it happens to be expressed at that moment. Applying a particle view to understand such processes may not be the best option. These two studies adopt different perspectives on the nature of ideas, and hence use different methodologies and yield distinct findings that appear incoherent or incompatible; however, closer examination reveals that they offer insights into different aspects of the phenomenon, and answer different types of questions. Applying the wave-particle framework to the literature helps us reconcile seeming incompatibilities between studies by highlighting how those studies, when taken together, show us a more complete understanding of ideas and the creative process.

TOWARDS AN AGENDA FOR ORGANIZATIONAL RESEARCH ON IDEAS

Having first developed a historically grounded definition of ideas as provisional, communicable representations, we then argued that those three definitional features could be interpreted in two distinct ways, giving rise to two separate worlds of understanding about ideas as either particles or waves. Within those worlds, researchers ask distinct questions and use distinct approaches, intertwined with different assumptions about the boundaries, origins, location, and value of ideas. Since a researcher's worldview determines and is determined by the questions they ask and the methods they employ, it is critical that, as a community, we employ both views to understand the "totality of the phenomenon" (Bohr, 1927). Thus, a primary contribution of introducing the wave-particle duality as a framework for understanding

seemingly contradictory approaches and findings is to suggest that, rather than being in conflict, each view provides a window into different aspects of the phenomenon of ideas.

Below, we elaborate three sets of principles for drawing on the duality to move research on ideas forward: 1) the appropriate view should be used for capturing the part of the phenomenon that a researcher aims to study; 2) to avoid creating false dichotomies, researchers should position their findings relative to research in the same view, rather than in contrast to the alternative view; 3) each view should be used to expand the other.

Deciding Whether and When to Use a Particle vs. a Wave View

The first principle we propose is that each view will be most valuable for asking distinct questions about ideas and for understanding different aspects of the phenomenon, and that researchers should try to make appropriate choices of which view to adopt. Our review showed that in their idealized forms, a particle view treats ideas as *separable* from each other (i.e., discrete and bounded), from the process for producing them (i.e., originating at a moment), from their context (i.e., having independent location), and from their domain (i.e., having inherent value); whereas a wave approach treats ideas as *inseparable* from each other (i.e., continuous with blurry boundaries), process (i.e., originating emergently), context (i.e. in an embedded location), and domain (i.e., value is constructed). It may not always be easy or attractive to move back and forth between views, but researchers should consider whether the view they adopt is best suited to the questions they want to ask or the phenomena they want to study. For example, do they want to capture how ideas interact with their context, or compare ideas to one another

within a context? Do they want to identify a specific moment when a final idea can first be identified, or capture the process through which an idea developed its final form?

While our review suggests that researchers usually implicitly adopt one of the views, this does not imply that they commonly adopt a 100% particle or 100% wave view—in fact, either would make research impossible. Past research implicitly holds one or more of these areas constant: boundaries, process, context, or domain. For example, although particle research assumes that ideas can be meaningfully interpreted in and of themselves, any interpretation presupposes some context. At the very least, brainstorming researchers treat ideas as responses to a problem or question presented to participants, and interpret (i.e., code) ideas on the basis of their beliefs about participants' intentions. Conversely, a wave researcher will adopt a highly contextualized view of the process of developing ideas, but assigning any interpretation to what happens during this process requires some 'fixed point' or constant, without which everything would be unique and no pattern could ever be identified. Thus, we argue that researchers need to, first, be *aware* of the degree to which they adopt a particle or wave view and, second, to make a deliberate or thoughtful choice about which elements to hold constant and which to allow to vary when developing new research questions and methods.

The particle view seems most appropriate for examining specific, regular, and important points in the creative process, when the development of an idea pauses, and a snapshot can be taken of it that can be readily understood by those who view it. At that point, the idea is a mental representation that, while not fully developed, can be communicated. Further, a particle approach lends itself to differential and comparative questions where, for example, people's creative

output or the effectiveness of different procedures or settings need to be assessed and/or

compared. In contrast, we suggest that the wave view is most appropriate for understanding how

ideas develop, evolve, and change over time and how they may be interpreted and used in

different ways. A wave view fits well with questions regarding interpersonal processes over time

within or between groups. During those processes, ideas are enacted representations

communicated through interaction, that may be diversely interpreted or contested. Underlying

these suggestions are two questions that determine when to apply a particle or a wave view: 1)

whether we want to capture and study changes or stability in ideas, and 2) whether an idea can be

commonly understood by various stakeholders, such as collaborators and audiences.

Do we want to capture and study change or stability? Researchers need to consider

whether they want to capture ongoing evolution in an idea or whether the idea is in a relatively

stable state. Our review of research on brainstorming, creativity, networks, entrepreneurial

ventures, and innovation showed that by treating ideas as bounded and discrete, researchers

imply that there are points in the creative process when ideas are stable and can be captured. For

researchers, it is important to identify points where ideas reach a natural resting point—for

example, when an idea is first *generated* and expressed, as captured in brainstorming research

that asks participants to write ideas down; when it is *shared*, as captured in entrepreneurship

research that examines how entrepreneurs get feedback on pitches or resources from IPOs; when

it is *materialized*, as captured in innovation research that looks at tangible output such as

research papers or patents; or when it is *stored* for future use, as captured by idea and innovation

management research. At those points, ideas can be compared because they are relatively stable

and crystallized. For example, it makes sense to examine which entrepreneurial ventures are most likely to obtain investment at a given point in time based on their pitches, because the pitch represents the idea at a point where it is stable enough to be persuasively communicated.

Our review of research on design, knowledge creation, and creative work, in contrast, showed that those subdisciplines are interested in processes and interactions that occur while ideas are in flux—for instance, before there is *consensus* about them or while creators are *developing* them. Those subdisciplines ask questions aimed at understanding the processes of emergence, of conflict and consensus building, and of change or development. For example, design research aims to understand how solutions to ill-defined problems evolve (Buchanan, 1992; Inie & Dalsgaard, 2017), often through the way that designers interact with material objects like mood boards or drawings. It makes sense to explore such questions from a wave view, because it is difficult to know at what point a sketch or drawing 'becomes an idea'. Even if researchers took the finished sketch as a resting point, they could not observe how the idea developed from looking at it because the sketch "is also changed and developed, as the idea is being articulated and developed", and what is observed is not a mere illustration of an idea but "a conversation between the designer and the drawing" (Ewenstein & Whyte, 2007: 698). In these studies, researchers need to be mindful of applying a particle view to a wave research question, for example, by arbitrarily segmenting interactions or dialogues into ideas or becoming too fixated on ideas as focal objects at times when ideas do not have stable identities, thus missing the important activities around ideas. Instead, they would probably need to study the idea in flux.

One challenge is for researchers with a predominant approach, who want to ask questions better suited to the alternative view, to supplement their understanding and learn to adequately adopt the other view. For instance, researchers across both approaches increasingly acknowledge the fundamental messiness of the creative process. Attempting to capture that messiness from a particle view is inherently limiting. However, adopting the questions and methods of the alternative view alone will not be enough to uncover the wholeness of the phenomenon. For example, a researcher embedded in the particle view who turns to questions about the process of idea development is likely to focus more narrowly on how ideas mature, as the particle view assumes that they become more elaborated and polished if and when they change over time (e.g., Berg, 2016). From a wave view, however, ideas can move in different directions—they may become more ambiguous or less well suited for a given problem over time. A particle-oriented researcher may not expect or look for those directions, and hence they might be missed, ignored, or considered to be errors or deviations. Likewise, even in an ongoing creative process that would typically be studied from a wave view, there will be moments where creators will engage with ideas in a more or less stable state. For example, theatrical or musical improvisations may eventually crystallize into drafts of pieces, which requires some decision-making as to which ideas to retain. This means that creators must be able to identify and discuss ideas. Studying these discussion and decision-making processes might benefit from adopting more of a particle view. As such, this situation is somewhat comparable to discourse analysis (e.g., Graesser, Millis, & Zwaan, 1997), where the emphasis is not on individual linguistic elements, but on the whole of a conversation as it unfolds over time – and yet, sometimes individual speech acts are

studied in isolation, and some questions can only be answered by focusing on specific utterances or even discrete elements of utterances.

Importantly, it will not always be clear when it might be helpful or necessary to consider shifting to another view, because researchers may disregard certain phenomena as 'error' within their default paradigm. An example of this was discussed above (Rietzschel et al., 2006), where idea selection was studied from a strong particle view, thus posing difficulties when participants displayed behaviors (e.g., combining ideas into new ones during the selection phase) that did not fit this approach. Rather than treating this as 'error' or 'noise' in the data, researchers confronted with such unruly responses might realize that these were instances of ideas in flux, and that a wave view might be more helpful in uncovering and describing the dynamics of those behaviors. Conversely, when working in a more wave-oriented tradition, ideas at rest may not seem the most interesting things to focus on, because these do not capture the dynamics of the process and thus stability might be mistaken for stasis. However, these temporarily stable ideas may contain crucial information about where the process is and may well play a decisive role in where the process will go afterwards – such as when a group or team takes stock of the ideas that have been floating around in various forms, in order to decide which ones to drop or pursue.

Can the idea be commonly understood by various stakeholders? In deciding if the particle or wave view is more appropriate, researchers also need to consider whether people working on or considering the idea have (or can develop) a shared perception of the nature and content of the idea. A particle view is generally more suited for answering questions about creativity when this is indeed the case. For example, since in brainstorming studies ideas tend to

be brief and specific statements (e.g., 'make textbooks available online'), there is less ambiguity or less need to integrate different interpretations and it is sensible to assume that an idea can be commonly understood. Our review showed how brainstorming studies often take this approach by asking a set of raters to judge and agree on their semantic content, novelty, or usefulness. Similarly, a particle approach can be useful where people receiving ideas can be assumed to have an equal ability to understand the idea. For example, innovation research that uses measures of impact like citation counts of published papers assumes that other scientists have a similar understanding of those papers, even if their judgments of the value of the ideas may differ. Where those considering an idea similarly have a reasonable level of expertise in a given subject, that assumption is likely to hold—for example, organizational members from the same department, performing the same function, who make suggestions for a procedural change are likely to share a similar understanding of the idea.

Yet, organizational members who hold different specialized functions, and therefore have different levels of expertise in a domain, may not understand the idea in the same way. When there is no common understanding to guide people's interpretation of an idea, it may be more appropriate to adopt a wave view, as is the case with many studies of creative work, design, and knowledge creation, which view ideas as being located in the interactions between people, where those interactions shape and create new meaning. A wave view further implies that it is the very fact that people diverge in their understandings that allows new ideas to emerge (e.g., Majchrzak et al., 2012; Tsoukas, 2009). This view thus allows researchers to investigate research questions concerning how consensus is built and emerges around what the idea is (e.g., Drazin et al., 1999;

Harvey & Mueller, 2021). In addition, questions around how ideas develop may be suited to a wave view, because while an idea is developing and creators disagree over it, they are unlikely to share a common understanding of it.

A challenge in deciding which view to adopt is that the extent to which an idea is open to interpretation is not often easily or cleanly determined, as it depends on many factors and can change during the creative process. For example, an idea for a piece of art may be more open to interpretation than an idea for a scientific manuscript. It will also vary depending on context; for example, the expertise of the audience will influence their ability to understand the idea. Similarly, where the idea is in its developmental trajectory will influence whether it can be commonly understood, with vague, emergent ideas being more open to interpretation than detailed ideas that are close to implementation. At some point, an idea becomes agreed upon, and at that point it transitions to an outcome or product, like new knowledge that is articulated in a research paper or a stream of research that converges, or a finished prototype for a new product. However, the knowledge may transition back to an idea when an expert from another field challenges it, reopening the knowledge to interpretation. In deciding which view to utilize, the more interpretative degrees of freedom there are for a given idea, the more likely it is that a wave view is appropriate: ideas that are highly open to interpretation (and which cannot be said to have one specific meaning or content) cannot as fruitfully be studied in isolation, nor can they be sensibly coded or rated (e.g., for content or quality) in a context-and rater-independent way.

Using the Duality to Reconcile Apparent Conflicts in the Literature

The second principle we propose for using the wave-particle duality is that, since both are

necessary to understand the phenomenon, they should not be framed as competing views. There

are instances where the literature may *appear* to be in conflict. For example, if we had assumed a

dichotomy in our discussion above regarding when ideas are in flux and when they can be

commonly understood, the particle and wave views would seem to be in competition. These

issues are easily perceived or framed as conflicts when, in fact, it is the dual nature of ideas that

creates a disconnect. This may also be partly because the wave view is often framed as a reaction

against or as an alternative to the dominant particle view (Glăveanu, 2014). That is limiting in at

least two interrelated ways. First, it means that the wave view highlights what ideas are *not* (e.g.,

not discrete, not stable) rather than explaining what ideas *are*. Second, it makes it difficult to

understand how particle researchers can use the wave view in their research. We elaborate two

such disconnects below, revolving around (a) the product versus process view of creativity and

innovation, and (b) comparing the magnitude of ideas.

Product versus process. Prior work has debated the value of focusing on the products

that result from a creative process or on the process that produces them (Simonton, 2003). Our

duality suggests that this is a false dichotomy, showing how both are critical for understanding

ideas, but also disentangles the two. In its most extreme form, because the particle view

emphasizes capturing, measuring, and comparing ideas, it implies that the process for producing

those particles need not be studied at all—that is, a meaningful understanding of ideas can be

obtained by considering the ideas themselves, the inputs into them, and perhaps the context

surrounding them. However, even where process is considered, research on creativity and

innovation assumes that only those processes that result in ideas judged to be creative or innovative are worth considering (e.g., Leavitt, 1963; Baer, 2012). From a wave view, however, that exclusive focus does not make sense, because wave ideas cannot be readily captured, compared, and judged. Instead, the wave view suggests that whether an idea is in the process of developing itself is important; even if something judged to be creative never develops.

This means that as a community, we need to expand research to cover all processes of developing ideas, not only those for producing a creative idea. For instance, rather than asking how people generate and select ideas that are high in novelty and usefulness (e.g., Rietzschel, Nijstad, & Stroebe, 2010; Mueller et al., 2012), we should also ask how people engage in creative work *in situ*, as is more common in studies of creative work (e.g., Svejenova et al., 2010; Long-Lingo & O'Mahony, 2010). Expanding our understanding of process is important because that research uncovers parts of the process that had not been previously theorized about or studied, such as collaboration (Harrison & Rouse, 2014; Vera & Crossan, 2005) and problem construction (Getzels, 1979). Those processes may be critical to ideas, but less directly tied to specific ideas. They may therefore be obscured from studies of novel and useful ideas.

At the same time, however, once we expand our view of the processes involved in developing ideas, we may want to systematically capture and compare some aspects of those processes and how ideas associate with them at different stages. The particle view can thus subsequently expand the wave view to capture the fullness of this phenomenon. This calls for greater attention to how the particle and wave view can be productively combined, rather than cast against one another. This is illustrated by research on feedback. Dominant models of the

creative process omit feedback as stage in the creative process (e.g., Amabile, 1996). Studies on

creative work (Harrison & Rouse, 2015) and entrepreneurship (Grimes, 2018) have shown that

whereas feedback does not dominate any stage, it is intertwined throughout. Yet, how to

incorporate it into stage models is unclear—including it as a distinct stage or treating it as an

input to other stages of activity may not represent the phenomenon well. Instead, it may be that

feedback is how the idea actually forms—it may *be* idea generation or evaluation, rather than

something that fuels those processes. Research is needed to disentangle those options.

 Comparing the magnitude of ideas. Scholars have also debated whether to study major,

radical ideas that depart from the status quo or to include daily acts of creativity in research

(Merrotsy, 2013). This debate revolves around the question of which creative expressions count

as 'ideas'. Individual moments of creative insight during a learning process, which Kaufman and

Beghetto (2009) labeled 'mini-c' creativity, are rarely studied as ideas; yet, they overlap

considerably with a wave view of ideas. The duality framework suggests that whether some

creative acts, insights, or experiences 'count' as ideas presents a false dichotomy (see also

Runco, 2014). Our review revealed how, from a wave view, quotidian acts of creativity such as

reframing or reinterpreting another creator's comment (Tsoukas, 2009) represent development of

an idea; but it does not make sense to compare the magnitude of such moments, because how can

one know whether they are comparable? If we keep the wave-particle duality in mind, we can

avoid comparing across things that are, in effect, incomparable. Moreover, if creativity is a

judgement or reaction from others, then we can only see the magnitude of creative outputs when

the wave has 'finished' (and others have responded). Thus, to study whether something is big C

or little c (or mini-c) is really to study the way that others have responded to and judged ideas (cf. Csikszentmihalyi, 1999). The 'meaning' and 'quality' of an idea, in this view, are not exclusively located within the idea itself but emerge from the interaction of the idea with other observers, cocreators, stakeholders, and so on.

Using the Duality Framework to Expand Our Understanding of Ideas

The third principle we propose in applying the wave-particle duality is that the two views should be used to expand the scope of research on ideas, creating new possibilities for research. We propose three ways that our understanding of ideas can be expanded: points considered in the creative process, forms of creativity studied, and expanded conversations with practitioners.

Expanding the number of points studied in the creative process. Applying the particle view to research that adopts a wave view suggests that there may be additional points where ideas could be captured and meaningfully studied. Consider some particle ideas that existing research might examine—a novelist is inspired by a landscape and jots down a note for a book; an employee suggests a new training program during a conversation with a manager; an improvisational group agrees a theme for a performance. In each example, creators have reached a temporary end point—the note, the training program, and the theme could all be examined as particle ideas and variance in their quantity or quality could be studied. Yet, there are more points to consider in the process than is typically recognized. The note is a resting point until the novelist returns to it, when it may get fleshed out into a full concept that is passed on to an agent; it then reaches another temporary resting point. The training program can be considered a particle when it is suggested, or when it is recognized by the manager.

Ideas considered at different points lend themselves to different questions. For example, we can ask which of all the suggested ideas a manager takes into consideration, or we can ask which of the ideas are evaluated as novel or useful. Points worthy of study that have received less attention in prior research include moments when a problem is first presented, when creators begin to interact with materials (e.g., when they begin sketching an idea out), or when creative activity pauses (e.g., when there is a creative block). By considering the full range of places in the process where ideas are temporarily stable, future research can open new points to study.

These examples also illustrate that researchers who traditionally adopt a particle view should consider at what point they are capturing an idea. Our review has shown how prior research captures ideas at different points in their development—innovation research captures them when they are implemented in prototypes or products, creativity research captures them when they are first discussed with managers or peers, and brainstorming research captures them when they are first generated. For the purpose of theorizing about ideas, those points have been treated as if they are equal. For example, brainstorming research typically treats the point at which groups move from generating ideas to implementation in a form like a sketch or prototype as the end of idea generation, whereas design research would consider sketching ideas or developing prototypes as part of the idea generating process. This is also evident across literatures—an idea considered ready for implementation can actually look very different in a creativity and an innovation study and are thus not necessarily comparable. These are different interim endpoints, and it is problematic to treat them as interchangeable.

Expanding the forms and value of ideas studied. One striking observation from our review is that ideas come in many forms, with some forms more prevalent in a particle view and others more so in a wave view. Attending to both views can lead to new insights on how ideas cycle through different forms and their influence on other organizationally important processes (e.g., different forms require different types of championing to be accepted). Amongst the studies we reviewed, forms include: vague intentions (e.g. Obstfeld, 2012; Bird, 1998), moods or feelings (e.g., Stigliani & Ravasi, 2012; Stephens, 2020), performances (e.g., Sawyer, 1998), new ways of seeing (e.g., Uzzi & Spiro, 2005; Hargadon & Bechky, 2006), and concrete outputs (e.g., Singh & Fleming, 2010). Some research treats particular forms as distinct manifestations of creativity—for example, emphasizing the unique nature of improvisational creativity (Fisher & Barrett, 2019) or physical prototypes (Carlile, 2002); for the most part, however, differences in form have been described as elaborations that do not substantively change the idea.

Our review suggests that attending to differences in forms may be insightful for understanding ideas and their development, and provides a way to understand differences between forms as combinations of the defining features of ideas. For instance, research to date generally focuses on situations where the form of a final idea to be generated is known by creators—such as when creators are asked to produce an idea for a new product or service (e.g., Berg, 2019; Goncalo & Staw, 2005)—but it may be productive to consider situations where the task or goal is open-ended. For example, research may consider how not knowing the final form of an idea shapes the way creators engage with that idea. A further opportunity is to consider when, why, and how forms change over time.

Finally, existing research excludes some potential ideas by focusing on new ideas and adopting a strong particle view of what ideas are. Whereas the strong consensus that creativity is the production of ideas that are both novel and useful has greatly benefited creativity research (Amabile, 1983; George, 2007; Hennessey, Amabile, & Mueller, 2010; Woodman et al., 1993), it also implies that those ideas that are *not* new have no value and are not worthy of study. Paradoxically, that criterion has devalued activities that are clearly in the domain of creativity or innovation, but that may struggle to meet the novelty criterion, including more mundane activities within the creative industries (e.g., Caves, 2000), personal expressions of creativity (e.g., McNiff, 2015), or activities that lay people would consider to be creative (e.g., Glăveanu, 2014). Indeed, much of what lay people consider creative is craft that they are unfamiliar with (e.g., a novel and interesting sounding guitar solo may be an established scale or riff). Consider, for example, actors, singers, orchestra musicians, chefs, artisan bakers, choir members, hobby knitters; although all of these examples involve some novelty—such as to interpret and act out a role or to choose how to season a recipe one is reproducing. However, the dominant creativity paradigm would either not consider these to be ideas at all (e.g., a new musical composition is an idea, but one's interpretation in playing an existing composition is not seen as an idea) or incremental changes that may be uninteresting to study.

The wave-particle duality broadens the scope of where to look for ideas, demonstrating that creative endeavors involving creative expression rather than creative production also involve ideas. When one acts out a scene from Shakespeare, she embodies a representation of a character and an action that is open to interpretation as it is communicated to the audience; while knitting,

one not only develops a material representation of a pattern that is unfinished until the final stitch is made, but also interacts with the physical materials in a way that may change his perception of the task and its outcome. These are all legitimate phenomena of study for understanding how ideas emerge, develop and change, where they are located, and who develops them. A core finding of our work, then, is that ideas need not be novel—in fact, for most of history, novelty was not considered to be an important feature of ideas. Novelty has primarily been considered important because only novel ideas are thought to have economic value. Our review suggests a shift from studying creativity to studying ideas.

Better informing research-practice conversations. Much research in creativity and innovation has an applied focus. However, like other fields in psychology and management, a research-practice gap is visible here (e.g., Benedek et al., 2021; Rainone et al., 2021). Creativity researchers and practitioners, although their goals and interests are aligned, do not always approach the field with the same set of assumptions or questions. This can lead to an unsatisfactory mismatch in, for example, the way that research results are interpreted and used to inform practice—or the way creative techniques and interventions are assessed or studied. Being aware of, and making explicit, the wave or particle assumptions researchers and practitioners bring to their communications could lead to a more informed conversation and better progress on both sides of the divide.

A good example of a research-practice mismatch is the field of brainstorming. Ever since Osborn's (1953) original claim that people would be more productive when working in a group than when working alone, researchers have been testing and refuting this claim, and devising

social-cognitive models of the process to explain productivity loss in groups (see Stroebe, Nijstad, and Rietzschel, 2010, for an overview). The general conclusion of this research is that group brainstorming does not work, since people are less productive when brainstorming in groups without measures to avoid production blocking, like electronic brainstorming. The underlying assumption is that the effectiveness of group brainstorming is best measured in terms of number of ideas generated (a particle view), since this is what the technique was intended to stimulate, and, by extension, presumably the reason practitioners *use* brainstorming. In practice, however, this is far from obvious. Sutton and Hargadon (1996) found that brainstorming was used for a variety of purposes, many of which did not link with ideational fluency, such as developing stronger group transactive memory. Isaksen (1998) argues that, although research on group brainstorming has produced important insights regarding group processes and idea generation, most of this research does not constitute an actual test of brainstorming's effectiveness as an ideational tool, since studies differ so strongly from the way brainstorming is used in practice (for example, problems are presented to research participants, whereas they are usually discovered or developed in practice). These criticisms suggest that the research-practice gap in brainstorming may be partly due to the strong particle approach adopted in brainstorming research, which does not correspond with the more dynamic and process-based approach taken by practitioners. The result of this mismatch is that both researchers and practitioners seem dissatisfied with the state of things: researchers wonder why brainstorming remains so popular, and practitioners wonder why researchers insist on using an impoverished version of the task.

The wave-particle duality could help to resolve such debates and mutual dissatisfaction, because it would allow both sides to identify their own and the other's assumptions, as well as the limitations that result from these assumptions. A particle approach is highly suitable for testing claims regarding ideational fluency, but may not work as well to assess effectiveness on other, more process-based outcomes; moreover, adopting a particle approach requires structuring the creative task in such a way that ideas can be counted and coded. However, this may preclude more dynamic processes involving problem discovery and the combination, refinement, or development of ideas. Conversely, maintaining a strict wave view means that certain problems (such as production blocking in brainstorming groups, or differences in ideational fluency between groups working under different circumstances) are not –and probably cannot be– addressed, which can lead to missed opportunities for improving practice. Thus, a mutually informative conversation between research and practice could benefit from a more explicit consideration of the duality identified and analyzed in this paper.

CONCLUSION

In this review, we have explored the ways ideas have been conceptualized and operationalized across disciplines. The wave-particle duality framework we developed to integrate across disciplines aims to further research on ideas and to the development of sound practices for generating and assessing ideas. Creative ideas remain essential to any change process, be it organizational, personal, or societal. Just as builders need deep knowledge of the kinds of bricks they are working with (to take a particle-oriented metaphor), those involved in

creative change will benefit from a deeper understanding of the units of ideation they hope to

encounter, elicit, encourage, and ultimately build upon. Our hope is that this review provides that

foundation and helps to integrate research on ideas across the different fields of research.

REFERENCES

Akbar, H. 2003. Knowledge levels and their transformation: Towards the integration of knowledge creation and individual learning. *Journal of Management Studies*, 40(8): 1997–2021.

Alksher, M. A., Azman, A., Yaakob, R., Kadir, R. A., Mohamed, A., et al. 2016. A review of methods for mining idea from text. *2016 Third International Conference on Information Retrieval and Knowledge Management (CAMP)*, 88–93. Malacca, Malaysia: IEEE.

Almkvist, J. 2009. *Radical innovation: A new approach to creative product development at AB Sandvik Coromant*. Luleå University of Technology.

Amabile, T. M. 1982. Social psychology of creativity: A consensual assessment technique. *Journal of Personality and Social Psychology*, 43(5): 997–1013.

Amabile, T. M. 1988. A model of creativity and innovation in organizations. *Research in Organizational Behavior*, 10(1): 123–167.

Amabile, T. M. 1996. *Creativity in context: Update to "The Social Psychology of Creativity."* Boulder, CO: Westview Press.

Amabile, T. M., & Pratt, M. G. 2016. The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, 36: 157–183.

Anderson, N., Potočnik, K., & Zhou, J. 2014. Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework. *Journal of Management*, 40(5): 1297–1333.

Anderson, P., & Tushman, M. L. 1990. Technological discontinuities and dominant designs: A cyclical model of technological change. *Administrative Science Quarterly*, 35(4): 604–633.

Argyris, C. 1976. Single-loop and double-loop models in research on decision making. *Administrative Science Quarterly*, 21(3): 363–375.

Arreola, N., & Reiter-Palmon, R. 2016. The effect of problem construction creativity on solution creativity across multiple everyday problems. *Psychology of Aesthetics, Creativity, and the Arts*, 10(3): 287–295.

Audia, P. G., & Goncalo, J. A. 2007. Past success and creativity over time: A study of inventors in the hard disk drive industry. *Management Science*, 53(1): 1–15.

Baas, M., Koch, S., Nijstad, B. A., & De Dreu, C. K. W. 2015. Conceiving creativity: The nature and consequences of laypeople's beliefs about the realization of creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 9(3): 340–354.

Baer, J. M. 1988. Long-term effects of creativity training with middle school students. *The Journal of Early Adolescence*, 8(2): 183–193.

Baer, M. 2012. Putting creativity to work: The implementation of creative ideas in organizations. *Academy of Management Journal*, 55(5): 1102–1119.

Baer, M., & Brown, G. 2012. Blind in one eye: How psychological ownership of ideas affects the types of suggestions people adopt. *Organizational Behavior and Human Decision Processes*, 118(1): 60–71.

Baer, M., Oldham, G. R., & Cummings, A. 2003. Rewarding creativity: When does it really matter? *The Leadership Quarterly*, 14(4–5): 569–586.

Baron, R. A., & Ensley, M. D. 2006. Opportunity recognition as the detection of meaningful patterns: Evidence from comparisons of novice and experienced entrepreneurs. *Management Science*, 52(9): 1331–1344.

Beaty, R., & Silvia, P. 2012. Why do ideas get more creative across time? An executive interpretation of the serial order effect in divergent thinking tasks. *Psychology of Aesthetics Creativity and the Arts*, 6: 309–319.

Bechky, B. A. 2003. Sharing meaning across occupational communities: The transformation of understanding on a production floor. *Organization Science*, 14(3): 312–330.

Becker, H. S. 1982. *Art Worlds*. Berkeley and Los Angeles: University of California Press.

Benedek, M., Borovnjak, B., Neubauer, A. C., & Kruse-Weber, S. 2014. Creativity and personality in classical, jazz and folk musicians. *Personality and Individual Differences*, 63: 117–121.

Ben-Menahem, S. M., Von Krogh, G., Erden, Z., & Schneider, A. 2016. Coordinating knowledge creation in multidisciplinary teams: Evidence from early-stage drug discovery. *Academy of Management Journal*, 59(4): 1308–1338.

Bereiter, C., & Scardamalia, M. 2014. Knowledge building and knowledge creation: One concept, two hills to climb. In S. C. Tan, H. J. So, & J. Yeo (Eds.), *Knowledge Creation in Education*: 35–52. Singapore: Springer Singapore.

Berg, J. 2014. The primal mark: How the beginning shapes the end in the development of creative ideas. *Organizational Behavior and Human Decision Processes*, 125: 1–17.

Berg, J. 2016. Balancing on the creative highwire: Forecasting the success of novel ideas in organizations. *Administrative Science Quarterly*, 61(3): 433–468.

Berg, J. 2019. When sliver is gold: Forecasting the potential creativity of initial ideas. *Organizational Behavior and Human Decision Processes*, 154: 96–117.

Bird, B. 1988. Implementing entrepreneurial ideas: The case for intention. *The Academy of Management Review*, 13(3): 442.

Biscaro, C., & Comacchio, A. 2018. Knowledge creation across worldviews: How metaphors impact and orient group creativity. *Organization Science*, 29(1): 58–79.

Blackburn, S. 2016. *The Oxford dictionary of philosophy* (Third edition). Oxford: Oxford University Press.

Boas, G. 1974. Ideas. (P. Wiener, Ed.)*Dictionary of the History of Ideas (Vol. 2)*. Scrobner.

Borghi, A. M., Binkofski, F., Castelfranchi, C., Cimatti, F., Scorolli, C., et al. 2017. The challenge of abstract concepts. *Psychological Bulletin*, 143(3): 263–292.

Bracha, O. 2016. *Owning Ideas: The Intellectual Origins of American Intellectual Property, 1790-1909*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9780511843235.

Brem, A., & Voigt, K.-I. 2009. Integration of market pull and technology push in the corporate front end and innovation management—Insights from the German software industry. *Technovation*, 29(5): 351–367.

Bridgman, P. 1927. *The Logic of Modern Physics*. New York: Macmillan.

Briggs, R. O., & Reinig, B. A. 2007. Bounded ideation theory: A new model of the relationship between idea quantity and idea-quality during ideation. *2007 40th Annual Hawaii International Conference on System Sciences (HICSS'07)*, 16–16. IEEE.

Brophy, D. R. 1998. Understanding, measuring, and enhancing individual creative problem-solving efforts. *Creativity Research Journal*, 11(2): 123–150.

Brown, T. 2008. Design thinking. *Harvard Business Review*, 86(6): 84–932.

Bruza, P. D., Wang, Z., & Busemeyer, J. R. 2015. Quantum cognition: A new theoretical approach to psychology. *Trends in Cognitive Sciences*, 19(7): 383–393.

Buchanan, R. 1992. Wicked problems in design thinking. *Design Issues*, 8(2): 5.

Burkhardt, M. E. 1994. Social interaction effects following a technological change: A longitudinal investigation. *The Academy of Management Journal*, 37(4): 869–898.

Burt, R. S. 1992. *Structural holes: The social structure of competition*. Cambridge, Mass: Harvard University Press.

Campbell, D. T. 1960. Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes. *Psychological Review*, 67(6): 380–400.

Capaldo, A. 2007. Network structure and innovation: The leveraging of a dual network as a distinctive relational capability. *Strategic Management Journal*, 28(6): 585–608.

Carland, J. W., Hoy, F., Boulton, W. R., & Carland, J. A. C. 1984. Differentiating entrepreneurs from small business owners: A conceptualization. *The Academy of Management Review*, 9(2): 354–359.

Carlile, P. R. 2002. A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science*, 13(4): 442–455.

Carroll, L. 1876. *The hunting of the snark: An agony in eight fits*. London, UK: MacMillan.

Charmaz, K. 2014. *Constructing grounded theory*. SAGE.

Christensen, P. R., Guilford, J. P., Merrifield, R. P., & Wilson, R. C. 1960. *Alternate uses*. Beverly Hills, CA: Sheridan Psychological Service.

Ciriello, R. F., Richter, A., & Schwabe, G. 2017. When prototyping meets storytelling: Practices and malpractices in innovating software firms. *2017 IEEE/ACM 39th International Conference on Software Engineering: Software Engineering in Practice Track (ICSE-SEIP)*, 163–172.

Cohen, M. N. 1995. *Lewis Carroll: A biography*. London, UK: MacMillan.

Coldevin, G. H., Carlsen, A., Clegg, S., Pitsis, T. S., & Antonacopoulou, E. 2018. Organizational creativity as idea work: Intertextual placing and legitimating imaginings in media development and oil exploration. *Human Relations*.

Cook, S. D. N., & Brown, J. S. 1999. Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. *Organization Science*, 10(4): 381–400.

Craig, T. Y., & Kelly, J. R. 1999. Group cohesiveness and creative performance. *Group Dynamics: Theory, Research, and Practice*, 3(4): 243–256.

Cray, W. D., & Schroeder, T. 2015. An ontology of ideas. *Journal of the American Philosophical Association*, 1(4): 757–775.

Crilly, N. 2018. 'Fixation' and 'the pivot': Balancing persistence with flexibility in design and entrepreneurship. *International Journal of Design Creativity and Innovation*, 6(1–2): 52–65.

Cronin, M. A., & George, E. 2020. The why and how of the integrative review. *Organizational Research Methods*, 109442812093550.

Cronin, M. A., & Loewenstein, J. 2018. *The craft of creativity*. Stanford University Press.

Cross, N. 1982. Designerly ways of knowing. *Design Studies*, 3(4): 221–227.

Cross, N. 2007. From a design science to a design discipline: Understanding designerly ways of knowing and thinking. In R. Michel (Ed.), ***Design Research Now: Essays and Selected Projects***: 41–54. Basel: Birkhäuser.

Dailey, L., & Mumford, M. D. 2006. Evaluative aspects of creative thought: Errors in appraising the implications of new ideas. ***Creativity Research Journal***, 18(3): 385–390.

Damanpour, F., & Schneider, M. 2006. Phases of the adoption of innovation in organizations: Effects of environment, organization and top managers. ***British Journal of Management***, 17(3): 215–236.

Davidsson, P. 2015. Entrepreneurial opportunities and the entrepreneurship nexus: A re-conceptualization. ***Journal of Business Venturing***, 30(5): 674–695.

De Dreu, C. K. W., & West, M. A. 2001. Minority dissent and team innovation: The importance of participation in decision making. ***Journal of Applied Psychology***, 86(6): 1191–1201.

de Vaan, M., Stark, D., & Vedres, B. 2015. Game changer: The topology of creativity. ***American Journal of Sociology***, 120(4): 1–51.

de Vreede, G.-J., Briggs, R. O., & Reiter-Palmon, R. 2010. Exploring asynchronous brainstorming in large groups: A field comparison of serial and parallel subgroups. ***Human Factors***, 52(2): 189–202.

Dewey, J. 1938. ***Logic: The Theory of Inquiry***. New York: Henry Holt and Company.

Diehl, M. 1991. ***Kollektive kreativität: Zur quantität und qualität der ideenproduktion in kleingruppen [Collective creativity: On quantity and quality of idea production in small groups]***. University of Tübingen, Germany.

Diehl, M., & Stroebe, W. 1987. Productivity loss in brainstorming groups: Toward the solution of a riddle. ***Journal of Personality and Social Psychology***, 53(3): 497–509.

Doboli, S., & Brown, V. R. 2010. An emergent attractors model for idea generation process. ***The 2010 International Joint Conference on Neural Networks (IJCNN)***, 1–8. Barcelona, Spain: IEEE.

Duncker, K. 1945. ***On problem-solving. (Psychological Monographs, No. 270.)***. Washington, DC, US: American Psychological Association.

Elsbach, K. D. 2009. Identity affirmation through "signature style": A study of toy car designers. (B. Townley, N. Beech, A. McKinlay, & G. Fairhurst, Eds.)***Human Relations***, 62(7): 1041–1072.

Elsbach, K. D., & Kramer, R. M. 2003. Assessing creativity in Hollywood pitch meetings: Evidence for a dual-process model of creativity judgments. ***Academy of Management Journal***, 46(3): 283–301.

Elsbach, K. D., & Van Knippenberg, D. 2020. Creating high-impact literature reviews: An argument for 'integrative reviews.' ***Journal of Management Studies***, 57(6): 1277–1289.

Endrissat, N., & Noppeney, C. 2013. Materializing the immaterial: Relational movements in a perfume's becoming. In P. R. Carlile, D. Nicolini, A. Langley, & H. Tsoukas (Eds.), ***How Matter Matters***: 58–91. Oxford University Press.

Ewenstein, B., & Whyte, J. 2007. Beyond words: Aesthetic knowledge and knowing in organizations. ***Organization Studies***, 28(5): 689–708.

Fancher, R. E., & Rutherford, A. 1979. ***Pioneers of Psychology***. WW Norton & Co.

Feldman, M. S., & Orlikowski, W. J. 2011. Theorizing practice and practicing theory. ***Organization Science***, 22(5): 1240–1253.

Fennell, M. L. 1984. Synergy, influence, and information in the adoption of administrative innovations. *The Academy of Management Journal*, 27(1): 113–129.

Finke, R. A., Ward, T. B., & Smith, S. M. 1992. *Creative cognition: Theory, research, and applications*. Cambridge, MA: Bradford/MIT Press.

Fisher, C. M., & Amabile, T. 2008. Creativity, improvisation and organizations. In M. Runco, S. Moger, & T. Rickards (Eds.), *The Routledge Companion to Creativity*. Routledge.

Fisher, C. M., & Barrett, F. J. 2019. The experience of improvising in organizations: A creative process perspective. *Academy of Management Perspectives*, 33(3): 148–162.

Fisher, C. M., Pillemer, J., & Amabile, T. M. 2018. Deep help in complex project work: Guiding and path-clearing across difficult terrain. *Academy of Management Journal*, 61(4): 1524–1553.

Fleming, L., Mingo, S., & Chen, D. 2007. Collaborative Brokerage, Generative Creativity, and Creative Success. *Administrative Science Quarterly*, 52(3): 443–475.

Florida, R. 2002. *The Rise of the Creative Class*. Hachette UK.

Ford, C. M. 1996. A theory of individual creative action in multiple social domains. *The Academy of Management Review*, 21(4): 1112–1142.

Förster, J., Friedman, R. S., & Liberman, N. 2004. Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology*, 87(2): 177–189.

Gallupe, R. B., Dennis, A. R., Cooper, W. H., Valacich, J. S., Bastianutti, L. M., et al. 1992. Electronic brainstorming and group size. *Academy of Management Journal*, 35(2): 350–369.

Gardner, L. 2011. Review of Tim Burton: The monster and the crowd—A post-Jungian perspective. *International Journal of Jungian Studies*, 3(2): 208–212.

Garud, R., Tuertscher, P., & Van de Ven, A. H. 2013. Perspectives on innovation processes. *Academy of Management Annals*, 7(1): 775–819.

George, J. M. 2007. Creativity in organizations. *The Academy of Management Annals*, 1(1): 439–477.

Getzels, J. 1975. Problem-finding and the inventiveness of solutions. *The Journal of Creative Behavior*, 9(1): 12–18.

Ghanem, A. G., Minai, A. A., & Uber, J. G. 2010. A multi-agent model for the co-evolution of ideas and communities. *IEEE Congress on Evolutionary Computation*, 1–8. Barcelona, Spain: IEEE.

Gilson, L. L., & Litchfield, R. C. 2017. Idea collections: A link between creativity and innovation. *Innovation*, 19(1): 80–85.

Gilson, L. L., & Madjar, N. 2011. Radical and incremental creativity: Antecedents and processes. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1): 21–28.

Gino, F., Argote, L., Miron-Spektor, E., & Todorova, G. 2010. First, get your feet wet: The effects of learning from direct and indirect experience on team creativity. *Organizational Behavior and Human Decision Processes*, 14.

Glaveanu, V., & Kaufman, J. 2019. Creativity: A historical perspective. *The Cambridge Handbook of Creativity*: 9–26. Cambridge: Cambridge University Press.

Glăveanu, V. P. 2014a. Revisiting the "art bias" in lay conceptions of creativity. *Creativity Research Journal*, 26(1): 11–20.

Glăveanu, V. P. 2014b. The psychology of creativity: A critical reading. *Creativity*, 1(2): 10–32.

Glier, M. W., Tsenn, J., Linsey, J. S., & McAdams, D. A. 2014. Evaluating the directed intuitive approach for bioinspired design. *Journal of Mechanical Design*, 136(7): 071012.

Godin, B. 2015. *Innovation Contested: The Idea of Innovation Over the Centuries*. New York, US: Routledge.

Goncalo, J. A., & Staw, B. M. 2006. Individualism–collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, 100(1): 96–109.

Graesser, A., Milis, K. K., & Zwaan, R. A. 1997. Discourse comprehension. *Annual Review of Psychology*, 48(1): 163–189.

Graham, D. W. 2019. Heraclitus. (Z. Edward N, Ed.)*The Stanford Encyclopedia of Philosophy (Fall 2019 Edition)*.

Grégoire, D. A., Barr, P. S., & Shepherd, D. A. 2010. Cognitive processes of opportunity recognition: The role of structural alignment. *Organization Science*, 20.

Grimes, M. G. 2018. The pivot: How founders respond to feedback through idea and identity work. *Academy of Management Journal*, 61(5): 1692–1717.

Guilford, J. P. 1950. Creativity. *American Psychologist*, 5(9): 444–454.

Guilford, J. P. 1967. Creativity: Yesterday, Today and Tomorrow. *The Journal of Creative Behavior*, 1(1): 3–14.

Gurteen, D. 1998. Knowledge, creativity and innovation. *Journal of Knowledge Management*, 2(1): 5–13.

Hagtvedt, L. P., Dossinger, K., Harrison, S. H., & Huang, L. 2019. Curiosity made the cat more creative: Specific curiosity as a driver of creativity. *Organizational Behavior and Human Decision Processes*, 150: 1–13.

Hannah, D. R. 2004. Who owns ideas? An investigation of employees' beliefs about the legal ownership of ideas. *Creativity and Innovation Management*, 13(4): 216–230.

Hargadon, A. B. 2002. Brokering knowledge: Linking learning and innovation. *Research in Organizational Behavior*, 24: 41–85.

Hargadon, A. B. 2006. Bridging old worlds and building new ones: Towards a microsociology of creativity. In L. L. Thompson & C. Hoon-Seok (Eds.), *Creativity and innovation in organizational teams*: 199–216. Psychology Press.

Hargadon, A. B., & Bechky, B. A. 2006. When collections of creatives become creative collectives: A field study of problem solving at work. *Organization Science*, 17(4): 484–500.

Hargadon, A., & Fanelli, A. 2002. Action and possibility: Reconciling dual perspectives of knowledge in organizations. *Organization Science*, 13(3): 290–302.

Harrison, S. H., & Rouse, E. D. 2014. Let's dance! Elastic coordination in creative group work: A qualitative study of modern dancers. *Academy of Management Journal*, 57(5): 1256–1283.

Harrison, S. H., & Rouse, E. D. 2015. An inductive study of feedback interactions over the course of creative projects. *Academy of Management Journal*, 58(2): 375–404.

Harvey, S. 2013. A different perspective: The multiple effects of deep level diversity on group creativity. *Journal of Experimental Social Psychology*, 49(5): 822–832.

Harvey, S. 2014. Creative synthesis: Exploring the process of extraordinary group creativity. *Academy of Management Review*, 39(3): 324–343.

Harvey, S., & Mueller, J. 2021. Staying alive: Toward a diverging consensus model of overcoming a bias against novelty in groups. *Organization Science*, 32(2): 293–314.

Heisenberg, W. 1958. *Physics and Philosophy: The Revolution in Modern Science*. New York: Prometheus Books.

Heracleous, L., & Jacobs, C. D. 2008. Understanding organizations through embodied metaphors. *Organization Studies*, 29(1): 45–78.

Herman, A., & Reiter-Palmon, R. 2011. The effect of regulatory focus on idea generation and idea evaluation. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1): 13–20.

Hill, S. A., & Birkinshaw, J. M. 2010. Idea sets: Conceptualizing and measuring a new unit of analysis in entrepreneurship research. *Organizational Research Methods*, 13(1): 85–113.

Hofstadter, D., & Sander, E. 2013. *Surfaces and essences: Analogy as the fuel and fire of thinking*. New York, US: Basic Books.

Howard, T. J., Dekoninck, E. A., & Culley, S. J. 2010. The use of creative stimuli at early stages of industrial product innovation. *Research in Engineering Design*, 21(4): 263–274.

Howkins, J. 2001. *The creative economy: How people make money from ideas*. London, England: The Penguin Press.

Inie, N., & Dalsgaard, P. 2017. A typology of design ideas. *Proceedings of the 2017 ACM SIGCHI Conference on Creativity and Cognition*, 393–406. Presented at the Creativity and Cognition, Singapore: ACM.

Jackson, M. H., & Poole, M. S. 2003. Idea-generation in naturally occurring contexts: Complex appropriation of a simple group procedure. *Human Communication Research*, 29(4): 560–591.

James, W. 1890. The stream of thought. *The Principles of Psychology*: 224–279. Henry Holt and Co.

Janssen, O. 2000. Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 73(3): 287–302.

Kan, J. W. T., & Gero, J. S. 2005. Can entropy indicate the richness of idea generation in team designing? *CAADRIA 2005—The Association for Computer-Aided Architectural Design Research in Asia: Digital Opportunities*, 451–457.

Kanter, R. M. 1988. When a thousand flowers bloom: Structural, collective, and social conditions for innovations in organizations. In B. M. Staw & L. L. Cummings (Eds.), *Research in Organizational Behavior*. Greenwich, CT: JAI Press.

Kaplan, S. 2011. Strategy and PowerPoint: An inquiry into the epistemic culture and machinery of strategy making. *Organization Science*, 28.

Karlsson, A., & Törlind, P. 2013. What happens to rejected ideas? Exploring the life of ideas following the completion of project. *DS 75-3: Proceedings of the 19th International Conference on Engineering Design (ICED13) Design For Harmonies*, 3: 229–238. Seoul, Korea.

Katila, R. 2002. New product search over time: Past ideas in their prime? *The Academy of Management Journal*, 45(5): 995–1010.

Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, 45(6): 1183–1194.

Kaufman, J. C., & Baer, J. 2012. Beyond new and appropriate: Who decides what is creative? *Creativity Research Journal*, 24(1): 83–91.

Kaufman, J. C., Russell, C. M., & Plucker, J. A. 2013. Models and methods of assessing creativity. *The Oxford handbook of child psychological assessment*: 614–622. New York, NY, US: Oxford University Press.

Kilduff, M., & Brass, D. J. 2010. Organizational social network research: Core ideas and key debates. *Academy of Management Annals*, 4(1): 317–357.

Kim, Y. J., & Kim, J. 2020. Does negative feedback benefit (or harm) recipient creativity? The role of the direction of feedback flow. *Academy of Management Journal*, 63(2): 584–612.

Kim, W. C., & Mauborgne, R. 2014. *Blue Ocean Strategy, Expanded Edition: How to Create Uncontested Market Space and Make the Competition Irrelevant*. Harvard Business Review Press.

Klofsten, M. 2005. New venture ideas: An analysis of their origin and early development. *Technology Analysis & Strategic Management*, 17(1): 105–119.

Knight, A. P., & Baer, M. 2014. Get Up, Stand Up: The Effects of a Non-Sedentary Workspace on Information Elaboration and Group Performance. *Social Psychological and Personality Science*, 5(8): 910–917.

Knudsen, M. P. 2007. The relative importance of interfirm relationships and knowledge transfer for new product development success. *Journal of Product Innovation Management*, 24(2): 117–138.

Koen, P. A., Bertels, H. M. J., & Kleinschmidt, E. J. 2014. Managing the front end of innovation—Part II: Results from a three-year study. *Research-Technology Management*, 57(3): 25–35.

Koestler, A. 1964. *The act of creation*. London, UK: MacMillan.

Kohn, N. W., Paulus, P. B., & Choi, Y. 2011. Building on the ideas of others: An examination of the idea combination process. *Journal of Experimental Social Psychology*, 47(3): 554–561.

Kruglanski, A. W., Chernikova, M., Babush, M., Dugas, M., & Schumpe, B. M. 2015. The architecture of goal systems. *Advances in Motivation Science*, vol. 2: 69–98. Elsevier.

Kuhn, T. S. 1970. *The structure of scientific revolutions*. University of Chicago Press.

Laursen, K., & Salter, A. 2006. Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, 27(2): 131–150.

Lehtovaara, M., Karvonen, M., Tuunanen, J., Pyrhönen, O., & Kässi, T. 2012. Commercializing emerging renewable energy: A case study. *International Journal of Engineering Business Management*, 4(44). https://doi.org/10.5772/54707.

Lewitt, S. 1968. *Sentences on Conceptual Art*.

Liao, J., & Wang, H.-C. 2019. Gestures as intrinsic creativity support: Understanding the usage and function of hand gestures in computer-mediated group brainstorming. *Proceedings of the ACM on Human-Computer Interaction*, 3(GROUP, Article 243). https://doi.org/10.1145/3361124.

Libben, G. 2017. The quantum metaphor and the organization of words in the mind. *Journal of Cultural Cognitive Science*, 1(1): 49–55.

Lilienfeld, S. O., & Strother, A. N. 2020. Psychological measurement and the replication crisis: Four sacred cows. *Canadian Psychology/Psychologie Canadienne*. https://doi.org/10.1037/cap0000236.

Lindauer, M. S. 1990. A failure to find an effect of perceptual set on creativity. *Bulletin of the Psychonomic Society*, 28(1): 33–36.

Lissitz, R. W., & Willhoft, J. L. 1985. A methodological study of the torrance tests of creativity. *Journal of Educational Measurement*, 22(1): 1–11.

Litchfield, R. C., & Gilson, L. L. 2013. Curating collections of ideas: Museum as metaphor in the management of creativity. *Industrial Marketing Management*, 42: 106–112.

Litchfield, R. C., Gilson, L. L., & Gilson, P. W. 2015. Defining creative ideas: Toward a more nuanced approach. *Group & Organization Management*, 40(2): 238–265.

Loewenstein, J., & Mueller, J. 2016. Implicit theories of creative ideas: How culture guides creativity assessments. *Academy of Management Discoveries*, 2(4): 320–348.

Long-Lingo, E. L., & O'Mahony, S. 2010. Nexus work: Brokerage on creative projects. *Administrative Science Quarterly*, 55(1): 47–81.

Long-Lingo, E. L., & Tepper, S. J. 2013. Looking back, looking forward: Arts-based careers and creative work. *Work and Occupations*, 40(4): 337–363.

Lu, S., Bartol, K. M., Venkataramani, V., Zheng, X., & Liu, X. 2019. Pitching novel ideas to the boss: The interactive effects of employees' idea enactment and influence tactics on creativity assessment and implementation. *Academy of Management Journal*, 62(2): 579–606.

Luo, H. 2014. When to sell your idea: Theory and evidence from the movie industry. *Management Science*, 60(12): 3067–3086.

Maddux, W. W., & Galinsky, A. D. 2009. Cultural borders and mental barriers: The relationship between living abroad and creativity. *Journal of Personality and Social Psychology*, 1047–1061.

Maier, A., Suarasan, M.-M., & Nicoara, F. D. 2012. Innovation – a must for the durable development. *Management & Marketing Challenges for the Knowledge Society*, 7(3): 479–492.

Mainemelis, C., & Ronson, S. 2006. Ideas are born in fields of play: Towards a theory of play and creativity in organizational settings. *Research in Organizational Behavior*, 27: 81–131.

Majchrzak, A., More, P. H. B., & Faraj, S. 2012. Transcending knowledge differences in cross-functional teams. *Organization Science*, 23(4): 951–970.

Mandelbrot, B. B. 1983. *The fractal geometry of nature*. London, UK: MacMillan.

McLeod, P. L., Lobel, S. A., & Cox, T. H. 1996. Ethnic diversity and creativity in small groups. *Small Group Research*, 27(2): 248–264.

McNiff, S. 2015. *Imagination in Action: Secrets for Unleashing Creative Expression*. Shambhala Publications.

McRae, R. 1965. "Idea" as a philosophical term in the seventeenth century. *Journal of the History of Ideas*, 26(2): 175–190.

Merton, R. K. 1957. Patterns of influence: Local and cosmopolitan influentials. *Social Theory and Social Structure*, 2: 387–420.

Montoya-Weiss, M. M., & O'Driscoll, T. M. 2000. From experience: Applying performance support technology in the fuzzy front end. *Journal of Product Innovation Management*, 17: 143–161.

Mueller, J., Melwani, S., Loewenstein, J., & Deal, J. J. 2018. Reframing the decision-makers' dilemma: Towards a social context model of creative idea recognition. *Academy of Management Journal*, 61(1): 94–110.

Mueller, J. S., Melwani, S., & Goncalo, J. A. 2012. The bias against creativity: Why people desire but reject creative ideas. *Psychological Science*, 23(1): 13–17.

Mumford, M. D., Baughman, W. A., Threlfall, K. V., Supinski, E. P., & Costanza, D. P. 1996. Process-based measures of creative problem-solving skills: I. problem construction. *Creativity Research Journal*, 9(1): 63–76.

Nard, C. A., & Morriss, A. P. 2006. Constitutionalizing patents: From Venice to Philadelphia. *Review of Law and Economics*, 223–321.

Neck, H. M., Meyer, G. D., Cohen, B., & Corbett, A. C. 2004. An entrepreneurial system view of new venture creation. *Journal of Small Business Management*, 42(2): 190–208.

Nelson, R. R., & Winter, S. G. 1982. The Schumpeterian tradeoff revisited. *The American Economic Review*, 72(1): 114–132.

Nevitt, T., & Davies, B. 2020. *Thomas Aquinas's Quolibetal Questions*. Oxford University Press.

Nicolini, D., Mengis, J., & Swan, J. 2012. Understanding the role of objects in cross-disciplinary collaboration. *Organization Science*, 23(3): 612–629.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. 1999. Persistence of brainstorming groups: How do people know when to stop? *Journal of Experimental Social Psychology*, 35(2): 165–185.

Nijstad, B. A., Stroebe, W., & Lodewijkx, H. F. M. 2002. Cognitive stimulation and interference in groups: Exposure effects in an idea generation task. *Journal of Experimental Social Psychology*, 38(6): 535–544.

Niu, W. 2012. Confucian Ideology and Creativity. *The Journal of Creative Behavior*, 46(4): 274–284.

Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1): 14–37.

North, M. 2013. *Novelty: A History of the New*. University of Chicago Press.

Obstfeld, D. 2005. Social networks, the tertius iungens orientation, and involvement in innovation. *Administrative Science Quarterly*, 50(1): 100–130.

Obstfeld, D. 2012. Creative projects: A less routine approach toward getting new things done. *Organization Science*, 23(6): 1571–1592.

Oldham, G. R., & Cummings, A. 1996. Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, 39(3): 607–634.

Onarheim, B., & Christensen, B. T. 2012. Distributed idea screening in stage–gate development processes. *Journal of Engineering Design*, 23(9): 660–673.

Ong, L. S., & Leung, A. K.-Y. 2013. Opening the creative mind of high need for cognitive closure individuals through activation of uncreative ideas. *Creativity Research Journal*, 25(3): 286–292.

Orlikowski, W. J. 2002. Knowing in Practice: Enacting a Collective Capability in Distributed Organizing. *Organization Science*, 13(3): 249–273.

Orlikowski, W. J. 2006. Material knowing: The scaffolding of human knowledgeability. *European Journal of Information Systems*, 15(5): 460–466.

Osborn, A. F. 1963. *Applied imagination: Principles and procedures of creative problem-solving (3rd revised edition)*. New York, US: Charles Scribner's Sons.

Parnes, S. J., & Meadow, A. 1959. Effects of "brainstorming" instructions on creative problem solving by trained and untrained subjects. *Journal of Educational Psychology*, 50(4): 171–176.

Paulus, P. B., Dzindolet, M. T., Poletes, G., & Camacho, L. M. 1993. Perception of performance in group brainstorming: The illusion of group productivity. *Personality and Social Psychology Bulletin*, 19(1): 78–89.

Paulus, P. B., Larey, T. S., & Ortega, A. H. 1995. Performance and perceptions of brainstormers in an organizational setting. *Basic and Applied Social Psychology*, 17(1–2): 249–265.

Perks, H., Cooper, R., & Jones, C. 2005. Characterizing the role of design in new product development: An empirically derived taxonomy. *Journal of Product Innovation Management*, 22(2): 111–127.

Perry-Smith, J. E. 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *The Academy of Management Journal*, 49(1): 85–101.

Perry-Smith, J. E., & Coff, R. W. 2011. In the mood for entrepreneurial creativity? How optimal group affect differs for generating and selecting ideas for new ventures. *Strategic Entrepreneurship Journal*, 5(3): 247–268.

Perry-Smith, J. E., & Mannucci, P. V. 2017. From creativity to innovation: The social network drivers of the four phases of the idea journey. *Academy of Management Review*, 42(1): 53–79.

Perry-Smith, J. E., & Shalley, C. E. 2003. The social side of creativity: A static and dynamic social network perspective. *The Academy of Management Review*, 28(1): 89.

Poincaré, H. 1913. *The Foundations of Science*. (G. B. Halsted, Tran.). New York: The Science Press.

Polanyi, M. 1966. *The Tacit Dimension*. Routledge & Kegan Paul.

Popadiuk, S., & Choo, C. W. 2006. Innovation and knowledge creation: How are these concepts related? *International Journal of Information Management*, 26(4): 302–312.

Proctor, R. A. 1991. The importance of creativity in the management field. *British Journal of Management*, 2(4): 223–230.

Rainone, N. A., Natale, A. N., Alenick, P. R., Kato, A., Patel, K. R., et al. 2021. Lost in translation? A review of popular-press claims about organizational creativity and innovation. *Creativity Research Journal*, 33(4): 424–436.

Ravasi, D., & Stigliani, I. 2012. Product design: A review and research agenda for management studies. *International Journal of Management Reviews*, 14(4): 464–488.

Reinig, B. A., Briggs, R. O., & Nunamaker, J. F. 2007. On the measurement of ideation quality. *Journal of Management Information Systems*, 23(4): 143–161.

Reiter-Palmon, R. 2017. The role of problem construction in creative production. *The Journal of Creative Behavior*, 51(4): 323–326.

Reiter-Palmon, R., Mumford, M. D., O'Connor Boes, J., & Runco, M. A. 1997. Problem construction and creativity: The role of ability, cue consistency, and active processing. *Creativity Research Journal*, 10(1): 9–23.

Rhodes, M. 1961. An analysis of creativity. *The Phi Delta Kappan*, 42(7): 305–310.

Riedl, C., May, N., Finzen, J., Stathel, S., Leidig, T., et al. 2009. Managing service innovations with an idea ontology. *Proceedings of XIX International RESER Conference*, 876–892.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. 2006. Productivity is not enough: A comparison of interactive and nominal groups on idea generation and selection. *Journal of Experimental Social Psychology*, 42(2): 244–251.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. 2007. Relative accessibility of domain knowledge and creativity: The effects of knowledge activation on the quantity and originality of generated ideas. *Journal of Experimental Social Psychology*, 43(6): 933–946.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. 2010. The selection of creative ideas after individual idea generation: Choosing between creativity and impact. *British Journal of Psychology*, 101(1): 47–68.

Ritter, S. M., & Rietzschel, E. F. 2017. Lay theories of creativity. In C. M. Zedelius, B. C. N. Müller, & J. W. Schooler (Eds.), *The Science of Lay Theories: How Beliefs Shape Our Cognition, Behavior, and Health*: 95–126. Cham: Springer International Publishing.

Roe, R. A., Gockel, C., & Meyer, B. 2012. Time and change in teams: Where we are and where we are moving. *European Journal of Work and Organizational Psychology*, 21(5): 629–656.

Romer, P. M. 1992. Two strategiesfor economic development: Using ideas and producing ideas. *Proceedings of the World Bank Annual Conference on Development Economics 1992*, 63–91.

Rosenblum, & Kuttner. 2011. *Quantum Enigma: Physics Encounters Consciousness*. Oxford University Press.

Roskes, M., De Dreu, C. K. W., & Nijstad, B. A. 2012. Necessity is the mother of invention: Avoidance motivation stimulates creativity through cognitive effort. *Journal of Personality and Social Psychology*, 103(2): 242–256.

Rothberg, G. 2004. The role of ideas in the manager's workplace: Theory and practice. *Management Decision*, 42(9): 1060–1081.

Rubenstein, A. H. 1964. Organizational factors affecting research and development decision-making in large decentralized companies. *Management Science*, 10(4): 618–633.

Rubenstein, A. H. 1994. At the front end of the R&D/Innovation process: Idea development and entrepreneurship. *International Journal of Technology Management*, 9(5/6/7): 652–677.

Runco, M. A. 2010. Divergent thinking, creativity, and ideation. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge Handbook of creativity*: 413–446. Cambridge University Press.

Runco, M. A., & Smith, W. R. 1992. Interpersonal and intrapersonal evaluations of creative ideas. *Personality and Individual Differences*, 13(3): 295–302.

Russell, B. 2009. *History of Western Philosophy* (New ed. / foreword by Anthony Gottlieb.). London: Routledge.

Rychlak, J. F. 1993. A suggested principle of complementarity for psychology: In theory, not method. *American Psychologist*, 48(9): 933–942.

Sandberg, J., & Tsoukas, H. 2011. Grasping the logic of practice: Theorizing through practical rationality. *Academy of Management Review*, 36(2): 338–360.

Sawyer, R. K. 1992. Improvisational creativity: An analysis of jazz performance. *Creativity Research Journal*, 5(3): 253–263.

Sawyer, R. K. 2000. Improvisation and the creative process: Dewey, Collingwood, and the aesthetics of spontaneity. *The Journal of Aesthetics and Art Criticism*, 58(2): 149.

Sawyer, R. K., & DeZutter, S. 2009. Distributed creativity: How collective creations emerge from collaboration. *Psychology of Aesthetics, Creativity, and the Arts*, 3(2): 81–92.

Scheuer, J. D. 2008. Innovation with care in health care: Translation as an alternative metaphor of innovation and change. *Innovation and the Creative Process*: 57–83. Edward Elgar Publishing.

Schön, D. A. 1983. *The reflective practitioner: How professionals think in action*. New York: Basic Books.

Schrage, M. 2000. *Serious Play: How the World's Best Companies Simulate to Innovate*. Boston, MA: Harvard University Press.

Schulze, A., & Hoegl, M. 2006. Knowledge creation in new product development projects. *Journal of Management*, 32(2): 210–236.

Schumpeter, J. A. 1976. *Capitalism, socialism and democracy*. Routledge.

Shalley, C. E. 1995. Effects of coaction, expected evaluation, and goal setting on creativity and productivity. *Academy of Management Journal*, 38(2): 483–503.

Shalley, C. E., & Gilson, L. L. 2004. What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, 21.

Shalley, C. E., Zhou, J., & Oldham, G. R. 2004. The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, 30(6): 933–958.

Shane, S. 2012. Reflections on the 2010 AMR Decade Award: Delivering on the promise of entrepreneurship as a field of research. *Academy of Management Review*, 37(1): 10–20.

Shane, S., & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *The Academy of Management Review*, 25(1): 217–226.

Short, J. C., Ketchen, D. J., Shook, C. L., & Ireland, R. D. 2010. The concept of "opportunity" in entrepreneurship research: Past accomplishments and future challenges. *Journal of Management*, 36(1): 40–65.

Silvia, P. J., Nusbaum, E. C., & Beaty, R. E. 2017. Old or new? Evaluating the old/new scoring method for divergent thinking tasks. *The Journal of Creative Behavior*, 51(3): 216–224.

Simon, H. A. 1969. *The sciences of the artificial*. Cambridge, MA: MIT Press.

Simonton, D. K. 2003. Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin*, 129(4): 475–494.

Singh, J., & Fleming, L. 2010. Lone inventors as sources of breakthroughs: Myth or reality? *Management Science*, 56(1): 41–56.

Smith, G. F. 1998. Idea-generation techniques: A formulary of active ingredients. *The Journal of Creative Behavior*, 32(2): 107–134.

Smith, S. M., Ward, T. B., & Schumacher, J. S. 1993. Constraining effects of examples in a creative generation task. *Memory & Cognition*, 21(6): 837–845.

Solow, R. M. 1957. Technical change and the aggregate production function. *The Review of Economics and Statistics*, 39(3): 312–320.

Somech, A., & Drach-Zahavy, A. 2013. Translating team creativity to innovation implementation: The role of team composition and climate for innovation. *Journal of Management*, 39(3): 684–708.

Srinivasan, V., & Chakrabarti, A. 2010. Investigating novelty–outcome relationships in engineering design. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, 24(2): 161–178.

Stephens, J. P. 2020. How the show goes on: Using the aesthetic experience of collective performance to adapt while coordinating. *Administrative Science Quarterly*.

Sternberg, R. J., & Davidson, J. E. 1995. *The Nature of Insight*. The MIT Press.

Stompff, G., Smulders, F., & Henze, L. 2016. Surprises are the benefits: Reframing in multidisciplinary design teams. *Design Studies*, 47: 187–214.

Stough, R. R., Haynes, K. E., & Campbell, H. S. 1998. Small business entrepreneurship in the high technology services sector: An assessment for the edge cities of the U.S. national capital region. *Small Business Economics*, 10: 61–74.

Stroebe, W., Nijstad, B. A., & Rietzschel, E. F. 2010. Beyond productivity loss in brainstorming groups. *Advances in Experimental Social Psychology*, vol. 43: 157–203. Academic Press.

Sukhov, A. 2018. The role of perceived comprehension in idea evaluation. *Creativity and Innovation Management*, 27(2): 183–195.

Sukhov, A., Magnusson, P. R., & Netz, J. 2019. What is an idea for innovation? In P. Kristensson, P. Magnusson, & L. Witell (Eds.), *Service innovation for sustainable business: Stimulating, realizing and capturing the value from service innovation*: 29–43. World Scientific.

Sutton, R. I., & Hargadon, A. 1996. Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, 41(4): 685.

Svejenova, S. 2005. 'The Path with the Heart': Creating the Authentic Career*. *Journal of Management Studies*, 42(5): 947–974.

Svejenova, S., Planellas, M., & Vives, L. 2010. An individual business model in the making: A chef's quest for creative freedom. *Long Range Planning*, 43(2–3): 408–430.

Taylor, A., & Greve, H. R. 2006. Superman or the Fantastic Four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, 49(4): 723–740.

Taylor, D. W., Berry, P. C., & Block, C. H. 1958. Does group participation when using brainstorming facilitate or inhibit creative thinking? *Administrative Science Quarterly*, 3(1): 23–47.

Thorleuchter, D., den Poel, D. V., & Prinzie, A. 2010. Mining ideas from textual information. *Expert Systems with Applications*, 37(10): 7182–7188.

Thorleuchter, D., & Van den Poel, D. 2015. Idea mining for web-based weak signal detection. *Futures*, 66: 25–34.

Thorndike, E. L. 1904. *An introduction to the theory of mental and social measurements*: 277. The Science Press.

Torraco, R. J. 2005. Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, 4(3): 356–367.

Torrance, E. P. 1962. *Guiding creative talent*. Englewood Cliffs, NJ: Prentice.

Torrance, P. E. 1988. The nature of creativity as manifest in its testing. In R. J. Sternberg (Ed.), *The Nature of Creativity*. Cambridge, England: Cambridge University Press.

Trope, Y., & Liberman, N. 2010. Construal-level theory of psychological distance. *Psychological Review*, 117(2): 440–463.

Tsoukas, H. 2009. A dialogical approach to the creation of new knowledge in organizations. *Organization Science*, 20(6): 941–957.

Tushman, M. L. 1977. Special boundary roles in the innovation process. *Administrative Science Quarterly*, 22(4): 587–605.

Tushman, M. L., & Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31(3): 439.

Unsworth, K. 2001. Unpacking creativity. *Academy of Management Review*, 26(2): 286- – 297.

Urmson, J. 2006. Ideas. (D. Borchert, Ed.)*Encyclopedia of Philosophy*. Gale.

Utterback, J. M. 1971. The process of innovation: A study of the origination and development of ideas for new scientific instruments. *IEEE Transactions on Engineering Management*, EM-18(4): 124–131.

Uzzi, B., Mukherjee, S., Stringer, M., & Jones, B. 2013. Atypical Combinations and Scientific Impact. *Science*, 342(6157): 468–472.

Uzzi, B., & Spiro, J. 2005. Collaboration and Creativity: The Small World Problem. *American Journal of Sociology*, 111(2): 447–504.

Van de Ven, A. H., Polley, D., Garud, R., & Venkataraman, S. 1999. *The innovation journey*. New York: Oxford University Press.

Van Kleef, G. A., Anastasopoulou, C., & Nijstad, B. A. 2010. Can expressions of anger enhance creativity? A test of the emotions as social information (EASI) model. *Journal of Experimental Social Psychology*, 46(6): 1042–1048.

Van Leeuwen, W., & Baas, M. 2017. Creativity under attack: How people's role in competitive conflict shapes their creative idea generation. *Creativity Research Journal*, 29(4): 354–369.

Vandenbosch, B., Saatcioglu, A., & Fay, S. 2006. Idea management: A systemic view. *Journal of Management Studies*, 43(2): 259–288.

Vedres, B., & Stark, D. 2010. Structural folds: Generative disruption in overlapping groups. *American Journal of Sociology*, 115(4): 1150–1190.

Venkataraman, S. 1997. The distinctive domain of entrepreneurship research: An editor's perspective. In J. Katz & R. Brockhaus (Eds.), *Advances in entrepreneurship, firm emergence and growth*, vol. 3: 119–138. Greenwich, CT: JAI Press.

Venkataswamy, A., Sodhi, R., Abdildin, Y., & Bailey, B. P. 2009. Groupware for design: An interactive system to facilitate creative processes in team design work. *2009 42nd Hawaii International Conference on System Sciences*, 1–10. Waikoloa, Hawaii, USA: IEEE.

Vera, D., & Crossan, M. 2005. Improvisation and innovative performance in teams. *Organization Science*, 16(3): 203–224.

Vincent, J. B. 2015. *Cirque du Soleil review: Performers impress but formula feels tired in Totem*. https://www.smh.com.au/entertainment/cirque-du-soleil-review-performers-impress-but-formula-feels-tired-in-totem-20150122-12vjl9.html.

Viswanathan, V., Tomko, M., & Linsey, J. 2016a. A study on the effects of example familiarity and modality on design fixation. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, 30(2): 171–184.

Viswanathan, V., Tomko, M., & Linsey, J. 2016b. A study on the effects of example familiarity and modality on design fixation. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, 30(2): 171–184.

Wallas, G. 1945. *The Art of Thought*. London: C.A. Watts.

Ward, T. B. 1994. Structured imagination: The role of category structure in exemplar generation. *Cognitive Psychology*, 27: 1–40.

Ward, T. B. 2001. Creative cognition, conceptual combination, and the creative writing of Stephen R. Donaldson. *American Psychologist*, 56(4): 350–354.

Weaver, R., M. 2013. ***Ideas Have Consequences: Expanded Edition***. University of Chicago Press.

Weick, K. E. 1979. ***The social psychology of organizing***. Reading, MA: Addison-Wesley.

Weiner, R. 2000. ***Creativity and Beyond: Cultures, Values, and Change***. SUNY Press.

Weisberg, R. W. 2006. Expertise and reason in creative thinking: Evidence from case studies and the laboratory. In J. C. Kaufman & J. Baer (Eds.), ***Creativity and Reason in Cognitive Development***: 7–42. Cambridge: Cambridge University Press.

West, M. A. 2002. Ideas are ten a penny: It's team implementation not idea generation that counts: creativity and innovation implementation. ***Applied Psychology***, 51(3): 411–424.

Withagen, R., & van der Kamp, J. 2018. An ecological approach to creativity in making. ***New Ideas in Psychology***, 49: 1–6.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. 1993. Toward a theory of organizational creativity. ***Academy of Management Review***, 293–321.

Woodmansee, M. 1984. The Genius and the Copyright: Economic and Legal Conditions of the Emergence of the "Author." ***Eighteenth-Century Studies***, 17(4): 425–448.

Zhou, J., Wang, X. M., Bavato, D., Tasselli, S., & Wu, J. 2019. Understanding the receiving side of creativity: A multidisciplinary review and implications for management. ***Journal of Management***, 45(6): 2570–2595.

Zhu, Y., Ritter, S. M., Müller, B. C. N., & Dijksterhuis, A. 2017. Creativity: Intuitive processing outperforms deliberative processing in creative idea selection. ***Journal of Experimental Social Psychology***, 73: 180–188.

TABLE 1. Summary of Literatures Reviewed

Literatures	Key research question relating to ideas	Role and importance of ideas	Synonyms for ideas	Exemplars
Creativity	What factors help or hinder creative performance in terms of generating and evaluating ideas?	Ideas are the unit of performance and counted or coded; or ideas are stimulus materials presented to participants; or idea generation is assessed globally as a measure of (job) performance	Final concept, solution, insight, enlightenment	Amabile, 1996 Berg, 2019 Mueller et al., 2012 Shalley et al., 2004
Brainstorming	Which factors increase or decrease ideational fluency (the number of ideas generated)?	Ideas are the unit of performance and counted as a measure of fluency, or coded (for originality, feasibility, semantic diversity) as a measure of quality; or ideas are stimulus materials presented to participants	Solution	Diehl & Stroebe, 1987; Dugosh & Paulus, 1995; Rietzschel et al., 2007

Creative Work	How does the process of generating novelty unfold in individuals and groups engaged in creative work?	Ideas themselves are often not the topic of focus, but intertwined with processes and thus observed over the time period of the study	Narrative, improvised action, interactions	Elsbach & Kramer, 2003; Harrison & Rouse, 2014; Long-Lingo & O'Mahony, 2010; Sawyer & DeZutter, 2009
Innovation	What factors lead to the emergence, implementation, and diffusion of novel ideas?	Ideas are the raw material that eventually become innovations	Discovery, prototype, framework, artefact	De Dreu & West, 2001; Taylor & Greve, 2006; Utterback, 1997; Van de Ven et al., 1999
Entrepreneurship	How are opportunities created, identified and developed?	Ideas are the means, ends, or means-ends relationship that take advantage of opportunities	Vision; opportunity	Baron & Ensley, 2006; Gregoire & Shepherd, 2010; Grimes, 2018; Shane & Venkatraman, 2000
Design	How do designers generate, communicate, and interact with ideas to solve design problems?	Ideas are presented, discussed and developed throughout the design process	Mood, improvised action, prototype	Elsbach & Flynn, 2013; Ewenstein & Whyte, 2007; Inie & Dalsgaard, 2017; Ravasi & Stigliani, 2018

Knowledge Creation	How is new knowledge created, particularly in small, cross-disciplinary innovation groups?	Ideas, amongst other things, are the output of knowledge creation processes	Perspective shift, epistemic object, framework, artefact	Ben-Menahem et al., 2016; Biscaro & Comacchio, 2018; Majchrzak et al., 2012; Nonaka, 1994; Tsoukas, 2009
Networks	How does the network structure, or the network position individuals occupy, affect the likelihood of innovation and having new ideas?	Quantity and quality of ideas are treated as beneficial outcomes of certain network structure/positions.	Combination	Burt, 2004; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Uzzi & Spiro, 2005; Vedres & Stark, 2010

TABLE 2. Selective Summary of Idea Definitions Used in Current Research

Source	Idea definition (emphasis added)
Brem & Voigt (2009)	"In general, the company differs between a 'trend' and an 'idea': A trend identifies 'something new' and distinguishes it from 'something existing;' an idea is **a proposal for an action**, which either reacts to recent developments or proactively utilizes them."
Cray & Schroeder (2015)	"ideas are systems of **causal-historically related token mental states** of the same type. An idea is generated when a person (or group of people) comes to have a novel token (contentful) mental state"
Gurteen (1998)	"What is an idea? An idea is **simply 'something' that is unrealized, unproven or untested**. It can take many subtle forms. It could be an unrealized goal: 'Let's go to Mars'. It could be an unrealized product: 'Let's build a Mars ship'. It could be an unrealized service: 'Let's lay on charter flights to Mars'. It could be an unproven insight into the nature of things: 'Maybe there is a stream of particles flowing out from the sun'. Or it could be a new unproven concept of how something might work based on new knowledge of a natural, social or business phenomenon: 'The solar wind could power the ship'."
Knudsen (2007)	"In defining the idea stage, the respondent was instructed that ideas are **general concepts of what might be technically or economically feasible**"
Linsey et al., 2010	"Our basic definition for an idea is **something that solves one or more functions of the design**, as defined by the functional basis (a clearly defined and tested language for expressing design functions)."

Maier et al., 2012	"An idea is defined as '**any conception existing in the mind as a result of a mental understanding, of awareness or activity**' (…). This new idea can be a recombination of old ideas, a new pattern which represents a challenge for the actual order, a formula or a unique approach that is perceived as new by the stakeholders (…). Since an invention is something new and original by definition, an idea could be the usage of an invention in a new environment."
Montoya-Weiss & Driscoll (2000)	"An idea is defined as **the initial, most embryonic form of a new product or service idea – typically a one-line description accompanied by a high-level technical diagram**. A concept, on the other hand, is defined as a form, technology, plus a clear statement of customer benefit."
Proctor (1991)	"One might, indeed, think of ideas as '**the sentence of thought**'. Ideas are **mental phenomena** which somehow drift into the mind, wander through and often vanish into obscurity, never to be recalled again."
Rhodes (1961)	"The word idea refers to **a thought which has been communicated to other people** in the form of words, paint, clay, metal, stone, fabric, or other material."
Riedl et al. (2009)	"We informally define ideas as **an explicit description of an invention or problem solution with the intention of implementation** as a new or improved product, service, or process within an organization."
Rubenstein (1964)	"**suggestions or recommendations** for work which have not yet been formally designated as projects or programs"
Sukhov et al. (2019)	"Based on the existing literature, we define an idea for innovation as **a scenario in a specific context that is deemed unsatisfactory by an actor who explains how this scenario can be improved by applying appropriate resources**. In the early stages of an innovation process, an idea is thus a combination of a problem and

	solution that is communicated as a narrative between the idea creator and the idea assessor."
Thorleuchter & Van den Poel (2015)	"Idea mining is based on technique philosophy where an idea is defined as a means together with a corresponding end. Means and ends are seen as textual patterns that consist of several technical terms (words) occurring together. Thus, an idea is defined as **a textual pattern where terms describing a means and a corresponding end co-occur**."