LEADERS' PORTFOLIO: PSYCHO-SOCIAL MECHANISMS AUGMENTING CREATIVITY

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Abstract

Purpose: There is a consensus that creativity is one of the pivotal characteristics of a contemporary leader. There are however no publications indicating how the leader may augment own, as well as the team's creativity. The article fills this gap, focusing on the type of creativity which is a long-lasting propensity – as opposed to one creative act usually considered in literature.

Approach: The article is based on literature review and case studies analysis. After presenting cases illustrating the role of and need for creativity as a longitudinal propensity, a literature analysis follows delineating the mechanisms regulating creativity. We outline the role of brain plasticity in establishing the process of "being creative" as an enduring characteristic, as well as the ambient factors augmenting creativity.

Findings: We focus on how to sustain a lasting creative state of mind (as opposed to performing single creative acts) and examine the factors that maintain the creative drive. We look at affective, cognitive and ambient mechanisms that enhance creativity. We specifically look at the role of joy (affective), distance (cognitive) and ambient factors (horizontal networks). We also review several techniques for enhancing teams' creativity and conclude with recommendations for further studies.

Implications: The article provides information useful for leaders and their teams, delineating ways of enhancing creativity.

Value/Originality: The article presents a new approach to creativity as enduring phenomenon and to ways of augmenting creativity.

Keywords: creativity, leadership, dopamine, neurotransmitters, brain plasticity, serendipity

Paper type: Research paper

1. Introduction

Inspiration for this article comes from the feeling of happiness associated with creativity; for example in his study on creative people, Mihaly Csikszentmihályi reported that whether "lost in Antarctica or confined to a prison cell, some individuals succeed in transforming their harrowing conditions into a manageable and even enjoyable struggle, whereas most others would succumb to the ordeal"

(Csikszentmihályi, 1991). In the author's work with innovative social leaders from around the world [1], it is evident that they are motivated by the joy of discovery (Bornstein, 2004; Praszkier and Nowak, 2012). What is it about creativity that brings us joy? Is it solely emotional satisfaction? Creativity, whether it's an isolated occurrence or a lasting state of mind, is vivid, easily recognized in the innovations and solutions it generates, and most often admired. A popular example is the apocryphal story about a truck stuck in the tunnel. Experts argued whether to cut off the top of the truck or blow up the roof of the tunnel, until finally a child asked, "Why don't you simply deflate the tires and, thus, lower the truck?"

There are numerous studies on the mechanisms of a creative act (e.g. Flaherty, 2005, 2018; Beaty et al., 2018) and many popular articles on the subject (e.g. Newman, 2016; Haridy, 2018). Here we will consider creativity from the social leaders' perspective, as a continuous state of mind and a specific kind of drive that can be maintained by re-enforcing certain mechanisms (Flaherty, 2005).

We'll examine those re-enforcing mechanisms and how they function through literature review and case studies analysis, especially focusing on the distinction between a creative act and being creative as a durable approach.

2. Case studies: The Creativity of Social Leaders

2.1. Wannakanok Pohitaedaoh from Thailand's Deep South

Living in Thailand's Deep South, a region fraught with unrest and facing frequent attacks by Muslim terrorists, Wannakanok Pohitaedaoh [2] was preoccupied with the growing number of child victims and orphans traumatized after seeing their family members killed. She was especially concerned that the victimized children, even if they were cared for, remained disempowered and marginalized.

Thinking about the root causes of the violence, she sought to bring peace to the region. Her insight was that peace should come from within the community, given that external initiatives usually failed or were short-lived. However, the predominantly Muslim community of the Deep South was passive, suffering atrocities in silence and taking no action. Pohitaedaoh wrestled with this state of affairs until she had the idea to take a different approach and empower the orphan victims to become a powerful taskforce campaigning for peace and civic engagement. Her creative notion filled her with the energy to empower, train and turn these children into peace and civic engagement ambassadors. But the question of how to do it remained. Answers came quickly: The children should visit schools and tell their stories. They should engage with victimized families and publish and disseminate their objectives. Understanding that in order to sustain peace the people must participate and stand up against terror, Pohitaedaoh conceived the

idea of empowering young victims to participate in solving social and communal problems, establishing a paradigm of civic engagement and demonstrating that the power is with the peace-oriented majority.

In the course of her work Pohitaedaoh was frequently threatened and attacked – a bullet grazed her head, a bomb was thrown into her room. But against all odds, she persisted, pursuing her passion to innovate and bring novel peace-making solutions to her community and finding true happiness along the way.

2.2. David Kuria from Kenya

David Kuria [3], a young architect in Kenya, was ostracized by his peers and family for spending most of his time in the Kiberia slums, searching for a solution to a pervasive sanitary disaster and major threat of an epidemic. For some historical reason, Kiberia slum dwellers stubbornly resisted managing their human waste, choosing instead to deposit in plastic bags outdoors. And Kuria, instead of using his expertise to design tidy bungalows, was determined to solve the problem.

Many top-down governmental and international efforts to deal with the issue had failed, and a lot of money had been wasted, but Kuria looked for a creative way to engage the residents in the solution rather than impose one from the outside. To do that he quit his stable job and joined the social sector, much to the dismay of his family and friends.

He found great satisfaction in his search for innovative ways to create a communal mind-shift, circumvent conflict (Praszkier et al., 2010) and engage the community in improving sanitation. Kuria felt most happy when he initiated regular meetings of small groups of slum dwellers and asked them to draw their own dream-toilets. As they discussed their concepts, they gradually identified with the notion of actually having their own clean toilet areas.

Kuria collected the groups' artwork and used it to create an architectural drawing that became the residents' dream-goal. With minimal initial investments, using their own pro bono labor and scrap materials, the residents built their dream toilet. Taking full ownership, they cared for it and protected it from vandalism. They raised money for maintenance by posting ads in the structure and even started using biogas processed from human waste for cooking. The area became a focal point of the community, which took pride in its cleanliness. A new trend to improve sanitation overall took hold, which in turn spurred new innovation and entrepreneurial activity.

Since his work in Kiberia, Kuria has continued to promote bottom-up societal orientation toward caring for sanitation issues. This engagement keeps him continuously creative, as with each new endeavor he must figure out how to tap the community's often latent potential for taking responsibility into its own hands.

2.3. Megh Ale from Nepal

Megh Ale's passion is preserving the natural flow and purity of Nepali rivers and conserving river habitat [4]. Early on, Ale understood that in order to oppose the construction lobby interested in building dams that could harm the rivers, he needed to engage the villages located along the riverbank.

His first idea was to merge the popular activity of rafting with the tradition of taking tea. Rafting tours would stop along the route to have delicious Nepali tea with the riverside communities, generating income for residents and giving rafters the opportunity to learn more about local life. To ensure the success of "teahouse rafting" and support the nascent ecotourism industry, Ale developed a certification program to transform river guides into river conservation ambassadors. The guides follow Ale's strict "code of conduct" and share with tourists fascinating stories about the local communities and habitat and instill the importance of protecting the rivers.

Ale also determined that, in order for his ecotourism program to succeed, the residents must know how to effectively tell their stories to the tourists and understand the environmental issues affecting their communities. So he works with more than 30 schools along the riverbanks to teach locals about the river ecosystem, forest development and pollution control. With this educational piece, Ale has created a program that benefits all participants. The locals earn income from serving tea and snacks to the tourists and also get to tell their stories; the guides earn income from the skyrocketing number of rafting tourists and get to share their expertise; and the tourists gain an understanding of the local environment and culture. Moreover, everyone involved advocates for clean and natural flowing rivers, which helps sustain effective lobbying efforts to protect the rivers and the environment. As for Ale, he continues to work to protect Nepal's rivers and says that the challenges, while never ending, have given him the happiest moments of his life.

These three social leaders have demonstrated a continuous drive to find creative solutions and found joy in the process. So how do their experiences mesh with our understanding of creativity theory?

3. Creativity and being creative

3.1. Creativity

Some define creativity as a specific process resulting in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time (Stein, 1953, 1974; Amabile, 1996; Sternberg and Lubart, 2004). However, most authors perceive creativity less as a process and more as a capacity of the human mind, i.e., an ability to generate ideas that are new, surprising and valuable (Boden, 2004, 2013) – in other words, an ability to produce work that is both novel

(original and unique) and useful within a social context (Runko and Jaeger, 2012; Fink and Benedek, 2013).

Recently, a third component of creativity has been proposed (Simonton, 2017; 2018). That is, in addition to being novel and useful, creativity is also surprising or unexpected. It's fair to say that the efforts of the social leaders described above meet all three of these criteria and possess a capacity previously highlighted by Findlay and Lumsden (1988), who see creativity as a constellation of personality and intellectual traits demonstrated by individuals who spend a significant amount of time engaged in the creative process.

The essence of creative cognitive processing is seen as divergent thinking, i.e., the ability to generate novel ideas by exploring many possible solutions, as opposed to convergent thinking, which follows a particular set of logical steps to arrive at one solution, viewed in some cases as "correct" (Guilford, 1950; Runco, 2007). In that vein creativity may also be seen as an ability to retrieve and connect disparate concepts stored in long-term memory.

Some refer metaphorically to the creative act as "quantum leap thinking" analogous to an electron changing its orbit while generating or absorbing a quantum of energy (Mapes, 2003). Following this path we may perceive the creative act as a sort of eruption following a sudden association of concepts retrieved either from short or long-term memory. Some call this phenomenon serendipity [5], defined as the art of making unsought findings (van Andel, 1994). Serendipity is a desirable phenomenon that indicates creativity and generation of new ideas. It also plays a central role in finding interdisciplinary discoveries (Darbellay et al., 2014). If we value novelty and new ideas, we will invariably trend toward greater serendipity over time (Lindsay, 2014).

Margaret Boden (2004) mentions two kinds of novelties: psychological (the discovered idea is new to the individual) and historical (the idea is new to the world). The former characterizes the individual, while the latter is a contribution to global development. Boden also mentions three types of creativity (Boden, 2004, 2013):

Combinational creativity is the generation of unfamiliar combinations of familiar ideas (divergent thinking). This is the most thoroughly explored and studied kind of creativity (Boden, 2013). It's also the basis for many training techniques (e.g., the trainees are provided with several unconnected items or concepts and asked to connect them in a functional idea).

Exploratory creativity occurs when existing rules or conventions are used to generate novel ideas or items, whose possibility may or may not have been realized before exploration took place.

Transformational creativity brings about an idea that appears to be not only new, or even strange, but also impossible. "Seemingly, it could not have arisen but it did. By definition it involves breaking or ignoring of culturally sanctioned

rules." (Boden, 2013). Transformational creativity is often demonstrated by entrepreneurs who introduce new solutions to solving seemingly insurmountable and intractable problems (Praszkier and Nowak, 2012). This is probably the most admirable act of creation, as it conjures the emergence of impossible.

3.2. Being creative

In light of this it's important to consider what being creative means (some mention creativity as a protracted phenomenon, see Gruber, 1988). The paramount factor is motivation, which influences the persistence of creative drive (Flaherty, 2018). Psychological creativity leads to continual output of multiple creative acts and implies being confident, independent, risk-taking, intuitive and flexible, as well as demonstrating the courage to dare to differ, to make waves, to challenge traditions, and to "bend a few rules" (Davis, 1993). Creative people may be characterized by ideational fluency (i.e., producing a large quantity of ideas), originality (i.e., the novelty or uniqueness of their ideas), or the ability to think flexibly (i.e., generating a variety of ideas) (Guilford, 1950; Fink and Benedek, 2013).

Some creative individuals possess an abundance of enthusiasm and curiosity and have broad interests, while others have a tolerance for complexity and ambiguity and an attraction to the mysterious. To be considered a creative thinker, one must be able to work with incomplete ideas, where relevant facts are missing, rules are cloudy, and "correct" procedures are nonexistent (Davis, 1993).

3.3. Joyful experience

Prof. Mihaly Csikszentmihályi's (1997) analysis of 91 videotaped interviews illustrated that the reason creativity is so fascinating is that creative people live more fully than others. Creative people love what they do. It's not the hope of achieving fame or making money that drives them; rather, it's the opportunity to do the work that they enjoy doing (Csikszentmihalyi, 1997).

"When creative people were asked to choose from a list what they most enjoyed doing, whether reading, climbing mountains, playing chess, whatever, the answer most frequently chosen was designing or discovering something new. "[---] it seems perfectly reasonable that [---] some people [---] enjoy discovering and creating above all else" (Csikszentmihalyi, 1997).

Creativity engenders happiness, say medical doctors Carrie and Alton Barron (Barron and Barron, 2013). Similarly, Gruber (1988) mentions felicity associated with the creative processes. And if creativity is so pleasant, then it's no wonder that some individuals get "addicted" to being creative, continually seeking the self-induced, joyful experiences of innovation. This is clearly visible in the experiences of the three social leaders previously discussed: Wannakanok Pohitaedaoh after innovating the concept of turning ex-victims into Peace Ambassadors kept seeking other innovations and struck the idea if fostering those

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young people to become role-models for civic engagement as to empower the communities to stand up against violence. She reported that innovations provided joy and happiness, enabling her to resist threats and attacks. David Kuria, after the success in Kiberia slums, continued innovating hygienic solutions to toilet matters in other regions and countries, basing on bottom-up people involvement; this, as he said, was a joyful experience. Megh Ale continued finding novel ideas for protecting also other than his Initial Bagmati River, involving the river communities, rafters, schools, students and media – and this was for him, as he said in the interview – a path to happiness.

The question addressed in this article is whether this process works in reverse: Does joy enhance creativity?

4. Neural background of creativity

Our brains must stay flexible in order to overcome routine thought patterns and generate new associations and novel ideas. But it may seem that, over the course of a lifetime, the opposite is more likely to occur: The older we get, the more rigid our thinking tends to be.

It starts when we're young. A baby experiments with movements and reactions, learning by trial and error. Imagine, for example, the baby reaching for a toy. How many different muscles in the arm and shoulder must be coordinated in that simple act? At first the movement is quite clumsy, becoming more precise with time. Each act involves multiple neuronal connections, and in the baby's case, they are newly established and unstable. However, over time, as the movement is repeated, there develops a neurological "movement memory," which becomes routine. This simply means that a solid track of neuronal connections is being established and entrenched. These movements, as well as cognitive (e.g. attributions) and emotional patterns, serve us by eliminating the need to experiment with each activity over and over again. But they also make us use fixed neuro-paths, which may cause rigidity over time.

Previously, it was believed that this rigidity was an inevitable part of aging. However, contemporary neuroscience has discovered the phenomenon of brain plasticity, which enables flexibility despite the presence of old, proven neuronal pathways.

4.1. Brain plasticity

Neuroplasticity became a hot topic when two popular books were published: How to Think Like Leonardo da Vinci (Gelb, 2000) and The Brain That Changes Itself (Doidge, 2007). Each featured case studies of people whose mental limitations or brain damage were previously thought to be unalterable and explained how their conditions, once thought hopeless, and their lives were transformed through the mechanisms of neuroplasticity.

Although plasticity is greatest during childhood, the adult brain retains a capacity for functional and structural reorganization that had been underestimated (Johansson, 2004). The word plasticity suggests pliability and malleability. It can be defined as the capacity of neurons and neural circuits in the brain to change structurally and functionally in response to new experience. This property is fundamental to the adaptability of our behavior, learning and memory processes, brain development, and brain repair (Sale et al., 2014).

Brain plasticity can also be conceptualized as nature's invention to overcome limitations of the genome and adapt to a changing environment. As such, plasticity is an intrinsic property of the brain from birth to death, enabling the nervous system to escape the restrictions of its own genome and thus adapt to environmental pressures, physiological changes and experiences (Pascual-Leone et al., 2005, 2011). Simply put, plasticity is the brain's ability to rewire itself (Johansson, 2004). Contemporary studies support the view that the human brain is much more plastic than had been believed 20 years ago (Jäncke, 2009). Fortunately, experience as well as development can shape brain physiology and brain anatomy (Chaney, 2007).

There are three forms of brain plasticity. The kind that has been known for some time, especially in rehabilitation, is functional compensatory plasticity, where parts of the brain take over when, for some reason, other parts aren't functioning well (Shelton, 2013). This is particularly important for aging people. The most recently discovered form of brain plasticity is neurogenesis plasticity, where stem cells reproduce fully functioning brain cells. The third kind of plasticity is synaptic, evidenced by the appearance of new neuronal paths. Synaptic plasticity is the primary focus of this article.

4.2. New neuronal connections and the role of neurotransmitters

The brain provides neuronal connections in two ways. The first is through direct synaptic bonding, and the second is through special neuro-hormones, which serve as neurotransmitters, connecting more distant synapses.

Neurotransmitters include serotonin, epinephrine (also known as adrenaline), norepinephrine (noradrenaline), endorphin and dopamine. We're especially interested in those that contribute to creativity by making it a joyful experience. For example, dopamine helps control the brain's reward and pleasure centers (Beversdorf, 2013; Flaherty, 2005; Chermahini and Hommel, 2010), and endorphins are endogenous opioid peptides that provide pleasure and euphoria (Hawkes, 1992; Stoppler, 2014).

Dopamine. Recent research shows that for both neurogenic and synaptic plasticity dopamine plays a critical role. It influences the formation of new neurons deep in the center of the adult brain (Shelton, 2013) and also serves as one of the basic neurotransmitters.

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Dopamine influences the formation of new neurons deep in the center of the adult brain. Once formed, they move to areas of the brain associated with higher brain functions, thus playing a critical role while enhancing brain plasticity (Shelton, 2013). Dopamine also influences novelty seeking and creative drive (Flaherty, 2005, 2018; Zabelina et al., 2016). It's associated with pleasure (Sprouse-Blum et al., 2010; Flaherty, 2018) and is considered a factor contributing to a divergent mind (Kaufman, 2010; Chermahini and Hommel, 2010).

Dopamine helps control the brain's reward and pleasure centers. The brain transmits representations of reward to the dopamine system thus initiating further, similarly motivated behavior (Ballard et al., 2011). In that way it mediates reward-seeking activity ranging from gambling and cocaine addiction to the appreciation of beautiful faces and music (Flaherty, 2005; Aharon et al., 2001; Breiter et al., 2001).

Experiments on animals revealed that the neurotransmitter dopamine, constituting a major part of the brain's reward system, also generates motivation to engage in particular kinds of behavior (Pellis and Pellis, 2009).

Conversely, a deficiency in dopamine influences various diseases, such as Parkinson's disease, in which case dopamine therapy is often prescribed to increase dopamine levels in the brain. (Dopamine depletion in Parkinson's frequently leads to dementia.) In the treatment of artistic patients with Parkinson's, achieving a proper balance in the level of dopamine helps increase creativity (Kulisevsky et al., 2009).

Endorphin (an abbreviation for endogenous morphine) serves as a brain-controlled painkiller (MacLean Jr. et al., 1985; Sprouse-Blum et al., 2010; Stoppler, 2014, Scheve, 2014). It also delivers the feeling of pleasure and even euphoria (Stoppler, 2014).

Endorphin effects are similar to codeine's or morphine's, but aren't addictive. Several human activities are rewarded with pleasure stemming from the endorphinergic system in the brain, especially sex and some intense and prolonged forms of exercise, during which endorphins can decrease muscle pain (Hawkes, 1992; Stoppler, 2014). As such, the endorphin plays a role in a mental reward system that may cause a habit to exercise (Boecker et al., 2008; Hockenbury and Hockenbury, 2011).

The feedback-loop: creativity delivers joy and joy enhances creativity. It's worth mentioning that endorphin's effect lasts only for a short time, delivering a brief but noticeable dose of pleasure, while dopamine gives a longer-lasting feeling of joy (Rusu, 2013). In that vein creative individuals are both rewarded short-term and invited to continue the "creative drive" for a more sustained "high."

As Csikszentmihályi reported (1991, 1997), inventing delivers to the inventor a virtual "kick" of happiness. Innovation gives social entrepreneurs a similar reward, inducing them to persevere (Praszkier and Nowak, 2012; Praszkier, 2018).

There is no doubt that solving apparently insurmountable problems and achieving mission-impossible goals is a source of satisfaction per se. However, there's more to it: The neuroscience of the human being is constructed in an intelligent way. Innovations spring from new neuronal connections, which are perpetuated to a great extent by neurotransmitters. Those neurotransmitters, in a feedback loop, provide more pleasure.

This supports the theory that as creativity augments joy, joy also augments creativity, innovating delivers more satisfaction, and satisfaction triggers more innovations. As Alice Flaherty (2005) stated, "dopamine influences novelty seeking and creative drive." In other words, the way to augment creativity is through joy.

5. Augmenting creativity

Here we'll elaborate on this feedback loop phenomenon and look at other (affective or cognitive) mechanisms and activities that augment creativity. For example, we will see that music, dance, play and humor are among the most effective ways to boost creativity and sustain the creative drive.

5.1. Affective mechanisms: play, humor, music and dance

Play, humor and joy. Playful activity leads to the growth of more inter-neuronal connections, particularly in the frontal lobe – the part of the brain responsible for uniquely human higher mental functions (Pellis and Pellis, 2009).

Pretend play also fosters the development of cognitive and affective processes related to divergent thinking in children. In a longitudinal study, the quality of fantasy and imagination in play predicted changes in divergent thinking over time. Play also facilitates insight (Russ, 2003, 2016).

Interestingly, experts on animal behavior posit that play also generates creativity and stimulates innovation in other species. Through observation of animals they conclude that play helps the subjects find novel solutions. Play enables "breaking rules" in a protected environment and generates new ideas (creativity) and new ways of doing things (innovation). The same effects can be observed in human children (Bateson and Martin, 2013).

The influence of unstructured play on creativity in young children has been documented by the following research: Two randomly selected groups of children (age range 6–7) were asked to perform a task that involved playing with colors using their imagination. Before performing the task, children in the experimental group played freely with play-dough for 25 minutes. In the control group, the children performed a structured exercise in which they copied text from a blackboard. During the creative task that followed, the children who had played freely beforehand used more colors and were more imaginative (Howard-Jones et al., 2002).

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Humor also has a creativity-enhancing power (McFadzean, 1998; Couger, 1995; Amabile et al., 2005). "Getting into a humorous frame of mind not only loosens you up, it also enhances your creativity" says Von Oech (1990).

People in various professions when asked what is the secret of transforming activities so that they are rewarding in and of themselves choose amongst all answers "designing or discovering something new." It is the happiness of discovery which makes people creative (Csikszentmihalyi, 1997).

In a group setting humor can stretch participants' thinking and help them change mindset. It can also prompt them to combine ideas they hadn't associated before, and it can help them relax, encouraging them to take things less seriously and thus reducing one of the primary obstacles to creativity: feeling foolish or fearful of making a mistake (Von Oech, 1990; Couger, 1995; Abel, 2002).

Music and dance. Research has shown that music can also improve neuronal connections and brain plasticity, including the release of important neurotransmitters. Music is a powerful tool for recovering memories and enhancing the capacity to learn. Listening to music or learning to play it can also increase one's mental sharpness (Majd, 2012).

Dancing improves brain function on a variety of levels (Bergland, 2013). Dancing stimulates creativity by calling on multiple brain activities simultaneously (Majd, 2012). Dancers maximize cognitive function through practice. This leads to improving brain function on a variety of levels. Studies show that dancing contributes to achieving better performance by blending cerebral and cognitive thought processes with muscle memory and "proprioception" held in the cerebellum (Bergland, 2013).

Dance provides a way of learning which develops communication abilities, problem- solving techniques, and creative and critical thinking skills along with kinesthetic abilities. (Kogon, 2013). Consistent with recent work on simpler, rhythmic, motor-sensory behaviors, these data reveal the interacting network of brain areas active during spatially patterned, bipedal, rhythmic movements that are integrated in dance. Dance, as a universal human activity, involves a complex combination of processes related to the patterning of bipedal motion and to metric entrainment to musical rhythms (Brown et al., 2006). Empathetic "feeling into" a partner's movements and achieving kinesthetic synchrony with another also augments creativity. Moreover, research supports the idea that frequent dancing can reduce the risk of dementia by more than 70 percent (Powers, 2010; Majd, 2012).

5.2. Cognitive mechanisms: distance and metaphors

Cardinal aspects to consider, when we examine the phenomenon of creativity, are also its cognitive dimensions:

Distance and divergent thinking. An important aspect of creative problem solving is the perceived spatial or temporal distance from the problem. The closer

to the problem we are, the less likely it is that we will find creative solutions. Directly confronting and struggling with a problem narrows one's perspective, whereas a glance from a distant perspective opens more options.

With regard to temporal distance, in one exemplary study the participants were told to imagine their lives tomorrow (near future) or on a day one year from now (distant future), and then to imagine themselves completing a task on that particular day. Those who imagined a day in the distant future performed the task better than those who focused on the near future. In a series of experiments it was documented that the distant-future perspective facilitates abstract thinking (Förster et al., 2004).

The role of spatial distance in creative thinking is illustrated by a study from the University at Bloomington. Researchers randomly divided subjects into three groups and told them that a friendly academic team needed some support in their research. The only difference between groups was that the introductory story for one group indicated that the friendly academic team was located at a far spatial distance ("in California, actually around 2,000 miles away from here"). Another group was told that the academic friends were "actually 2 miles away from here," and the third group (the control group) received no information regarding the team's location. Next, all groups heard the same thrilling story:

"A prisoner was attempting to escape from a tower. He found a rope in his cell that was half as long as needed to permit him to reach the ground safely. He divided the rope in half, tied the two parts together and escaped. How could he have done this?" (Jia et al., 2009).

The participants were given one minute to find the solution. Finding the solution in this case requires creative thinking, as one needs to detach from the conventional thinking that "dividing the rope" automatically means cutting it into two pieces and see that the solution is to divide the rope by unraveling it lengthwise and tying the remaining strands together.

The research question was: Which group was better at "discovering" the solution? The result was that the group told that the solution was for a distant academic team did significantly better than the group told that the solution was for a group located quite close by. Distance helped. Because the problems seemed farther away, they seemed easier to solve (Shapira and Liberman, 2009).

These and other studies suggest that merely the perception of temporal or spatial distance from a problem can generate more creative solutions.

Distance through metaphors. Distance can also be achieved through metaphors. A metaphor, by definition, implies divergent thinking, as it is a comparison that shows how two things that are not alike in most ways are similar in another important way (Lakoff and Johnson, 2003) [6]. And indeed, metaphors open up new perspectives and are motivational and inspiring (Kolar, 2012). Some even see metaphors as a "liberating force" providing new perspectives (Inkson, 2002).

In business, metaphors are frequently used to reveal the complexity of the organization (Morgan, 1980). And many suggest that each situation or problem should be "metaphorized," i.e., simulated for various settings (McFadzean, 1998). Some metaphors are quite simple and popular, e.g. "putting two and two together," "connecting the dots" or "thinking outside the box." More elaborate ones may be found in marketing: "This vacuum cleaner is so powerful that it can suck the light out of a black hole"[7].

One of the most illustrative examples of a business metaphor can be found in the well-known writing of Eric Raymond: The Cathedral and the Bazaar. In it Raymond depicts "closed" Microsoft software as a cathedral built by a cloistered team of developers under the authority of a bishop and portrays the open-source software Linux as an open bazaar (Raymond, 2001).

Some business consultants use the warfare metaphor, drawing strategic approaches and knowledge from the military field and applying them in business (Talbot, 2003). Others argue against using battle metaphors for business strategy (Cespedes, 2014) and replace them with the "blue ocean" metaphor, which suggests that effective strategy shouldn't aim to confront competitors, but instead, should make competitors irrelevant (Kim and Mauborgne, 2005). Success comes from creating one's own "blue ocean" of uncontested market space, and one's own values and approach, regardless of what competitors do. The blue ocean strategy means creating new opportunities, instead of confronting the old ones.

One of the most common business metaphors is Edward de Bono's six hats of different colors (de Bono, 1995, 1996). Each color represents a different type of thinking used to solve a problem. To clarify the thinking process one has to don the hat representing the current mode of analysis. The White Hat covers facts, figures, information, asking questions, and defining information needs and gaps. The Red Hat relates to intuition, feelings and emotions. The Black Hat is a logical critique, representing judgment and cautions, and is used to point out why a particular suggestion doesn't fit the facts, the available experience, the system in use, or the policy that is being followed. The Yellow Hat is also embedded in cognitive thinking, finding reasons why something will work and why it will offer benefits. The Green Hat is the hat of creativity, alternatives, proposals, provocations, and changes. The Blue Hat represents surveying the entire process and controlling its proper flow. Metaphors provide distance and, at the same time, they may be a source of fun – which is a creativity-reinforcing factor.

5.3. Affective – cognitive mechanisms: delving into the imagination
The influence of imagination on solving problems. In the first decade of the 21st century researchers carried out a project at the University of Amsterdam where participants imagined one of three situations: a long walk with their beloved one, casual sex with a person to whom they were attracted but not in love with,

or a nice walk on their own (control group). Participants then attempted to solve two kinds of problems, some requiring creative insights and others calling for analytic thinking. The results were that participants imagining a walk with a loved one solved more creativity problems and fewer analytic problems than those in the control situation. Participants imagining casual sex, on the other hand, solved fewer creativity problems and more analytic problems compared with participants in the control group (Förster et al., 2009; Liberman and Shapira, 2009).

Imagining love activates a long-term perspective that elicits global processing, which promotes creativity and impedes analytic thinking. In contrast, thoughts of casual sex activate a short-term perspective that elicits local processing, which encourages analytic thinking and hinders creative thinking (Förster et al., 2009; Liberman and Shapira, 2009).

The general conclusions are, first, that imagination has the capacity for influencing creative potential and, secondly, that more abstract imaginings (love) does significantly more to augment creativity than more concrete thoughts (sex).

Guided imagery. An elaborate form of metaphor is a technique used to activate imagination called guided imagery. Guided imagery recalls images from long-term or short-term memory, or those created from fantasy, or a combination of both, in response to guidance or instruction (Kosslyn et al., 2001; Pearson, 2007). It has the built-in capacity to deliver multiple layers of complex, encoded messages by way of simple symbols and metaphors (Naparstek, 1995). As such it promotes divergent thinking, which enhances problem-solving ability (Sarnoff and Remer, 1982) and is also recommended for psychotherapy (Assagioli, 2000).

5.4. Environment: Serendipity and horizontal connections

Accidental discoveries. Creativity not only generates sought after solutions and innovation, it can also spawn fortuitous discoveries or happenstances in the form of pleasant surprises. As mentioned before, the propensity for such accidental inventions to occur is called serendipity. Velcro, penicillin, X-rays, Teflon, Newton's theory of gravitation and dynamite are all examples of serendipitous discoveries (Roberts, 1989).

As the art of making unsought findings (Andel, 1994), serendipity is a desirable phenomenon that indicates creativity and generation of new ideas. It also plays a central role in making interdisciplinary discoveries (Darbellay et al., 2014). If one values novelty and new ideas, one will invariably trend toward greater serendipity over time (Lindsay, 2014).

Some say that serendipity arises from a blend of non-purposive conditions, e.g., from the environment, and purposive strategies, e.g., from intentional knowledge acquisition (Foster and Ford, 2003). New findings (especially in Silicon Valley) indicate that there are tangible paths to facilitate both and augment serendipity. Making the assumption that serendipity is a certain state of mind

and a property of social networks (which indicates that it can be measured and analyzed), Silicon Valley leaders began engineering it [8] (Lindsay, 2014).

Here are some examples:

Between 1974 and 2005, U.S. Big Pharma noted a significant increase in the use of management resources and a parallel decline in its number of patents. The offices were traditional and the workplaces stable. During more or less the same period (1997–2012), the French company Paris Jussieu [9] was thriving. They published 55,000 scientific papers during this time. Also, Paris Jussieu employees were three to five times more likely to collaborate with their peers and did so nearly four to six times more often (as measured by citations).

The core driver of Paris Jussieu's remarkable performance was quite surprising. As it turned out, Jussieu was retrofitting its offices (removing asbestos), and during this time, offices frequently relocated labs and moving and reorganizing staff in random groups. People who didn't know each other met at the new locations and eagerly discussed their work, inspired each other and collaborated (Lindsay, 2015).

In another example, Yahoo instituted a work-from-home policy for employees in 2013, and saw a corresponding decline in productivity. When Marissa Mayer became CEO, she reversed the policy, claiming that working solo couldn't compete with lingering meetings around the coffee machine and the unexpected inspiration that can result. She believed that some of the best decisions and insights come from hallway and cafeteria discussions, meeting new people, and impromptu team meetings. In fact, to increase serendipity, Yahoo commissioned a new campus expressly designed to maximize casual collisions among the workforce. Likewise, Facebook hired the famous architect Frank Gehry to build office space that would keep thousands of people in close proximity, to encourage collaboration (Lindsay, 2015).

Random encounters and serendipity. Researchers have followed these experiences, attempting to document whether, indeed, random encounters and meeting in groups enhances serendipity. Arizona State University used sensors and surveys to study creativity within teams. The exploratory study indicated that movement and face-to-face interaction between the team members might be a significant indicator for enhancing creativity. Participants felt most creative on days spent in motion meeting people, as opposed to working for long stretches at their desks (Tripathi and Burleson, 2012).

MIT Media Lab's Human Dynamics Laboratory used "sociometric badges" to measure workers' movements, speech and conversation partners. The discovery was that employees who ate at cafeteria tables designed for twelve people were more productive than those at tables for four, because there were more chances for conversations within larger social networks. It was shown that these collegial lunches, along with random encounters during coffee breaks, can augment

individual productivity by as much as 25 percent. In his conclusion, MIT researcher Ethan Zuckerman said that the greatest threats to serendipity are our ingrained biases and cognitive limits; we intrinsically want more known knowns, not unknown unknowns (Baber et al., 2015).

Following this path, Lindsay (2015) defined serendipity as the process through which we discover unknown unknowns, based on an emergent property of social networks, instead of sheer luck.

Horizontal networks. As seen in these examples, there is a specific flow of information across departmental boundaries or across functional areas at a given level of an organization, which is called horizontal networks (Bovee and Thill, 2011). Horizontal networks may play a significant role in boosting serendipity as people at the same level communicate and inspire each other freely, without going through multiple organizational levels (Papa et al., 2007).

6. Discussion

This article is only a first step in the exploration of factors that may help leaders augment their own and their teams' creativity. We've looked at three instances of individuals using creative thought to affect change. And we've outlined the neuroscience foundation of emotional reactions to creativity and the feedback loop which may maintain creativity as a lasting state of mind, as well as the emotional (joy, humor, play and dance), cognitive (distance and metaphors), mixed (guided imagery) and situational (horizontal networks) factors that support creativity.

However, there are several topics that warrant further investigation. The feedback loop hypothesis (between joy and creativity, with neurotransmitters as mediators) is worth more research to learn how long it lasts and whether it extends beyond professional creatives and social entrepreneurs to include other social or age groups

Correlations between individual and group creativity also deserve further study. This topic is especially interesting in light of the latest Google findings (Project Aristotle) regarding the variables that influence group efficiency. Through many probes and trials in diverse settings, the company discovered that the intellectual strength of individual participants – even of those who scored highest on various scales – has no influence on the team's performance (Duhigg, 2016). What matters much more is, first, the psychological safety of the team members. Subjects should feel comfortable and safe in the group and focus not exclusively on the task, but also on each other by, for example, sharing personal information. Secondly, each member should speak for roughly the same amount of time in total (though they might speak for varying periods over time). These two features alone are sufficient to significantly improve the group's performance, regardless of the qualities of individual participants. These findings may be consequential relative to effective leadership.

The role of metaphors and parables also seems an interesting opportunity for new studies. A simple question to address might be whether people who typically use metaphors and parables are more creative than those who do not. Another to consider is, how does simply listening, instead of actively constructing metaphors, influence creativity? It seems especially important for leaders, to know more about the role of metaphors in enhancing their team's creativity, how to use them, what sort of metaphors are most effective, etc.

Another potential area of inquiry is the durability of the creative drive and the ways it may be influenced by various variables (emotional, cognitive, mixed or situational). Our conjecture is that the more diverse those variables are, and the more they accumulate and entwine over time, the more permanent the brain's plasticity would become, and hence, the more lasting the propensity for creativity would be [10]. For example, introducing a joyful context (e.g., dancing or humor exercises), while building distance through metaphors and encouraging horizontal accidental connections may aggregate a generalized and lasting disposition for creativity. If this hypothesis is confirmed in further studies, then the recommendation for leaders would be to build a diverse environment, intertwining hard work with such activities as humor and dancing.

Yet another avenue for research could relate to the role neurotransmitters (especially dopamine) play in some common disorders. For example, there are indications that autism correlates with low-dopamine levels (e.g. Krietel and Noell, 2015). How levels of these neurotransmitters tie to creativity may also warrant a closer look.

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Notes

[1] The author as a practitioner was a second opinion reviewer for over 100 candidates to Ashoka, Innovator for the Public association (www.ashoka.org).

[2] See: www.ashoka.org/fellow/wannakanok-pohitaedaoh; the presented cases are based on one of the co-author's (Ryszard Praszkier's) life second opinion interviews with candidates to Ashoka, Innovators for the Public (www.ashoka.org) fellowship.

[3] See: www.ashoka.org/fellow/david-kuria and http://ecotact.org.

[4] See: www.ashoka.org/fellow/megh-ale and www.nepalrivers.org.np.

[5] The word "serendipity" is based on an old Persian fairy tale "Three Princes of Serendip," about the travels of princes from Serendip, who made a series of accidental discoveries. The word serendipity was coined in the mid-18th century by Horace Walpole, who mentioned that the phenomenon of accidental discoveries may be called serendipity (see wiki: https://en.wikipedia.org/wiki/Serendipity).

[6] Interestingly, it was Aristotle who highlighted the pivotal role of metaphors in human communication; see: Kirby (1997); Levin (1982).

[7] Cited from: https://www.mindtools.com/pages/article/newCT_93.htm (accessed 27.01.17).

[8] Engineering serendipity may sound like an oxymoron – how one can engineer something that is by definition accidental? However, assuming that some properties of social networks may influence the propensity for serendipity, one may explore the relevance of some environmental components.

[9] The largest medical research complex in France of a similar pharmaceutical profile.

[10] Drawn from author's practical experience as a trainer and psychotherapist.

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