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Purpose: The purpose of this paper is to review intuition in the context of organizational change. We argue that intuition as a concept requires attention and its formulation is necessary prior to its application in organizations. The paper provides a critique of Dual Process Theory and highlights shortcomings in organization theorizing of intuition.

Method: The paper is conceptual and provides in-depth theoretical discussions by drawing from the literature on decision and intuition in the context of organizational change.

Findings and Analysis: In investigating whether Dual Process Theory is sufficiently clear, we found ambiguous explanations and arguments. Specifically, the current definition provided by Dane and Pratt is not clear in terms of its four sections: (1) The consciousness of non-conscious processing, (2) involving holistic associations, (3) that are produced rapidly, which (4) result in affectively charged judgments. Finally, we note that the evolutionary perspective is missing and we provide foundational concepts for such a perspective, including the discussion of information templates, memes and genes, as argued by research, condition intuition.

Originality and value: The paper finds that an evolutionary perspective develops a picture of intuition as an adaptive resource. This evolutionary perspective is currently absent in research and we provide foundational concepts for such a perspective. We propose specific arguments to highlight the evolutionary perspective.

Keywords: Dual Process Theory, Intuition, Change, Evolution; Contemporary Organization Research; Review.

Introduction

Humans are often agnostic about the kind of logic found in the annals of Mathematics, Physics and Economics. This is particularly the case for practitioners many of whom immersed in the swim of organizational dynamics will not use a logical tool to make sense of typical work-day problems. Even more impactful decisions like promoting a subordinate to further his or her career for instance, are not commonly based on normative theorizing or logic. Much of the time, practitioners and experts embroiled in pressured and competitive environments follow their intuitions about situations (Locke, 2015). Similarly, in their private lives logic has little attraction. Typically, a man will not propose marriage to a woman based on the logical fit derived through calculations about offspring development and adaptation success. Instead, he would follow his gut feeling. The idea that humans live through personal reasoning, often in the form of intuitive feelings, has been around since Barnard (1938) and Selznick (1948) argued for the existence of alogical mental states (i.e. states that do not wholly reflect normative logic). Recently, in organization research circles renewed interest in the phenomena of intuition has emerged.

Focus of Paper

There are two broad arguments: first, that intuition is a valuable resource often used by experts involved in business negotiations. Second, we must be cautious in praising intuition since it is not suitable in all situations. For organization theorists concerned with these arguments, a fundamental task involves asking what intuition is (Lieberman, 2000; Evans, 2012; Akinci and Sadler-Smith, 2012). *This forms our focus in the current conceptual paper.* In the larger scope of things, the challenge for research involves overcoming a research legacy that portrays workers as rational agents plagued with intuition and other mental states like emotion. Simultaneously, whether intuition is a valuable resource or one that is useful in particular environments, represents a concern secondary to the crucial task of determining *what intuition is*. The current paper addresses this concern by

- i/ critically evaluating the dominant account of intuition offered by Dane and Pratt (2007) and
- ii/ by offering an account of intuition during organizational change based on evolution.

The paper is organized as follows: First, the organizational change context is reviewed in terms of its importance for studying intuition. Second, definitions of intuition are reviewed and Dane and Pratt (2007) dual process theory definition is presented. The components proposed by Dane and Pratt are critically discussed and interpreted. The discussion introduces an evolutionary perspective currently

absent in organization theorizing of intuition. The perspective suggests ideas in relation to Dual process theory.

Why Organizational Change?

Human societies remain continuously in flux through the organizing processes of organizations. The notion of change is an intrinsic dimension of the organization, which in a sense remains in flux. However, use of the term organizational change by scholars specifically refers to intended modifications in human and non-human processes of the organization (Ibarra and Pertiglieri, 2010, Antonacopoulou and Gabriel, 2001, and Armenakis and Bedeian, 1999). Change management efforts are reactions to environmental demands and concerns for operational efficiency. About 70% of change projects fail. Successful change depends to a considerable extent on leadership. The Leader provides a vision, a direction, and emits security in uncertain conditions of change. He or she provides unity and often relies on *gut feeling or intuition* as a source of important decisions, generated in the context of poor rationalizations, high uncertainty and weak communication (Hensman and Sadler-Smith, 2011).

Akinci and Sadler-Smith (2012) suggest that organization research should ask what intuition means in terms of changes in leader behavior. In this regard, organizational change provides an opportunity (i.e. the dynamic environment) to study changes in leader behavior experienced as intuitive moments of individual experience in leadership positions. The implementation of organizational change alters working conditions and cogently stimulates worker behavior including cognitive as well as behavioral reactions. Senior management pressured by the complexity of experience, often withdraws from rationalizing behaviors. Instead, overwhelmed, they intuitively grasp a way forward. The point is that leader rationality is bounded. It is a limited deciphering framework. In the face of complex and dynamically occurring socio-economic change and related sets of humanly incomputable stimuli, rational frameworks can fail (see Simon, 1987). When this happens, senior managers in leadership positions turn to their gut.

In the 1990's the CEO of Chrysler Bob Lutz made the intuitive decision to invest in the Dodge Viper. At the time, the investment was a radical change in his behavior that made little sense from logical perspectives. The vision had come to Bob on a long car drive. He remembers a feeling in his gut telling him that it would work. In hindsight the Dodge Viper was a great success (Hayashi, 2001). It was 'gut feel' rather than mere rationalization that won for Chrysler. When senior managers leading organizational change follow their gut, they recognize complementarities in apparently contradictory forces of change (Sutherland and Smith, 2013: 220). A business solution that seemingly contradicts economic logic hides within it, the complementarities that intuition might draw on. Without this gut

feeling the senior manager or leader would myopically circle around the same issues whilst grounded and constrained in domain specific knowledge and routines (Salas, Rosen and DiazGranados, 2009: 10). For example, a finance CEO tends to see the organization in financial terms based on a repertoire of experiences. Here, intuition has the power to introduce a fresh perspective that is not crowded out by regularity of thought and habit, but by some unique combination of perceptions. To escape from regularity Lutz went on a long car drive leaving behind the regulating confines of his workplace. His intuition was the breaking and re-integration of conscious patterns of thought. But the converse situation also seems to work. During change organisations also hire specialists that bring expert domain-specific knowledge to manage aspects of change. Their schemas offer lessons that have been learnt through projects with various experiences and environments. Intuitive decisions draw on such schemas (Hogarth, 2001; Dane and Pratt, 2007) and play a strategic and project level role during organizational change. In other words, intuition during organizational change is the attainment of ‘other than regular’ thoughts that stand outside rational frameworks of managers. Overall, the presence of intuition during organizational change is a distinct opportunity for studying this resourceful phenomenon.

What Intuition is and Dane and Pratt’s Definition

Over the past eight decades the concept of intuition has attracted attention from management scholars in North America and Europe (see review by Akinci and Sadler-Smith, 2012). Etymologically, the word intuition comes from the latin word *in-tuir*. Hodgkinson et al (2008) translate this as the act of knowing from within. In other words, intuition is the innate tendency that provides actors with knowledge and business solutions. Most studies assert that intuition is different from logical reasoning, and at the same time the studies have nothing more to add (Evans, 2010). Historically, the term intuition has been associated with mystical revelations popularized in folklore and religious stories in cultures around the world. It is a spiritual and transcendental experience of the individual. It is a prophetic revelation in primitive belief systems.

Philosophical and scholarly accounts have defined intuition as an immediate apprehension of things which involves no explicit rationale or deliberation (Wild, 1938, 226; Rorty, 1967:204; Myers, 2002: 128; Dane and Pratt, 2007; Akinci and Sadler-Smith, 2012). In other words, a person suddenly clenches the answer to a problem, and cannot explain how it came about. For practitioners this presents an alternative to rational models (Lieberman, 2000; Akinci and Sadler-Smith, 2012). A top executive at Apple, Tim Cook, remarked in his interview that his decision to join the company was a gut feeling. His exploration of rational and analytical models had failed him. Similarly, a study interviewed officers who rated the credibility of loan applicants. It found that hard data analysis was not as valuable as the gut reactions of officers (Lipshitz and Shulimotvitz, 2007). Dane and Pratt

(2007) contend that intuition emerged to cope with the trade-off in decision theory whereby decision accuracy and decision speed are inversely related. The hope is that intuitive judgments are both accurate and timely (Khatri and Ng, 2000).

Related to this, the underlying approach that dominates organization research is the Dual Process Theory perspective (DPT) of intuition. The perspective emerged and developed from 1960 onwards, and is closely associated with seminal work by Daniel Kahneman. The core underlying assertion is the existence of two systems of human reasoning; system 1 and system 2 (Evans, 2012). Over the years different studies have offered exclusive features of the two systems, but a growing number of studies agree on some shared features (Akinci and Sadler-Smith, 2012). System 1 is older in evolutionary terms and it consists of unconscious, rapid, automatic, and high capacity mental processes. Such processes are interpreted by Smith and Ward as *“cognitive schemas that occur without explicit awareness or deliberate intention, which can be described as implicit cognition (2012:463).* System 2 is relatively recent and consists of conscious, deliberate, and relatively slow mental processes. An instance where an actor claims to have had an intuition involves both systems. Implicit cognitive processes occur in system 1 and surface as a judgment that seems to be automatically integrated within system 2 (Kahneman, 2002). Overall, most of the processing and coordination of memory structures occur underneath conscious awareness. Akinci and Sadler-Smith (2012) highlight that under the DPT perspective an influential definition is offered by Dane and Pratt (2007), which has been widely adopted by organization theorists and researchers.

Intuition is a (1) non-conscious process (2) involving holistic associations (3) that are produced rapidly, which (4) result in affectively charged judgments (2008: 36).

This definition draws on four themes, which are; the non-conscious domain, the related development of holistic associations, rapid and automated mental processing, and affective experiences of individuals. Critically reviewing these themes in context, the sections below expose considerable challenges. The challenges appear through an evolutionary perspective, in particular the usefulness of cultural evolution is argued as more suitable for organization theorists, compared to the

complimentary process of biological evolution; although both have explanatory power. Organizational change studies are used to further contextualize and exemplify points and arguments.

(1) The Consciousness of Non-Conscious processing

This section critically reviews the pitfalls of non-conscious processing and offers a new way of thinking about intuition through evolution. Generally, whilst the theme of non-conscious processing has been widely adopted by scholars of intuition, there remains philosophical uncertainty on this front. How should this type of processing be interpreted if not a set of invisible assumptions? In a historical context, the idea of non-conscious processing and structures in relation to intuition can be traced to the development of psychological types by Carl Gustav Jung, seminal work by Selznick (1948), the notion of Bounded Rationality by Herbert Simon (1987), work on tacit structures by Polanyi (1967), through to the Cognitive activation theories that emerged in the late 1970's and early 1980's (Bower, 1981; Salkovskis, 1986; Kahneman, 2002). Specifically, Evans (2003: 458) explains that in the DPT context *“Dual-process theories of thinking and reasoning quite literally propose the presence of two minds in one brain. The stream of consciousness that broadly corresponds to System 2 thinking is massively supplemented by a whole set of autonomous subsystems in System 1 that post only their final products into consciousness and compete directly for control of our inferences, decisions and actions.”* The passage suggests that whilst a leader consciously experiences the world through system 2, the driving schema consist of invisible ghosts of system 1 (i.e. the automated subsystems of intuition). There are two subsystems: heuristics¹ and constructive structures. Figure 1 situates these within system 1 and between system 2 (i.e. conscious rationalizations) and biological substratum (i.e. Limbic region).

¹ A heuristic is defined as a rule of thumb. It is a mental program in system 1, which manifests as an automatic response that filters through information to deal with environmental cues (Gigerenzer, 2008). Often heuristics are sub-optimal responses. That is, they are good enough responses and not the best ones (Tversky and Kahneman, 1974).

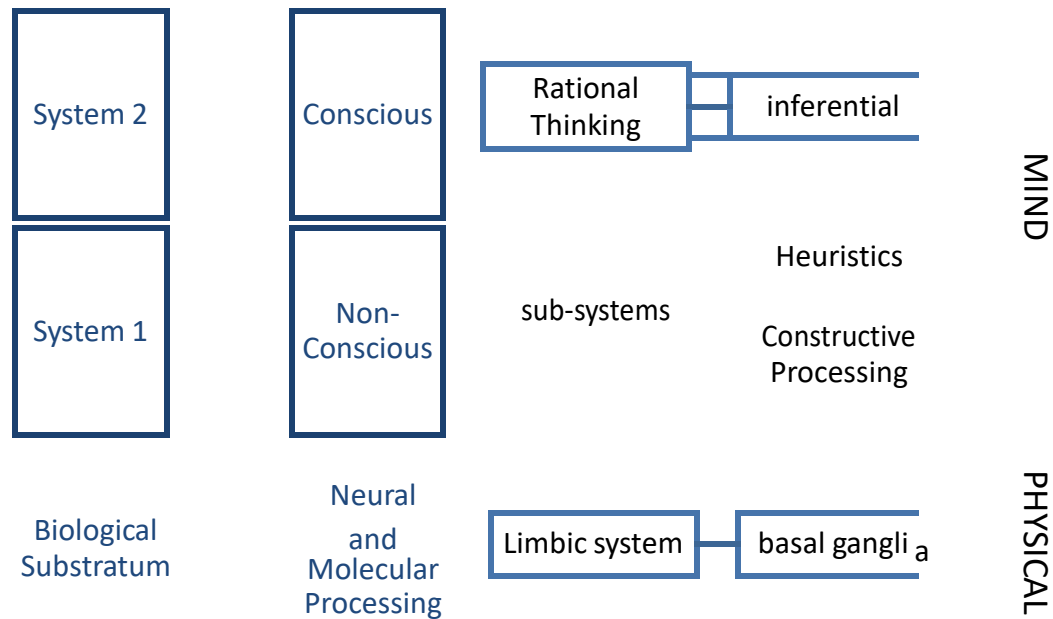


Figure 1:

Whilst Dane and Pratt (2007) define non-conscious processing in system 1 by distinguishing it from rationalizations of system 2, they also implicitly endorse that both systems are conditioned by neural processing; i.e. in reference to basal ganglia activation - Lieberman (2000). Thus, in the above figure system 2 works alongside system 1, whilst biological substratum underlines the whole affair. Dane and Pratt (2007) take stock of evidence from cognitive and neurological psychology. In these disciplines conceptualizations, definitions, and theory is increasingly being based on interactionist ontology (Bohl and Van de Boss, 2012). This ontology states that faculties and traits of individuals are the result of interactions between forces in biology and society. That is, the change leaders intuition is *appearing experience* that is emergent through the interaction of forces in biology and society. However, no philosophical tenet is explicitly stated in Dane and Pratt's definition. Without a philosophical interpretation their cross-disciplinary definition is open to the critical question: are systems 1 and 2 substantiations of mind stuff as assumed by Evans (2003), which in turn are reducible to physical matter constituting biological substratum conditioned by social experience? If Dane and Pratt's definition implicitly endorses interactionism then the further question arises; is system 1 a *purely theoretical model* that aides the conceptualization of neural and social impact unexplainable by system 2 deliberations and conscious inferences? If the answer is yes, then the concept of system 1 through an interactionism lens represents the *theoretical modelling* of activity originated in the basal ganglia of the limbic region (Lieberman, 2000) continually conditioned by social experiences and learning (indicated by arrow in figure 1). Conclusively, it is not a 'second mind' as asserted by Evans (2003). Consider the example of the electron in physics; this is a point particle with no spatial

extension. It is a useful theoretical assumption nonetheless. Similarly, system 1 has no spatial extension apart from its neurological substratum. It is useful as a theoretical model.

There has been criticism since the terms system 1 and system 2 were introduced by Stanovich (1999). It is argued that “Dual-process theories of reasoning exemplify the backwards development from precise theories to surrogates” (Gigerenzer, 2011:739). It is also argued that the two system conception lacks conceptual clarity and provides insufficient empirical evidence (Keren and Schul, 2009: 534). In other words, system 1 is not observable, nor experiential, and thus generalizations that adopt the two minds hypothesis rest on theoretical foundations. In the context of such criticism we assert that system 1 is a theoretical modelling or set of assertions about what system 2 cannot explain but requires for its definition. Simultaneously, system 1 is an accounting for behaviors induced by neural activity and shaped by external stimuli. Several questions remain unanswered and reflect crucial drawback in conceptualizing intuition, particularly from a cross-disciplinary perspective employed by Dane and Pratt (2007). Principled by interactionism intuition research has the opportunity to explore new perspectives offered by the powerful idea of evolution. In their extensive review of intuition research over the past eight decades Akinci and Sadler-Smith (2012: 117) recognize that “*Evolutionary perspectives are neglected but potentially fruitful avenue of inquiry for intuition research*” applicable in organizations. The evolution perspective is an alternative space for exploring intuition. A decade earlier in 2006 a special issue in the *Journal of Organizational Behavior* highlighted the explanatory power of evolution. Historically from this perspective topics including leadership, teams structure and culture have received limited attention based on work by Jay (1971) and Kolodny (1979) and more recently Lawrence and Nohria (2002).

Arguments in such studies emerge from the central idea of biological evolution commonly identified with Charles Darwin. Following the publication of the *Origin of the species* over the following century and a half several interpretations of evolution emerged and influenced theory construction in biology. This is often denoted as *Darwinism*. The central idea is modification by descent. This involves the forces of natural selection acting to influence the modification of genotype and phenotype parts in species populations. These parts pass through generations and enhance the species-environment fit (Nicholson and White, 2006: 112). However, the crucial point is that biological evolution through modification by descent is a special case of a more general principle known as *variation-selection-retention*. This principle has been applied to natural and man-made environments (see Campbell, 1969; and Van den Ven and Poole, 1995 on population changes in social organizations). The principle states that in a population over time conditions preserve some recurring patterns or information template. In biology this is the gene that constitutes the information needed for heredity. There takes place random variation in the template, whereby some traits are selected over others because of their adaptation advantage for the template striving to exist in hostile environments.

A template may be retained through generations of heredity across the population, depend on its adaptation advantages. Underpinning VSR is the interactionism thesis.

The thesis reasonably asserts that trait development is determined through VSR processes acting on some information templates, like the human gene, which is conditioned and shaped through interactions in society (Mameli, 2007). We propose that the evolution perspective opens space for phenomena known as cultural evolution. This offers the *meme* in Organization research acting analogous to the *gene* in biology.

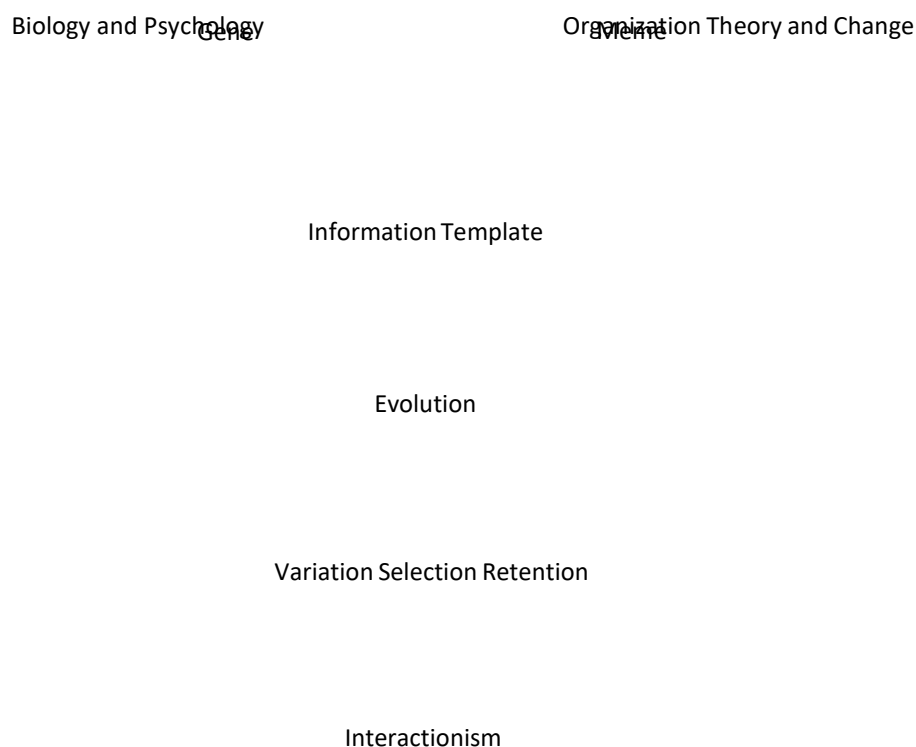


Figure 2

Figure 2 illustrates the prospect; interactionism underpins the principle of variation selection retention that weaves the evolution of an information template. In the case of biology and psychology most studies take the gene to be the information template. In organization theory the current paper argues the use of the meme in defining intuition and related condition. This does not exclude the importance

of genes, rather it places them as complimentary endowments of the modern worker. A meme is defined as a template for cultural transmission of ideas (Dawkins, 1976; Dennet, 1995; Blackmore, 1999; Distin, 2005). A meme can be an idea, belief, stories, rumors, legends, sciences, or behavior pattern of workers. As such it is the information template that spreads from mind to mind of workers embroiled amidst change. Just like a gene, a meme is able to replicate and produce copies of itself and spread in social organizations. Just as genetic evolution is conceived in terms of gene frequencies in a population, memetic evolution can be conceived in terms of meme frequencies spread across the organizational landscape (Mameli, 2007:30). The better the fitness of a meme, the stronger are the chances that it will occur more frequently (i.e. high meme frequency) and vice versa. Meme fitness strength depends on meme features as well as its consequences. From a memetics perspective an intuition might be a particular kind of meme (i.e. it is an information template or replicable pattern) of thought, which deviates from prevailing patterns found in the rational formalisms of practitioners and researchers. Given that memes with strong fitness and thus high frequency tend to be salient ideas, intuition in relation to its affectively charged salient content (Sadler-Smith, 2016: 3) qualifies as a good instantiation of a meme. We propose that *intuition* as a pattern of thought consisting of highly salient affective content can be categorized as a meme.

Given, the dual process approach by Dane and Pratt (2007) we run into a split. First, broadly speaking, the adoption of the meme as the unit of evolution in organizational change is not a divorce from consideration of biological influence. The evolutionary mind of the individual is both cultural conditioned and possesses genetic tendencies (Tomasello, 1999; Dennett, 2003; Vugt, 2006). We adopt the interactionism thesis and propose that intuition can be expressed through evolution by drawing on the language of biologists or equally those interested in cultural evolution and memes. However, given that genetic variation and influence is much slower than memetic development (Atran, 2001: 6), research into organizational change benefits from looking at memes more than from direct consideration of genetic development. Whilst a meme is meaningful in its everyday influence and meeting of minds, a gene is meaningful over generational timelines as the causal driver of innate tendencies. A meme in one sense is epiphenomenal to a gene, whereby the latter is causal (Volland, 2007). Second, the employment of genes and memes in studying organizations splits up the dual process theory further. Figure 3 illustrates system 1 looking to genes for explanatory power, and system 2 looking to memes.

Phenotypic Variation System 1 System 2 Memetic Variation

Figure 3

At an ontological level, Dane and Pratt's definition is a meme in its own scientific community, but this is not a concern in the current paper. In so far as system 1 is a non-conscious system, phenomenally it does not engage memes because there is no personal experience. However, if as we assert, system 1 is a modelling of neural activation, then the definition sits closer to genetic tendency and phenotypic behavior indicated in figure 3. Conversely, system 2 as a conscious system that is experienced. It directly engages, constructs and shares memes, and thus sits closer to the memetic system of evolution. We propose that this distinction is core for an evolutionary approach.

(2) Involving holistic associations

The definition offered by Dane and Pratt (2007) also adopts the idea of holistic associations (see Sadler-Smith and Shefy, 2004; Sadler-Smith and Akinci, 2012). Drawing on a host of studies in the dual process movement, they argue that intuiting (the unconscious processes of intuitive judgment formation) involves two mental operations **a/** linking disparate pieces of information together, therefore it is associative. And **b/** it involves the recognition of patterns, referred to as a holistic grasp of experience. In this idea there is an implicit assertion that **a** and **b** somehow co-operate. In other words, concepts associatively link in the mind and are apprehended by system 2 (consciousness) as patterns indicating a holistic phenomenal grasp. Thus, Dane and Pratt (2007) propose the presence of holistic associations through intuiting. Their assertion about intuiting involves non-conscious mapping of environmental stimuli onto cognitive structures of employees. There are two types of structures mentioned earlier. On the one hand, there are mental heuristics. These are mental shortcuts that

enable timely response in demanding environments and have evolutionary origins (Vugt, 2006). In evolutionarily older environments this manifests as fight/flight reactions that are visceral and relatively less cerebral. On the other hand, there are the more complex data rich structures, which involve reflection and deeper inferential thinking by practitioners and experts (i.e. constructive processing). The process of intuiting maps the perceptual stimuli onto such structures and somehow functions outside the observer's awareness. Confusingly enough, intuiting implies the lack of any logical inference binding **a** with **b** (i.e. no meaningful rules for inference are posited, since this is purported to be a non-inferential process of recognizing patterns by linking disparate data – not inferred causally by some conscious agent). Consequently, there remains poor clarity about how holistic associations result from what Dane and Pratt (2007) label intuiting. Van Riel and Horvath (2014: 44) ask “*what exactly is the matter of holistic associations, and how do they occur? Do these holistic associations go beyond linking conceptual entities?*” Indeed, clarifying the components that constitute intuiting, both in terms of their type (i.e. concepts, images, visceral feelings) is a necessary condition for explaining how intuiting unfolds according to some rules.

In so far as holistic associations do not involve logical inference due to lack of an inferring conscious agent that can offer deliberations, Van Riel and Horvath (2014) propose the exploration of somatic conditions to account for rapid non-cognitive responses involved in intuiting. The causal pathways of these somatic reactions are non-conceptual and remain outside deliberations of system 2. Associations are conditioned at a somatic level. Such visceral processing seems plausible if system 1 processing is acknowledged as a hypothetical model used by researchers to understand for instance, neural activations in the limbic region or pre-frontal cortex centers of the human brain underlying employee emotion in a change context (Le Doux, 2003). Prospects down this avenue represent a biological perspective the contributions of which are not yet clear in organization change theorizing in relation to a capacity such as intuition (Van Riel and Horvath, 2014). From the evolutionary perspective, to look beyond system 2, and beyond some *inferring* will, the literature supports and develops distinct ideas in the context of holistic associations. Here, we argue that system 1 consists of evolutionarily valuable mechanisms for adaptation. The mechanisms process data in parallel and in combination as a product of heuristics designed to simplify complex threats in the environment. The first thing to note is that system 2 (i.e. consciousness) and its role in causally generating or correlating with intuition heuristics, remains a blind-spot on the research agenda (Keren and Schul, 2009: 534; Kruglanski & Gigerenzer, 2011). This position is exploited by some evolutionary psychologists (Sivertson, 2013) who argue that free will of system 2 is an illusion. “Natural selection has no foresight, so it cannot select for buffers that protect the development of a trait [such as intuition] against future kinds of perturbations” (Mameli, 2007:23). This means that if intuition is a naturally selected behavioral trait, it is not a consciously planned human development (Searle, 1995: 13-18). The gene determined trait in question favors survival of some generations over others based on its social fitness and mechanical advantage


(Cosmides and Tooby, 2000). Intuition is not meaningful in the subjective world of values. It is not a choice. In fact, in evolutionary psychology terms, system 2 correlates with system 1, and provides the illusion of a will or choice maker to system 2 (Volland, 2007). The process whereby a trait like intuition is selected consequently represents a distribution of trait probabilities in a population along an evolutionary timescale. Therefore, we might perceive holistic associations as psychological capacities on such a timescale, useful for adaptation, and a mechanical phenomenon, experienced by system 2, which in retrospect labels it 'system 1'. That is, system 1 is a working hypothetical model to make sense of the impact of mechanical datum, represents an argument adopted, for meaningful debates delivered in system 2.

Second, an evolutionary perspective, does not propose two processing systems (systems 1 and 2) instead it offers the notion of many psychological mechanisms (Buss, 2005; Van Vugt and Kameda, 2012). The mechanisms are specifically designed to cope with adaptive tasks and problems. In agreement with Dane and Pratt (2007) evolutionary psychology proposes these mechanisms as 'if-then' rules, namely psychological heuristics. Thus, we find some overlap between Dane and Pratt's definition of intuiting and an evolutionary perspective. Intuiting or the formation of holistic association, from the evolutionary perspective, emphasizes a set of heuristics with an adaptive function. Third, it seems additionally the case that particular sets of environmental conditions are likely to involve intuition based behavior by invoking some useful intuiting set of heuristics. Locke (2015) argues that intuitive judgments by leaders can form when individuals encounter unstructured problems. Context provides meaning and a range of stimuli (Lasersohn, 2005). An example is a human resource judgment about swaying opinion in favor of an initiative. This involves no consistent rules, routines and objective criteria. You just go with your gut. In earlier hominids threats were far less complex and relatively unstructured. Thus, intuition may well have been present in our ancestors. Ronay and Vugt (2014) recognize this evolutionary mismatch between ancestral environments and modern society. Evolutionary psychologists studying intuiting may employ computational methods for developing interactionist models that represent the interactive generation of intuitive behavior (McElreath and Henrich, 2007). For instance, a model can be characterized as follows: Let evolution provide a set of heuristics (S) for intuiting. Thus, S maps onto and functions to resolve a set of organizational conditions (C) over an event (E), employing relationships (R). Members of S ($S^1 S^2 S^3 \dots S^n$) over an event E map onto members of C ($C^1 C^2 C^3 \dots C^n$) through relations R that satisfy the following criteria. First, members of C provide poor information-for-task (C^{\min}), which is often the case in organizational change that involves intuitive responses by individuals in leadership positions. (C^{\min}) invokes internal subset of psychological heuristics (S^{\max}) evolutionarily designed to cope with (C^{\min}) conditions. Second, the subset (S^{\max}) operates in a nonlinear pattern. Thus, (S^{\max}) is a subset of S that operates simultaneously through R, and draws on heuristics that are effective in adapting to

(C^{\min}). The members of R include sets of R^n that are likely or probable to be active over a set E^n of E , given (C^{\min}) and (S^{\max}).

The above is an example of the computational approach currently absent from intuition research in organization theory. In other disciplines, modelling has been dominant in studies of cognitive mechanisms including learning and reasoning and in fields including Evolutionary Game theory (Maynard-Smith, 1982) and Evolutionary Computation (De Jong, 2000). In organization change theorizing, a computational model would address developmental concerns in relation to the distribution of genes or memes, environmental conditions, and dynamics of behavioral relations in between, over a given time period. An example is provided by (Henrich and McElreath, 2007) of a spiral model of behavior that aims to predict how environments impact a person. Generally, the computational approach employs normative theorizing. Models are limited by a finite set of rules, states and homogenous data types, which are ideals. The central question is; are computational models of intuition sufficient for understanding leader intuition during change? Certainly, in so far as the evolutionary computational approach represents a normative science, it appears sufficient in providing a range of models designed to gauge how inputs – genetic and memetic – can logically relate with behavioral outputs. These are prescriptions in organizational scenarios. In an organizational change context, computational models would represent causal mechanisms, just like they do in psychology (see Boden, 1988). These mechanisms provide a processual view of the mechanics involved in behavior, including subjective utilities, estimates of likelihoods of occurrence, and other cognitive tasks underpinned by a multi-program design, often recognized as higher cognition based on human biology (O'Reilly, 2006; Sporns, 2014). From an evolutionary perspective, the notion of holistic associations represents an adaptive function particularly likely in uncertain scenario of organizational change.

This is because evolution has designed adaptive mechanisms to cope with environmental alarms and threats (Den Bos and Lind, 2013: 134). Alternative to the computational approach above stands the qualitative approach, useful in understanding intuition. This is a concern with a phenomenal “what it is like” experience of intuition (Stoljar, 2016). Phenomenally (i.e. in the world of appearances) we propose that evolved psychological capacities (i.e. intuition) generate mental models by drawing on a spectrum of heuristics. Towards one end of the spectrum are behavioral concerns about visceral survival (i.e. safety, shelter, aggression, reproduction), and toward the other end are concerns about social survival (socializing, recreational activity, commercial enterprise).



Visceral Survival

Social Survival

Figure 4

Heuristics employed in visceral (i.e. bodily) survival were useful in ancestral human environments. This includes facial recognition of cues associated with leadership qualities, which provided hominids with potential for survival on the grasslands of Africa. In modern society, these older heuristics continue to influence the success of leaders in organizations. For instance, during change employees attribute trustworthiness to leaders based on facial cues (Penton-Voak et al, 1999; Vugt and Grabo, 2015) and hence offer support or withdraw. These heuristics are situated near the visceral survival end of our spectrum and they are proposed psychological results of biological evolution (Boudry, Vlerick and McKay, 2015). On the opposite end of the spectrum sit the social heuristics. These are cooperative heuristics. Primarily, they accommodate cultural differences and represent internalized social norms in the form of automated behavioral dispositions exhibiting prosocial behavior (Gesiarz and Crockett, 2015). Whilst there may be biological hardwiring underlying these, it may be that some heuristics are socially learnt by exposure to culture (Petersen, 2012).

We hypothesize that intuiting thus involves a mental model generated by combinations of heuristics (C^H) across the proposed spectrum of possible heuristic combinations (C^U). Different organizational challenges that require specific tasks would influence the combination underlying a mental model that emerges into consciousness, like a rising iceberg above the waterline, suddenly whole and complete in appearance. The psychological capacity that combines heuristics in the context of the task required thus gradually reaches and crosses a threshold of combinations, above which the process of intuiting becomes an intuition – a leader’s inspirational vision of how everything fits together. Given (C^H) is a subset of (C^U), in a computational model over a given event (E) there might be some combination of subsets (C^H , C^{H1} , C^{H2}) that accounts for intuition mental models. On this front managerial cognition is a fertile area for further research. Given a mental model underpinning an intuitive choice to manage people a certain way, research might ask about the nature of categories in mental models and their inter-relations through heuristics.

During uncertain times, leaders and followers can find themselves frozen with fear (Moran and Brightman, 2000). Their visceral triggers and their underlying neuro-chemistry tells them to ‘fight or flee’ the situation, whilst their rational brain centers draw them towards social rules, morals and norms of rationalization (Denton and Krebs, 2016). For example, anger and aggression can lead to

risk taking choices in uncertain time. Earlier on the evolutionary timeline heuristics involved in such behavior directed visceral mobility. Their function was to smoothen out interactions in primitive communities. Whilst evolutionarily intuiting seems to involve some visceral heuristics useful for survival, on the other hand, heuristics involved in modern social survival seem more complex by virtue of the sophisticated tasks and challenges faced by individuals. In the construction of mental models, heuristics might conflict, compliment, or cancel out the effects of others heuristics (Abatecola, 2014). This suggests that in part, the ratio of the proposed visceral: social survival heuristics is moderated by the task at hand. Leaders during organizational change might follow their gut because the task at hand is not simple and thus not amenable to rational calculations. Perhaps there is insufficient time and insufficient information available. Certainly, options arrived at post-rationalization are inferential and thus violate the dual process premise of non-inferential processing. In change conditions transformational leaders, alongside inspirational stories and myths about their vision for the organization, encourage employees to be altruistic and position self-interest secondary to the teams benefit (Marinova, Van Dyne and Moon, 2015). They ask for commitment towards new practice and tasks. Crucially, the transformational leader must generate such behavior in his or her own public appearances of altruism. The task is complex; altruism in evolutionary terms was a visceral type of intuition, it was mobility of the body. In early hominoids it was essential in caring for each other. They followed that feeling from the gut. Without cognitively complex capacities, a leader felt the return-benefits of intuition in terms of loyalty and deferral to reject the group in favor for self-interest (Cosmides and Tooby, 2013; Ostrom, 2014). In modern contexts adopting the task of caring and supporting others, the affect heuristic suggests that a leader can intuitively employ emotional expressions of camaraderie and other visceral cues; a candid handshake, the silent affirmative nod of approval, or the pat on the back. These are system 1 manifestations from sub-programs or heuristics working together by selecting-through the complexity of the task (Dane and Pratt, 2007).

As the problem faced becomes more and more uncertain and tasks seem too complex, the leader resorts to intuition by loosening analytical reasoning. If a leader advises the practice of altruism, than care is needed to intuitively adapt these practices to the change vision. As adaptive behavior (decision or commitment to re-act), intuiting by the leader involves letting go and breaking free of cognitive routines of thinking, and immersing into the primal and more visceral behaviors suggested along the proposed heuristic spectrum. We argue that the as the task becomes more complex and uncertain, the leader withdraws from his cognitively loaded straight jacket towards more primitive behaviors. He reconstructs from the bottom up, an alternative intuitively informed solution. What aids this process is refocused attention away from the organizations ways of doing things and from its bounding regularities. Given paralysis by analysis, such behavior represents retrieval to automated heuristics that filter data along the propose spectrum (figure 4). As an adaptive tool, intuition involves moving from the details of the task towards a more holistic association as proposed by Dane and Pratt (2007).

Conclusively, the intuiting process underlying leader decision during change conditions represents frequencies of genes and memes behaving under task moderation and inversely proportional to the level of task complexity.

(3) That are produced rapidly, which (4) result in affectively charged judgments

Parts 3 and 4 of Dane and Pratt's definition mean that decisions based on intuition involve i/ very fast processing of data and ii/ emotional content. This aspect of the definition is concerned largely with system 1 and the formation and retrieval of emotional content.

i/ The processing is so fast, that system 2 is unaware of it. We contend that this argument by Dane and Pratt (2007) is epistemologically useful in so far as system 1 rapidity is a hypothesized model or explanation needed for system 2 to make sense; however ontologically the rapidity of processes is the effect of biological processing (Van Overwalle and Vandekerckhove, 2013), identifiable within various organizational situations and scenarios. Dane and Pratt (2007) propose that experts in various professions have nonconscious cognitive structures that rapidly link with stimuli directly. This involves intuiting which bypasses system 2 (Dreyfus & Dreyfus, 1986; Klein, 1998, 2003; Prietula & Simon, 1989; Simon, 1987, 1992, 1996; Simon & Chase, 1973). Thus, the leader intuitively grasps a holistic solution or picture, served by neural activation in circuit with social surroundings and conditions. The memory structures that Dane and Pratt (2007) refer to are neurological in nature, not hypothetical. This poses a serious limit on how system 1 grounds itself in relevant literature from organization research. However, simultaneously, Anderson and Bower (2014:136) have argued that biology is too complex. "The level of analysis is just too microscopic to be of any psychological utility". The rapidity of system 1 is necessary theorizing rather than methodological experimentation of biology. This suggests that system 1 and memetic evolution may somehow be abstracted and linked? We argue that memes evolve and condition rapidity of responses. Given a set of memes in an organizational space, the employment of a subset n_2 by an observer over a time period of change tx signals rapid awareness of a solution by system 2. This process of rapid awareness, where system 2 suddenly becomes aware does not of necessity imply that system 1 structures were formed over time tx . Evolutionarily, system 1 meme-content may have formed over a period greater than tx . Over time tx memes may be selected and consumed by observers rapidly (Phuaphanthong and Bui, 2014). Memes with low reflective content (i.e. memes with less deliberation involved in system 2) process faster compared with other memes that involve reflection. Thus, we propose that organization theorizing needs to recognize memes with respect of rapidity and their content.

ii/ The last part of Dane and Pratt's definition proposes that content involved in intuiting and forming holistic associations is emotional in nature. This proposition finds support in the work of Kahneman and Tversky (1979) and Kahneman (2003) who propose that in memory terms the availability heuristic dictates how a situation is understood. The degree to which memories are available, impacts the likelihood of forming certain perceptions of the faced environment. It has been established in research that emotional memories (i.e. memories with emotional content) are more readily available as fragments of enduring content stored neurology underpinning hypothesized system 1 (LeBar and Cabeza, 2006). We support Dane and Pratt's proposition and additionally propose that: given - Proposition A – emotional content involved in intuition requires exploration through an evolutionary lens. Specifically, emotion in terms of types (basic or complex emotion), need to be recognized in the context of evolution and its implications for dual process theory of intuition. It is established that emotion is an evolutionarily older response compared to reason. It is also established that emotion is categorized as that which is evolutionarily important for physical survival, and more complex emotions are required for social survival in information rich environments, which were not encountered by early hominids (Massey, 2001). Certainly, it is worth considering that there are emotions that are visceral and which had use in early human communities on the plains of Africa because they provided sensorimotor responses necessary for venging off predators. Here, researchers would look to biological markers and tendencies. In parallel, there are also emotions that are highly social in nature. That is, they are learnt within the context of memes battling for survival. Interestingly, Heath, Bell and Sternberg (2001) propose that there are memes that are consumed for the emotional pleasure involved in the behavior. A leader's speech that triggers gossip (i.e. meme consumption) across the corridors of the organization, by virtue of the emotional pleasure in its consumption, might thrive. The shared emotional pleasure across followers may provide the leader with stimulus that characterizes the organizational terrain as positive or negative. A happy workforce supportive of the leader might subsequently interlock with a biological evolutionary mechanism (Massey, 2001) designed to hone on types of organizational terrain. We hypothesize in conjunction with our proposition A; that evolutionary explanations of how emotional content through intuiting is available, is an example of lucrative research that draws on genetic and memetic evolution. This is fertile territory for further research.

Additionally, there are two more points of confusion that are present in Dane and Pratt's exposition and arguments. First, in considering parts 3 and 4 of the definition we argue that the phrase "nonconscious cognitive structure" (Dane and Pratt, 2007: 44) used to describe system 1 components is misleading. Specifically, the term cognitive refers to a process of forming knowledge; there is no structure in so far as this implies static structures. Rather, a nonconscious cognitive structure is a mental process that involves pattern recognition by one's attentional gaze (Khilstrom, 1990). Related to this, Dane and Pratt (2007) propose that various cognitive structures, simple and complex, are

schemas, defined by Fiske and Taylor (1991: 98) as “knowledge about a concept or type of stimulus”. Applied to schemas in system 1, this definition is poor in so far as it adopts the word “knowledge” which implies a knower, or an “I” concept. Conceptual clarity requires that fundamental terms like knowledge in discussions of the dual process account of intuition, be sharply defined (see Polanyi (1967) on tacit knowledge). Knowledge here refers to complex psychological phenomena reducible, but not sufficiently explainable, in terms of neural activation in social contexts.

Second, Dane and Pratt (2007) directly contradict their system 1 definition as an autonomous model. Specifically, the claim that “Individuals who can bring complex, domain-relevant schemas to bear on a problem..” implies that “one can bring”; that is, it is not autonomous and involuntary response, but rather that it is something under control. This poses a severe limitation on their definition; particularly in so far as concepts are poorly demarcated and prone to confusion for further research.

Concluding Remarks

There are several ideas that provide value in the current paper. First, we propose that Dane and Pratt’s (2007) account is insufficiently precise and clear. What is system 1? What is the philosophical basis of system 1? If it cannot be consciously experienced in system 2, since intuiting is largely purported as outside deliberation, we propose that system 1 is a hypothetical idea that has value because it enables recognition of system 2 and biology, as distinct experiential domains. Lack of clarity around this has been somewhat addressed by Sadler-Smith (2016) who recognizes that system 1 and 2 are metaphors espoused by Evans (2003), however there is far from agreement about this in cognitive research. For management research to adopt the dualist account of intuition, clarity is needed that system 1 accounts for those effects that are unaccountable by system 2 and causally related to observer biology in a social context. It is a hypothetical object. Second, in the dual process approach there is no further clarity provided about the nature of processes like intuiting and holistic associations. Mental associations are not causal relations between objects, rather, they are loose couplings of how we see the world. They are purported as weak explanations of behavior (Kaplan, Weaver and French, 1990; Morsella, Riddle and Bargh, 2009). Recalling something to mind may lead to certain other images or physical agitations. However, this is again a poor explanation because there are no repetitive phenomena. Rather one has a general idea that one observation is associated with certain behaviours of intuition. One possibility is to employ probability or Bayesian formalisms (Baetu et al, 2011). The purpose is to determine where there is a mental structure or combination thereof (i.e. heuristic) that repeats itself and remains recognizable as intuiting or reasoning or emotion or some other mental state of the individual? Dane and Pratt (2007) qualitatively hint towards such

structures. But as Van Riel and Horvath (2014) note, there is no clarity as to the generation and structure of holistic associations.

We propose that an evolutionary interpretation provides value in making sense of intuition within organizations. Contemporary organization research poses intuition as a resource for leader and managerial decisions. Rather than a dualist conception, evolutionary psychology advocates that intuition like other faculties of mind relies on programs that enable adaptation to environments. In a change context rife with uncertainty, intuition thus functions as an adaptive resource. We also propose that memes are more suitable for study by organization theorists compared with genes. This is because genes are subjected to VSR over evolutionary timescales, whereas genes are more rapid (Atran, 2001; Cosmides and Tooby, 2013). The operation of VSR on memes is driven by the emotional value experienced by the leader or follower in change contexts.

Conclusively, we propose that further research should consider evolutionary perspectives to highlight and explore how VSR operates on a variety of information templates such as the gene or the meme. Perhaps one can consider the evolution of mental objects (images, concepts, sensory datum forms). Additionally, relations between objects may be subject to evolution? This remains immensely fertile territory for further organization research. Our view is that only after intuition has been defined, can it be contextualised and appraised in terms of its implications for organizations, organizational change, and leaders.

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