

COMPLEXITY AS AN EMPIRICAL TENDENCY: PROMOTING NON-MEASUREMENT AS A MEANS TO ENHANCED UNDERSTANDING

Abstract

In this conceptual paper, I seek to provide an organizing framework for conducting qualitative research in complexity studies in management. Building upon the underlying logic of Kauffman's NK(C) model and the notion of second-order complexity, I urge management researchers interested in complex adaptive systems to capture, understand, and articulate complexity as an empirical tendency as opposed to the measurement-driven orientation of many scholars. I contend that the latter orientation's illusion for numerical precision, predictive accuracy and generalizable truthfulness is not only undoable but also unnecessary in the context of providing practically meaningful and realistic recommendations to those interested in complexity.

Keywords: complexity, measurement, epistemology, ontology, qualitative research, requisite variety

1. Introduction

Complexity is a field that is replete with idiosyncratic conceptualizations that sound almost exotic, perhaps appealing and certainly thought-provoking (e.g. dissipative structures, far-from-equilibrium, edge of chaos etc.). It is also a quintessential term for the world that surrounds us; its structural properties are ubiquitously characterized as complex. Management researchers employ it to describe markets (Angelis, Parry & Macintyre, 2012), institutional frameworks (Brantnell & Baraldi, 2020), organisational arrangements (Golonka, 2015), inter-firm relationships (Bidault & Salgado, 2001) etc. Therefore, its prevalence in our daily routine and academic discourse cannot be emphasized enough.

Given the omnipresence of the concept for contemporary management thought, I seek to contribute to an understanding of complexity through an epistemological perspective. In particular, I contend that a positivistic and measurement-driven orientation of complexity scholars engenders certain limitations, which impede further knowledge creation. I explain this orientation and its shortcomings and I identify its ‘problematic’ roots as ones being couched in the conventional ontological treatment of complexity in the literature. In turn, I propose a narrative approach for conducting research in the field by integrating Kauffman’s NK(C) model with second-order complexity. I conclude with an example that illustrates the meaningfulness of my proposal, which is based on a foundational law of complexity thinking; Ashby’s law of requisite variety (Ashby, 1956).

I early stress that my purpose is not to identify a literature gap. Rather, building upon Alvesson and Sandberg (2011), my purpose is to problematize the epistemological orthodoxy in conducting empirical studies of complexity in management. I consider this important for the following reasons: First, a monolithic adherence to an epistemological

perspective such as measurement precludes a further advancement of any field (Poulis, 2020). On the contrary, a more inclusive approach (which I showcase below) promises enhanced insights. Second, as noted, complexity is omnipresent in management. Therefore, elucidating complexity themes is expected to also rejuvenate parts of management theory that relate to them (e.g. systems-theoretic perspectives, cybernetics, ecological theories, networks etc.). Third, qualitative studies have advantages that are widely recognized in management studies. Nevertheless, these remain a rather uncharted territory in complexity-cum-management ones. Thus, significant theorizing opportunities are lost let alone the missed opportunities for cross-pollination between management and complexity realms following an almost fetishist adherence to measurement, verification and proof (Poulis and Kastanakis, 2020).

Therefore, advancing the incorporation of a more inclusive epistemology is of particular relevance to management scholars including readers of EMJ as a standard management journal. A wider epistemological arsenal will allow complexity theories to ‘convince’ us, management researchers, on whether these theories can indeed deliver their promise to elucidate our complex world. Currently, this promise is not met. Rather, the elusive nature, fragmentation and contradictory elements in complexity studies run the risk for complexity being seen as a non-valid exercise; as a conjecture or witchcraft (McKelvey, 1999; Houchin & MacLean, 2005; Corning, 2002). Therefore, despite the promise of complexity to open up a new theorizing window for management studies, it is acknowledged that several complexity advances have been marginally useful, ill-conceived, or poorly applied.

2. The measurement orientation in complexity scholarship

The appropriation of complexity by management scholars most often than not denotes a dire challenge. Managers dealing with complexity need to regulate it (Surie & Hazy, 2006), absorb it (Boisot and Child, 1999), destroy it (Ahsby, 1956), defeat it (Uhl-Bien et al., 2007) etc. Otherwise, organisations that do not achieve that are destined to decline and fall. Given this challenge for managers, there has been a concomitant need by researchers *to measure it as a means to tame complexity's inherently messy nature*. Measurement allows us to establish some order to what seems to be an unwieldy challenge; to give a manageable shape to the amorphous entanglement called 'complexity'. In turn, by ordering the template for action (i.e., the complex environment), we are in a position to internally proceed with adaptive solutions; the latter being the archetypical means to tackle external complexity (Uotila, 2018). As Cannon and John (2007, p. 296) note in their review of measurement studies in complexity scholarship, "it has been widely held among organizational researchers that organizations must adapt to their environments if they are to survive and succeed". Normally, this adaptation takes the form of increasing internal complexity up to the point of matching the external one (Schneider et al., 2017). Therefore, measurement is not simply an epistemological means to development of theory. It also appears as a necessary mediating force that signposts optimal standards towards organisational success and survival.

Consequently, according to conventional wisdom in complexity studies, without measuring the environments that call for our adaptation skills, we are destined to fail. We will be unable to respond as ought to, we will not manage to predict the behavior of the system in which we are embedded and we will not develop the requisite configurations internally. Thus, our ability to measure complexity is inextricably intertwined with our

environmental scanning and configuration skills; both being staple elements in management scholarship. Given these normative suggestions, and despite its striking lack of conceptual clarity, measurement has always been a main complexity mantra (Cannon and John, 2007). After all, if we do not measure, we appear as inadequately practicing what we preach. If we understand management as the field which aims to illustrate human agency's ability to provide structure to the utter complexity of an organization (i.e., the messy combination of people, material objects, immaterial resources, goals etc.) then, mastering complexity immediately becomes a theoretical pursuit that is inherently associated with management's orientation and scope. Indeed, management is inherently linked to the efficacy of human action towards ordering the complex entanglement that an organizational system is. Therefore, in addition to the aforementioned remarks, measuring complexity appears as a means to being faithful to management's core orientation, too.

Complexity applications have used variable means (e.g. network clustering algorithms, mathematical modelling, simulations, non-linear differential equations) in an attempt to measure complexity (Stacey, 2002; Heylighen et al., 2006). All of them rely on the typical epistemological tools of Newtonian science i.e., representation and abstraction opting for mathematical precision and accuracy. This is expected since a quest for measurement accords with the orientation for prediction as the epistemological cornerstone of modernity. Science's role is to provide the necessary theoretical abstractions that will parsimoniously represent and accurately predict focal phenomena. In turn, generalisations can be surmised; ones, which are stripped of unnecessary surrounding 'noise' and ones, which can then be used as heuristic rules for action by the users of a theory (e.g. managers or policy makers).

This epistemological orientation is the cornerstone of scientific rationality and is no different in complexity-cum-management studies. Representational models are the major instruments that management scholars utilize to make sense of complexity and do so by reducing its multifaceted nature to selected abstractions (variables) which are contingently linked through rules, laws, regularities and generalizable patterns. Therefore, our conventional mode of theorizing is an attempt to ‘squeeze’ complexity and its untamable nature into a simplistic representation through simplifying assumptions (Tsoukas, 2017). Simple abstractions are linked through measureable and identifiable rules and their contingent linkages are the guidelines that managers use to organize and strategize (Tsoukas and Hatch, 2001). Thus, by capturing those contingent linkages we can represent the bigger picture of complexity, predict future states of the complex entity under investigation and produce meaningful complexity theory. But, can we and do we really need to measure complexity as it unfolds in practice?

2.1 The epistemological shortcomings of a measurement orientation

In order to provide a meaningful answer to the aforementioned question, I first acknowledge that complexity researchers have a keen empirical interest in organizational practices amid complexity for many years now. So, they can definitely not be accused of scholarly complacency. However, an important observation is warranted: a focus on *practice* amid complexity has rarely taken place through notions of contextuality and emergence; temporality and relational situatedness (Tsoukas and Hatch, 2001; Concannon and Nordberg, 2018) or, most importantly, through acts of human agency (Darbi and Knott, 2016). Such a perspective would require grounded methods and narrative techniques which

are strikingly absent in the relevant literature. Instead, as noted above, quantification and measurement in a logico-scientific sense prevail.

The implications of this absence are significant since what emerges from these prevailing commitments is theoretical tools that seek to describe systemic features and generalizable properties (Poulis, Poulis & Jackson, 2020). However, this ‘systemic’ (as opposed to ‘agentic’) focus and the prioritization of the ‘generalizable’ (as opposed to the ‘grounded’) leaves critical management questions open: What is a prudent organisational practice in the midst of complex systemic features? What is a meaningful agentic choice when actors are confronted with an overwhelming complex environment? When it comes to questions that aim to surmise implications for organizational acting amid complexity, two options appear as dominant: either theory does not tell us anything about it (given the prioritization of ‘systemic’ qualities such as emergent self-organization, order, recursiveness etc.) or theory suggests a mere application of the *adaptive* responses that one learns in a business school. However, practice is not a mere extension of concrete theories in the industry arena. It is not an exercise of simply applying rigid conceptual frameworks exemplified in figures, boxes and arrows. This is because practice is neither a measurable mass nor a quantifiable force. Rather, it is a situated activity that stems from embedded relationality, entrenched cultural assumptions and ongoing deliberations. These contextual features must be unearthed and articulated if we remain truthful to our mission to understand and describe a complex reality as it really is.

This observation is also related to a main discussion that takes place in management fields and relates to the legitimacy, value, distinctiveness and relevance of business scholarship, which is largely challenged (see Delios, 2017; Poulis and Poulis, 2018;

Kaplan, 2014). Do we create graduates who are eager to appreciate diversity? Can they identify with the richness and cope up with the complexity of practice? Unfortunately, through our fixation with measurement, we nurture graduates who think that managing real-life problems is subject to concrete analysis of numerical figures. That a solution to a given problem will be identified if we process numerical data that will give us tangible results. Apparently, this idealized approach ignores ethical concerns at the societal level, multiple orientations and tensions in the workplace or emotions in strategizing. It results to an ideological view of theorizing when ideologues of any sort do not have a place in academia. After all, all those aspects (usually labelled as 'soft') do matter and they do not lend themselves to measurement for any meaningful appropriation of their nuances.

For example, how can you measure the complexity of corporate culture and, even if you could, what would be the value of doing so? One can hardly identify any causal efficacy or signs of meaningful understanding in quantitative designs (mostly exemplified in the over-use of regression techniques), which claim to be measuring such soft elements as corporate culture, identity, conflicts, meaning at work etc. Nevertheless, a monolithic measurement orientation often turns academia into a calculating factory (due to its focus on mathematical precision and formalism) and academics into some undue sort of scholarly Oracles (due to their fixation with prediction and generalization). Instead of incubating curiosity, fostering intellectualism and nurturing deep reflection, we reserve the role of methodological technicians for our scholarly selves. We pretend that a Pythian orientation to prediction will provide the answers that we desperately seek while neglecting the fact that any 'concrete' answer may be misleading and dangerous for the viability of an

organization (e.g. due to contextual differences, misaligned resource endowments, or diverse teleological orientations of idiosyncratic actors).

Overall, unearthing and apprehending complexity beyond numbers clashes with the core epistemological commitments described before. When the means of understanding complex practice are based on measurement through representation and abstraction then, inevitably, those situated specificities that shape organizational practice are bracketed in favor of some sort of analytical purity. It is not important whether the relational and processual situatedness associated with a complex practice is denied or not by complexity scholars. The important thing is that it is ignored in analytical pursuits; it is seen as a praxeological epiphenomenon that distorts the theoretical quest for generalizable purity. Thus, it is either contained through controlling variables or inauthentically represented through mono-dimensional measures of complexity. However, understanding organizational practice as a context-laden, ongoing accomplishment is what gives rise to the true ontology of this practice.

Thus, a practice orientation in relation to complexity urges us to revisit our epistemological commitments; to restore a much-needed balance that is unfortunately missing in relevant accounts. In fact, complexity studies –given their heavy mathematical formalism- is one of the most archetypical fields in management where grounded modes of knowing are almost an uncharted territory. Having said that, I note that I do not seek to disregard the value of representation or abstraction. However, measurement as an *exclusive or necessary* methodological antecedent in complexity studies impedes further knowledge creation (e.g. see a similar argument about over-reliance on multiple regressions in complexity; Díaz-Fernández, González- Rodríguez and Simonetti, 2019). Measurement

obeys to a mechanistic understanding of systemic behavior and seeks to identify regularities, laws and patterns of the system. However, as noted, management has human actors at its epicenter and seeks to understand their role and actions in the context of the complexity they encounter. How does the aforementioned macro focus on prediction and generalization of the system as a whole elucidate this micro concern i.e., the role of that actor amid complexity? How does measurement of systemic complexity facilitate an enhanced understanding of the minutiae and flow found in organizational actors' agentic initiatives? I contend that an exclusive insistence on measurement does not only lead to the inconclusive results noted in the beginning; it also does not allow a more nuanced examination of this core management concern i.e., human agency's role amid complexity (Poulis, Poulis & Jackson, 2020). Identifying and explicating aggregate, system-level properties of a complex system e.g. non-linearity of a complex market or emergent self-organisation of a complex organization is fair enough. However, this meta-type of focus on the emergent outcome renders micro-foundational underpinnings (which constitute those outcomes) unimportant, unarticulated or ignored (Barney and Felin, 2013; Child and Rodrigues, 2011).

Hence, complexity science may have started with an agenda of autonomizing itself as a stand-alone field of inquiry; even more as a field with a cross-disciplinary explanatory power. However, it has not managed to identify a voice that could be practically useful to the management field nor has it offered a consistent theoretical umbrella to rely upon. I do not seek to negate the value of system-level insights. Nevertheless, measurement and predictive orientations at the system level often act as an unproductive bedrock in an effort to *understand* the value and relevance of human efficacy within those settings. In other

words, who is the acting agent who achieves those aggregate outcomes and how; through which political or commercial praxis (Child and Rodrigues, 2011)? How are intra-organisational concerns analysed in conjunction with the external imperatives that complexity generates (Poulis & Poulis, 2016)? Unfortunately, complexity scholarship has reserved limited analytical space to understanding those intra-organisational ramifications.

Hence, the complexity-cum-management scholarship progresses on the basis of two parallel silos: On the one hand, we have significant theoretical advances produced at the systemic level (Stacey, 2002). On the other hand, complexity scholars have limited concern about an organisational actor's internal structure (Poulis, Poulis & Jackson, 2020; Heylighen et al., 2006) leaving that analytical sphere to other, more 'mainstream' strands of research. However, concerns related to the internal structure of complexity agents (e.g. ethical stances of decision-makers or the role of emotions in work-place arrangements) lie at the core of the management discourse. Therefore, despite the isolated merits of the former approach, I contend that surmising system-level properties at the expense of those who accomplish systemic outcomes opposes the very essence of management research as a whole. This stems from a firm belief that management research *is* that efficacy to a large extent.

3. A call for an epistemological shift

My first suggestion against the aforementioned prevailing epistemological commitments is to move beyond such a dominant focus on system-level prediction as the cornerstone of complexity inquiry. Second, to ease the quest for concrete measurement as a necessary methodological toolkit. Such underpinnings may have been to a certain degree

necessary so that the complexity field can excel but nevertheless, they have cemented a set of dogmas, which do not allow extending or refining management-relevant premises of the dialogue on complexity. For example, let's focus on regularities in an observed phenomenon. Those regularities are core theoretical pursuits since they mediate a generalization and its predictability (Holt and Holt, 1993). In complex systems, regularities often take the form of recursive symmetry i.e., repetition of the same structure at several scales (Tsoukas and Hatch, 2001). For example, structural regularities can be identified in both far and near environments or in both condensed and dispersed organisational configurations.

However, why should those regularities be measured? In fact, they can still perform the aforementioned mediating role by being *captured* as opposed to measured. That is, identifying qualitatively distinct patterns of regular behavior can be enabled through rich description. In turn, enabled by such patterns, practice-laden insights can be transferred to similar settings for further illumination and understanding. For example, why should recurrence of deviant behavior in the workplace be measured as opposed to capturing its reproducing nuances through narrative modes (Mainemenelis, 2010)? Why should we measure the systematicity of institutional contradictions when we can articulate how actors emotionally apprehend them through storytelling techniques (Voronov and Yorks, 2015)? Why should the regularity of workplace routines be measured as opposed to providing a stage-like explanation of how they are recreated from within in the workplace (Dionysiou and Tsoukas, 2013)? Why should we measure psychic distance in international business when we can provide a processual understanding of its emergence in the first place (Poulis and Poulis, 2018)? Notwithstanding the diversity of research questions that one may pose,

non-measurement approaches can be illuminating vehicles to identify and explain patterns and complexity features (e.g. openness, feedback loops, non-linearity etc.) without the need to quantify something (such as deviance, contradictions, routines, psychic distance) that is too complex and less prone to quantification through abstraction.

The aforementioned (usually qualitative) means are not inherently superior or inferior to quantification and measurement. They are simply *more realistically meaningful in an attempt to understand complexity's praxeological implications for organizations*. In addition, they do not 'suffer' from the *timelessness of measurement approaches*. The latter are portrayals of a specific phenomenon at a given point in time, which serves to act as a generic and universally applicable rule of action for subsequent users of theory. Thus, our future acts amid complexity are guided by a past theoretical achievement. Any deviation or paradox is often considered as an empirical anomaly that is of peripheral importance or considered as an epistemological nuisance that must be controlled by measurement-oriented scholars (Poulis, Poulis & Plakoyiannaki, 2013). However, exactly because of complexity's very nature (i.e., non-linearity and emergence of novelty), such universal rules are likely to be obsolete or irrelevant and hence, misleading; the complex world we seek to elucidate is too uncertain and ambiguous to rely on unambiguous and prescriptive modes of acting.

Therefore, if we want to counterbalance the 'witchcraft-ness' of many complexity applications, we need a more realistic arsenal to pursue an enhanced understanding of complexity. Paradoxically though, a logico-scientific type of reasoning promotes measurement and prediction in the midst of uncertainty, fragmentation and contradictions. In other words, the solution that complexity theorists promote in relation to the

inconclusiveness noted earlier is more of the same material (measurement of complexity), which contributed to this inconclusiveness in the first place.

At this stage, I need to clarify that measurement *per se* is not inherently the source of the problem. Measurement can be a noble orientation which promises to deliver scholarly benefits depending on the limits we self-dictate about its scope of applicability and value. However, a mono-dimensional insistence on measurement becomes unproductive and aggravates symptoms of inconclusiveness when a canonical representation, concrete operationalization or objective measure of complexity remains largely unattained (Lorino, Tricard and Clot, 2011; Cannon & John, 2007; Levinthal & Warglien, 1999). Thus, I do not seek to portray measurement as an inherent anathema for complexity scholarship since it opens up possibilities for a better understanding of the concept. I argue though that its nature as the exclusive epistemological means to theorise suffers from aforementioned shortcomings. All those primarily stem from the ontological treatment of complexity by management scholars.

4. The ontology of complexity in management

Management scholarship has reserved a particular ontological treatment for complexity, which generates the aforementioned epistemological implications (see Poulis, Poulis & Jackson, 2020). In particular, complexity is reified as a i) given, ii) consequential and iii) overwhelmingly dark, external imperative. First, its treatment as a *given* entity implies that complexity can be measured and efficaciously matched (see Katsikeas, Samiee and Theodosiou, 2006). This given identity of complexity is what facilitates its measurement and is used as a springboard for specific theoretical pursuits such as e.g. internally matching

external complexity (Boisot & McKelvey, 2010), comparability of complexity across sectors (Lawless & Finch, 1989), or describing the ruggedness of a fitness landscape (Rivkin, 2000). Second, its *consequential* nature implies that it inherently ignites adaptive behaviours (Bigley & Roberts, 2001). This consequentiality is again used across scholarly streams to describe the behavior of complex adaptive systems towards systemic order and emergent self-organisation (Surana, Kumara, Greaves & Raghavan, 2005), legitimise fit-as-congruence (Heracleous and Werres, 2015), or stress the inextricable duality of survival and adaptation (Ferrier, 2001). Third, its entitization as *dark* implies the paralyzing effect of complexity against agentic action or an ‘action void’ (Child and Rodrigues, 2011) or dictates a polemic response to do something *against* it (Benbya & McKelvey, 2006).

Thus, complexity is not there to be embraced or welcomed; understood or captured. Rather it is there to be measured (due to its given nature), matched through adaptive configurations (due to its consequentiality) and hence, defeated (due to its dark nature). Other forms of engaging with it are often associated with irrationality or an a priori inability to master its consequences (see Child & Rodrigues, 2011). I problematize such an ontological reification of complexity since I consider it as the origin of the measurement-driven problem that I indicated in the previous sections.

In particular, I argue that complexity is the archetype of perpetual dynamism; thus, at first, it cannot be *given* but only temporally stabilized. While the given entitisation of complexity connects well with the necessary abstraction described before, yet representing complexity as a concrete entity ‘out there’ is an oversimplification that ignores its inherent fluidity. However, this fluid nature matters. On the one hand, it matters because it cannot be grasped in concrete terms. On the other hand, it matters because the dynamicity of

complexity implies organizational resilience that cannot be fixed and temporal; only processual and relational. Ignoring this relationality and flow -and instead portraying complexity as an overwhelming meta-structure- renders microfoundational underpinnings less important and, consequently, limits the role of human agency to an adaptive imperative only (Barney & Felin, 2013; Child & Rodrigues, 2011; Poulis, Poulis & Jackson, 2020).

This is unfortunate since managing complexity is conducive to the role of the individual and his/her cognitive capacity and judgement (see Garud et al., 2011). In such settings, it is extremely challenging or even impossible for anyone to *a priori* know a universally correct answer related to a course of action (such as adaptation), since purpose, means, and context are in a constant state of flux (Shotter & Tsoukas, 2014a). Therefore, the practical wisdom of decision-makers is needed to address such an ambiguous, complex context since it reflects one's ability to make sensible decisions in situations in which there is no explicitly correct answer (Shotter & Tsoukas, 2014b). Paradoxically though, the complexity-cum-management literature, instead of attempting to understand those decision-makers' reflective and decision-making processes, it aims to measure the complexity which acts as the template for that reflection. As a result, the very elements of the decision-making process remain unarticulated and their essence for management scholarship is diluted in the midst of a quantifiable, system-level outcome.

An important point to emphasise is that this ontological treatment does not only mask actors' agentic initiatives in relation to complexity; management's core concern and focus. Reverting back to my previous remarks, I also contend that it is epistemologically inappropriate. If we acknowledge that complexity is the discourse of perpetual dynamism and complex spaces are ontologically understood as spatiotemporally fluid occurrences

then, this implies that their ephemeral state and inherent perturbations do not lend themselves to concrete measurement, verification and proof let alone adaptation and matching as practical pursuits (the main ought-to responses against complexity in the literature). Yet, paradoxically, the typical onto-epistemological treatment of complexity is that complex regimes are represented in a corpuscular and reductionist logic with researchers trying to identify stable regularities.

Having explained my own onto-epistemological caveats, I do acknowledge a certain sense of ontological and epistemological consistency in current complexity scholarship. The predominant ontological approach of complexity as something *given* offers the necessary parsimony that is inherently associated with the scientific, Newtonian paradigm described before. However, I pose a pragmatic question: does this materialization of complexity accord with the need for elucidating emergence or stability as a result of conscious agentic choices, emotional commitments, purposeful action, meaning-making processes, ethical orientations, values-based judgement and overall, *immaterial antecedents*? In the context of the latter concerns, Newtonian-style parsimony becomes a shortcoming rather than a strength.

However, even if we assumed that complexity was fixed, atemporal and measurable (or else, *given*), it is neither necessarily *dark* nor necessarily *consequential* in its adaptive sense. Both stances ignore the variable (in)action that organisations may meaningfully pursue in light of complexity (Poulis & Poulis, 2016). The ability of agents to e.g. imagine the enactment of a different environmental possibility (Välinkangas & Carlsen, 2019) or simply ignore others (Heylighen et al., 2006) do not lend themselves to an adaptive imperative only. However, unfortunately, the latter often appears as the only managerial

recommendation given to practitioners connecting with a complex regime. While a broad orientation *towards* fit may be reasonable (e.g. see Poulis, Poulis & Jackson, 2020 in the context of luxury firms or MNCs and corruption in emerging economies), pretending to accurately *match* a context is an undue oversimplification.

Therefore, the complexity literature is characterized by a certain feature: motives, emotions, memories, aspirations, purpose and all those ‘soft’ agentic elements inherent in decision-making are often treated as ontological epiphenomena. They do not accord with the concrete entitisation of complexity as a measurable, consequential entity that has to be matched. However, such lack of attention to immaterial antecedents of action in relation to complexity neglects how agency shapes (and is shaped by) change or reproduction amid complexity. Those issues are not of peripheral importance. Rather, they lie at the core of management inquiry and discourse (see Delbridge and Edwards, 2013).

5. A methodological suggestion

Given the aforementioned onto-epistemological treatment of complexity, I seek to offer a methodological proposal as a remedy. I explain its theoretical dimensions and I illustrate its value through an application on a cornerstone of complexity thinking i.e., the law of requisite variety. In particular, I use Kauffman’s (1993) NKC model as the means to organise an enhanced understanding of the internal and external complexity of organisations and I integrate it with my main focus: second-order complexity (Tsoukas and Hatch, 2001).

Second-order complexity is not an external understanding of complexity built upon measurement. It focuses on the *perception of actual decision-makers* as the ones who

receive, appropriate and engage with complexity. It aims to elicit insights from organizational actors themselves in relation to how they understand complexity's scope and magnitude. This focus is important since those actors' decisions not only demonstrate how they connect with complexity but also how they are part of the same emergent events that we are trying to capture through our methodological choices. So, their voices' centrality is ubiquitous and must be understood as a priority.

In fact, perceptible forms of complexity are a *realistic* means to provide a meaningful account of complexity. Any other attempt to objectively measure complexity will always be a contrived and substandard representation of its hugely abstract, aggregated nature. In essence, by focusing on those actors' views, we can understand the distinct environment within which organizational acts unfold. However, these acts are essentially management scholarship's unit of analysis. Given this focus, I contend that measurement is often unnecessary. This more agentic (as opposed to systemic) focus is not 'alien' to the field of complexity and has a legacy that goes back to second-order cybernetics (see Heylighen & Joslyn, 2001). It is based on the realistic treatment of complexity as a subjective construction by the members who experience it and not as an objective structure with pre-given properties. Thus, the notion of a single, objective environment –irrespective of an observer- is seriously challenged and a concomitant breaking away from stereotypical biological/natural approaches to representing complexity should be the norm (see Roth, 2019). In other words, complexity is not 'out there' waiting to be deciphered or discovered. Rather, it is variably understood by us, as actants-cum-observers.

Even in this case though, the focus on second-order complexity does not alleviate us from the burden of untangling complexity's messiness. Decision-makers' voices will still

be complex. Therefore, this onto-epistemological discussion raises a practical methodological concern: how can we more meaningfully navigate through the clutter of those respondents' views without diluting the scope of investigation or missing out important observations? In other words, we need to identify a consolidating framework in our effort to capture internal and external dimensions of complexity; one that could organise the messiness of our data in practical, user-friendly terms.

In order to do so, I go back to the complexity literature on complex adaptive systems (CAS) as the most relevant complexity theme for this study. It is relevant because it is the most typical complexity theory associated with notions of human agency i.e., what management largely studies. As Choi et al. (2001, p.353) note “agency, defined as the ability to intervene meaningfully in the course of events... is a key characteristic of the CAS”.

What constitutes complexity in a CAS is *variety* and *interactions among agents* therein and this understanding distinguishes CAS from other, either linear or chaotic systems (McCarthy et al., 2006). Illustration of those agentic perspectives has taken place through several means e.g. simulation attempts or time series analysis. However, as Van de Ven et al (2013) note, modelling CAS tends to begin with Kauffman's NK(C) (1993) model, which helps us understand the number of agents in a system (N) and their internal (K) and external (C) interrelationships. Kauffman uses two different variables (Levinthal and Warglien, 1999: 344): ‘N, the number of elements that characterize the entity, and K, the number of elements of N with which a given attribute interacts’. An extension to the NK model incorporates a third parameter, C, which refers to linkages among actors on a landscape, thus fruitfully capturing interorganizational aspects of complexity (Schneider,

Wickert, Marti, 2017). More specifically, ‘the parameter C refers to the number of the N elements that are linked across entities, in contrast to the parameter K, which indicates the degree of interrelatedness within a single entity’ (Levinthal and Warglien, 1999: 350). The complexity of the landscape on which the organization acts depends on the values of N, K, and C.

Building upon Weick’s (1979) seminal thesis that organisations’ foundational principle is the patterns of interaction among entities and Levinthal and Warglien’s (1999) note that the NKC structure adequately meets this principle, I call researchers to capture complexity in this way. Therefore, the number of actors/entities (N) and their internal (K) and external interrelationships (C) is what defines an organisation’s internal and external levels of complexity (Shumate, Bryant and Monge, 2005; Uotila, 2018).

What is particularly pertinent for my study is that as Van de Ven et al. (2013) note, the NKC model holds great promise to advance several management theories (e.g. fit) and combine them with complexity perspectives i.e., what my study is trying to contribute to. NKC can indeed be seen as intuitively relevant since complexity of a CAS is “the diversity of, and the level of interaction between agents” (Sherif and Xing, 2006, p. 503) or as Chiva, Grandio and Alere (2010) note, what constitutes complexity of a CAS (an organisation or environment) is the number of elements and the interactions among those elements. Therefore, on the one hand, complexity suffers from the inconclusiveness noted earlier. However, on the other hand, most definitions of complexity “attribute its emergence to combinations or interactions among heterogeneous elements” (Garud, Gehman & Kumaraswamy, 2011, p. 738). Thus, the CAS literature is one of those fortunate instances where a sense of definitional coherence can be noted. This notion of variety (N) and

interactions (K and C) as constitutive of complexity is concisely reflected in Chiva-Gomez (2004): “complex adaptive systems are systems made up of heterogeneous agents (N) which inter-relate with each other (K) and with their surroundings (C)” (p. 708; parentheses are ours) and is shared by many other authors in CAS, too (Chiva, Grandio and Alere, 2010; McCarthy et al., 2006; Anderson, 1999) through both quantitative (e.g. Celo, Nebus and Wang, 2018) and qualitative designs (e.g. Shumate, Bryant and Monge, 2005).

A slight yet important divergence in the definition can be seen in Lengnick-Hall and Beck (2005, p.744) who note: “complexity arises from the number of different elements that comprise a system, the nature of the interactions among the elements, and how tightly they are coupled”. It is true that some interactions are negligible in terms of the outcomes that they produce; either because of their insignificant reach and endurance upon others or because they are sporadic and parochial with no further importance for the overall complexity of a system. Therefore, dimensions of K and C need to be refined in terms of the strength of interactions that produce complex outcomes (but always according to respondents’ views).

Especially because of NKC’s legacy of mathematical formalism and quantification, it is important to clarify that I focus on NKC’s underlying qualitative logic, which accords with the aforementioned CAS definition of complexity (variety and interactions). Therefore, I highlight NKC’s analytical potential as an organising framework that can help qualitative researchers organise their arguments in a theoretically concise way and not as a measurement device. For this study, NKC is a parallelism; an analogy; a sensitising principle that captures the unanimous dimensions of complexity: variety of actors (N) and their internal (K) and external (C) interactions. It is not an epistemological-cum-

methodological tool to quantify. It is a means to provide structure to the messiness of one's qualitative data and an aid in organising them meaningfully and presenting them in a reader-friendly format. This is consistent with a narratological perspective in capturing second-order complexity since the NKC is my suggestion for a device of framing (Tsoukas and Hatch, 2001); one that will assist the narrator/researcher in producing his/her rich accounts of complexity.

Therefore, I make a suggestion to qualitative researchers to use NKC in order *to articulate perceived complexity*. I do not urge them to use it with its underpinning measurement-driven logic since I do not subscribe to the view of complexity as a reified entity that is subject to accurate measurement and optimal matching. Despite its heritage then, I believe that NKC can act as a probing 'vehicle' during e.g. interviews and help qualitative researchers to capture meanings that organizational respondents ascribe to their experiences (with regards to complex aspects of their external and internal environments). Therefore, NKC is the analytical framework that can help us reflect upon multiple voices and elicit insights that would be otherwise fragmented. Its meaningful multi-dimensionality coupled with its latitude of descriptive strength can help us make sense of arguments with simplicity (Weick, 1979) and accuracy (Cannon and John, 2007) without restricting us in employing narrative elements of contextuality and temporality (Tsoukas and Hatch, 2001). It can help us capture both internal/external levels of complexity against the limitations of mono-dimensional approaches to complexity (Nadkarni and Narayanan, 2007; Cannon and St. John, 2007). Such framing will not only help us reflect upon the complex features of the external environment one encounters but also in formulating context-sensitive accounts of the organization-induced narratives that we elicit from

organizational respondents. Therefore, it inherently helps in elucidating the role of human agency; a major concern in management studies and a neglected theme in the complexity literature.

5.1 An example

The law of requisite variety (LRV; Ashby, 1956) is an iconic cornerstone of complexity thinking (Poulis, Poulis and Jackson, 2020). Management scholars use it in various ways and for various reasons (see Cunha and Rego, 2010). However, its management-laden gist remains the same: an organisational system must possess the same internal variety/complexity in order to cope effectively with a given external complexity (Boisot and McKelvey, 2010). Otherwise, a non-matching configuration of internal/external complexity means that this organisation will perish. A somehow different approach has been also promoted. Due to non-linearity and unpredictability, organizations are not safe enough by simply matching levels of complexity. Rather, internal complexity must be, at any given point, more than the external one. This acts as a safety net that allows organizations to cope with unpredictable, rapid environmental change. Otherwise, they will not cope as they ought to. This need is aggravated in contemporary environments which feature as even more complex (e.g. due to discontinuous innovation that technology generates). Therefore, organizations should not simply possess matching variety but the adaptive capacity to effectively cope with unexpected pressures (Lynn, 2005; Allen, 2001). Arguably, this line of reasoning reflects several key management constructs such as dynamic capabilities, high-velocity environments and organizational slack.

This central notion of ‘matching’ is debated variably in other parts of the literature. For example, by building upon a systems-theoretic perspective, Roth et al. (2020) in this journal characteristically note that a growing internal complexity might in fact lead to a less sensitive organizational system i.e., one that is unable to sense and appropriate critical environmental cues (resulting to sustainability risks; Valentinov, Roth and Will, 2019). Therefore, despite the aforementioned promise of ‘matching’ to safeguard an organization against complexity, the opposite may actually occur. Moreover, corporations are often ‘defined by complexity reduction and operational closure, which may render them insensitive to their environment and undermine their sustainability’ (Valentinov, Roth and Will, 2019, p. 826). Consequently, the option they have is to be purely selective as to which parts of the external environment are given attention and which are not (Valentinov, 2014). These often counterfactual systems-theoretic insights imply something important: translating and appropriating concepts, themes and conditions related to the ‘environment’ for matching purposes not only entail inherent risks and ambiguity but also a potential inability to appropriate them for practical or theorizing purposes.

Intra-organizationally, authors in the same systems-theoretic tradition have suggested that this problem can be alleviated through the multifunctionality of the firm (see Roth, 2014; Roth, 2017; Roth et al., 2020). According to such scholars, multifunctionality enables an organization to account for differences across environmental conditions (economic, political, social, cultural etc.) and thus, to remain somehow more insulated against missing environmental cues. In order to methodologically support such analytical nuances, often, a

more abductive logic is required, which does not fall into the typical paradigms one can find in mainstream complexity theory (Roth et al, 2020)¹.

Whether someone agrees with one or a synthetic approach is subject to another paper and does not fall within the remit of this study. Herein, I can only argue that due to the conventional appropriation of the LRV in management studies (i.e., “match or at least match”), a typical complexity study would first try to measure internal and external complexity. Then, it would try to identify whether these two match. If yes, this would be indicative of the LRV’s applicability; if not, non-matching cases are subject to decline and ultimately, mortality. It is only fitting to note that the LRV -despite its wide appropriation across fields (see Poulis and Poulis, 2016)- is an iconic law that is empirically unsupported. For us, this is inevitable given *the impossibility of measuring levels of complexity for matching purposes in a quantitative sense*.

However, what stands out as even more important is that any quest for a measurable match is not even necessary. An effort to empirically appropriate the LRV and explicate its usefulness for management scholarship does not need to be preconditioned on that matching pursuit. This is because second-order complexity can elicit the needed insights from respondents directly and such situated feedback can be enough to assess whether the LRV applies. Building upon the NKC, researchers can surmise (non)matched levels of internal and external complexity according to organizational decision-makers’ views. Internal complexity can be surmised by gathering qualitative data from actors inside the firm (e.g. collective perceptions about number of employees and their interactions across departments; Colbert, 2004 or internal functional specialization, vertical or horizontal

¹ I thank one of the reviewers for introducing me to those systems-theoretic perspectives.

differentiation, intensity of intra-organizational communication through meetings, task force teams, and mechanisms of coordination and control; Schneider et al., 2017). Similarly, external complexity can be surmised by providing rich descriptions of the different institutions and the immediate, industry-specific forces, such as suppliers and customers (Child and Rodrigues, 2011; Kostova and Zaheer, 1999). Therefore, qualitative researchers can employ NKC and second-order complexity as follows:

- With regards to N, the number of elements in the internal or external environment of an organization can be considered first. For example: *Externally*, the elements may be competitive forces or the number of macro-environmental forces such as the number of governments, economic systems, or the number of laws and regulations (Lewis and Stewart, 2003). *Internally*, N may be the number of resources and competences deployed by the organization e.g., ‘the amount of human and financial resources allocated to the environmental scanning function’ (Lewis and Stewart, 2003: 33).
- With regards to K, the number of elements with which a given attribute interacts are to be identified, namely the degree of interrelatedness within a single entity. For example: *Externally*, a manifestation of interrelatedness within the same entity is e.g. competitors forming alliances with each other. *Internally*, a manifestation of interrelatedness within the same entity is e.g. how resources and competences are interlinked across departments (for example, cross-functional teams).
- With regards to C, the number of elements that are linked across entities are to be explored. For example: *Externally*, a manifestation of interrelatedness across entities is e.g. different institutions governing the rate of change in the sector. *Internally*, a manifestation of interrelatedness is e.g. collaborative schemes with partners.

Therefore, the higher the N and then K and C, the higher the complexity of the internal or external environment (and vice versa). Any (mis)match that emerges between the internal and the external environment of an organization implies that the LRV may be (dis)confirmed (when linked with the survival record of the organization). However, it is important to note that ‘higher’ or ‘lower’ does not imply measurability. Rather, it must be seen as a *perceived empirical tendency* towards one of the two poles: high or low (Poulis and Poulis, 2016). So, eliciting insights along NKC dimensions avoids the shortcomings of any measurable match and makes a theoretical contribution by investigating ‘qualitative changes in the boundaries of a theory (applications under qualitatively different conditions), rather than mere quantitative expansions’ (Whetten, 1989: 493)

Multiple instruments can help towards grasping those insights such as interviews, documentation, observation, story or metaphor analysis and textual material (Cassell and Bishop, 2019; Eisenhardt and Graebner, 2007; Siggelkow, 2007). The number of interacting forces as integral features of complex systems call a researcher to unravel ‘complex interrelationships’ and ‘observe many coexisting happenings’ (Stake, 1995: 37-39). Such confounding instances lend themselves to qualitative modes given the latter’s analytical plasticity. Therefore, setting boundary conditions to a theory related to complexity does not need any measurement-based approach. There are certain empirical particularities that can be captured as *tendencies* realistically and through qualitative means. This means that one’s qualitative analysis will portray an external environment or an organization as one that *tends to be* complex or less complex according to observers’/actants’ own judgement.

First, this notion of ‘perceived empirical tendency’ is in accordance with the inherent perturbations and flow of complex systems, which do not lend themselves to concrete measurement. Second, empirical tendencies allow us to identify a state of complexity that can meaningfully induce managerial lessons and recommendations beyond adaptation and matching. Thus, I consider it as a suggestion that i) enables a realistic engagement with complexity ii) facilitates narrative and storytelling methods that have the potential to elucidate agentic acts amid complexity i.e., managements scholarship’s core concern. Overall, my focus on complexity as a perceived empirical tendency signifies a drastic departure from the truth-seeking orientation of measurement-based studies in complexity. Instead, my focus seeks to capture plausible explanations and meanings through rich stories; enhance understanding through personal experiences of engagement with complexity. It does not seek to know nor prove an objective reality through concrete measurement techniques and timeless theoretical statements. Therefore, it understands complexity not as an a priori property of a system but as contingent on the human agent’s/observer’s perceptual powers (Tsoukas and Hatch, 2001). Thus, it opens up a wide realm of theorizing opportunities around the role of human agency amid complexity.

At this stage, I caution about an important caveat. A researcher always needs to link his/her analytical choices (such as NKC and second-order complexity) back to his/her ontological assumptions and epistemological commitments. Otherwise, there will be an ongoing misalignment between what we ought to and what we eventually practise in research. For example, in this particular application related to the law of requisite variety, qualitative findings may reveal that e.g. configurations of internal/external complexity tend to match in some organisations and in some other sampled organisations, they do not (see

Poulis, Poulis & Jackson, 2020). In essence, this outcome implies that configurations of internal/external complexity should be *contingent* in order to be requisite. However, if I go as far as pretending to propose a new “law of contingent variety”, this would be inherently antithetical to the epistemological stance that I promote in this paper. Interweaving nomothetic and contingent wording in a supposedly coherent theoretical device such as a law is a paradoxical way of stressing the need for idiographic explanations of its non-applicability. However, this idiographic nature of findings is the core advantage of qualitative studies. Thus, it should not be packaged under positivistic terms such as laws, regularities, and predictive orientations that emulate Newtonian overtones in the very traditions I seek to problematise. “Requisite” as a term is semantically neutral. However, precisely because of this neutrality in meaning, it engenders a threat of misconceptions. The problem rests with how complexity-cum-management scholars interpret the term “requisite” (“match”), and, in turn, how they appropriate a measurement orientation to theorise.

6. Conclusion

As may have been surmised by now, complexity is a polyvalent concept. However, this does not necessarily indicate a constructive diversity that enriches the discourse. Rather, this polyvalence often indicates a fragmented and inconclusive attempt to define, operationalize, appropriate or capture complexity. In fact, complexity is neither a unanimously agreed concept nor a homogenous field of scholarship. Rather, several traditions prevail therein, which have offered heterogeneous understandings of complexity and requisite operationalisations of the construct (Cunha and Rego, 2010). Consequently,

‘complexity’ is not *a* theory but rather several theories, which often imply completely different things (see Stacey, 2002; Burnes, 2005). Therefore, given complexity’s centrality in management scholarship, this inconclusiveness cannot be seen as teething problems of an emergent field but rather, as an identity concern for our field as a whole.

For reasons of fairness, I note that complexity scholars, in an outburst of self-criticism, have cautioned about this inconclusiveness (see Poulis & Poulis, 2016). Therefore, the problematic aspects of this inconclusiveness have not gone unnoticed. However, this ‘brave’ acknowledgment needs to translate into action if we wish something meaningful to stem out of this self-awareness process. Otherwise, the critique will simply remain as a constant reminder of the limitations of existing scholarship. Thus, this study is a modest attempt to contribute to such a research program; to offer an actionable alternative that may become useful through its empirical appropriation and further refinement.

In particular, I argued that a complex regime in real terms is never subject to actual measurement or adaptive matching as complexity theorists routinely suggest. Even if we assume that complexity can be measured and internally matched though, it would still be an approach that emphasises only the constraining role of complexity. Notwithstanding complexity's impeding properties of rendering some action impossible, complexity may also be an enabler and a reflective platform that drives actors towards certain possibilities beyond adaptive matching (see Välinkangas & Carlsen, 2019; Garud et al., 2011; Walker, Schlosser & Deephouse, 2014). What I also argued is that measurement will not contribute to more nuanced theorizing in an attempt to understand human agency amid complexity e.g. the bolder, more imaginative or deviant managerial acts that organizational actors adopt. On the contrary, through its habitual systemic focus and the secondary role that it

attributes to ‘soft’ antecedents of action, a measurement orientation masks shedding light on important management phenomena.

Thus, I promoted another epistemological orientation. Instead of measuring complexity, I called for an effort to capture it as an empirical tendency through qualitative means. Joining similar synthetic efforts (Voyer, Kastanakis and Rhode, 2017; Saunders & Bezzina, 2015), I ‘translated’ a core positivistic tool (NKC) and integrated it with a core interpretive theme (second-order complexity). Their merger promises to be a fruitful means towards understanding complexity and how it connects with themes that lie at the core of management scholarship’s identity and scope.

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