COMPLEXITY, PEACE OPERATIONS AND M&E: The Need for a Paradigm Shift?

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INTRODUCTION

> *For every human problem, there is a solution that is simple, neat, and wrong.*
> (H.L. Mencken, 1880-1956)

There is an increasing recognition in both research and practice that, unlike their traditional antecedents, the majority of modern peace operations are now complex undertakings. In the 1990s, humanitarian agencies began using the phrase 'complex emergencies', while the language of 'complex peace operations' is now ubiquitous throughout the peacekeeping community in describing the multi-agency and multifunctional character of twenty-first century peace operations.[1] However, regarding attempts to monitor and evaluate the impact of missions, this recognition has been largely a rhetorical one. Whilst there has been widespread acknowledgement that complexity is rife in the business of peacekeeping, this has not been adequately reflected in pervasive Monitoring and Evaluation (M&E) practice.[2] Current convention displays a limited appreciation of what complexity means for how the impact of mission activities should be captured and interpreted. This has significant implications for design, planning and on-going management of missions, to which M&E informed by complexity theory could be a valuable contributor.

This paper explores the possibility of harnessing insights from the study of 'complexity' to help understand how to analyse, monitor and evaluate multidimensional UN peace operations that are invariably part of conflict and peacebuilding systems in highly dynamic and nonlinear environments. In this paper I argue that complexity theory brings novel insights to the study of peace operations. In particular, I argue that the central claims and concepts of complexity theory correspond well with the challenges facing M&E for UNPOL and that consequently complexity theory can usefully inform the development of more appropriate approaches. The paper proceeds in four parts. First, it briefly charts the origins of complexity theory, distils the core concepts of the paradigm, introduces the features of a complex system and notes the increasing application of such concepts to the social sciences as well as enduring contentions. Second, it draws upon the emerging literature viewing peace missions and their operating environments as complex social systems and proceeds to expand on this nascent field using real-world examples to substantiate the suitability of such a representation. The third part demonstrates how the central tenets of complexity theory provide an alternative theoretical

framework for addressing the weaknesses of extant M&E in peace operations. It proceeds to looks at what employing a complexity lens means for - and brings to - the task of monitoring and evaluating progress and change in complex systems. Finally, the paper concludes by articulating the core implications of complexity-oriented M&E for contributing to subsequent development of a framework for UNPOL in peace operations.

COMPLEXITY THEORY

Complexity Science emanated from theoretical physics and cybernetics,[3] however, today Complexity Science is best understood as a loose constellation of ideas, principles and influences developed and embedded throughout the physical and natural sciences, particularly in biology, computer simulation, mathematics, physics and chemistry and sub-fields including chaos theory, fractal geometry and cybernetics. Other related disciplines such as systems thinking have also expounded upon and harnessed similar concepts and illustrative models.[4]

In basic terms, the science of complexity and its central tenets provide a framework for explaining systemic change processes evident in physical and organic phenomena. The common thread through these theories, henceforth 'complexity theory', is their contention that fixed linear paradigms – often referred to as Newtonian in character – are both limited and limiting when applied to complex systems.

By its nature, something which is complex is not easily reduced to a discrete categorization. Hence, complexity does not adhere to a precise definition. A commonly used device to explain complexity is to contrast a 'complicated' system with one that is truly 'complex'.[5] A complicated system can have a huge number of constituent parts and their configuration can appear complex. However, the behaviour of a complicated system is ultimately determined.[6] For example, the electronics systems in aircraft are extremely complicated. They are replete with components and utilise various different technologies. Whilst grasping all of this information may be beyond the capacity of any one individual, it is possible to understand its functioning. That is to say, the system is stable and 'knowable'. This means enough of the causal relationships between the system's elements are linear, that this modality applies at all times and locations, and that as a result, system-level outcomes are determined, finite and can be predicted.[7]

On the contrary, interactions between arrays of elements in complex systems are dynamic and non-linear. That is to say those relations transform over time and cannot be understood to trace a simple trajectory of causality. This means that outcomes are undetermined, unpredictable and can be unexpected. Phenomena as diverse as an ant colony, the human nervous system, language,

ecosystems, financial markets and political community are examples of complex systems.[8] A system's complexity is the product of its constituent parts interacting and emerges at the systemic level. As Jervis puts it, subtly but significantly altering a popular idiom, "the whole is *different from*, not *greater than*, the sum of the parts"[9] (original emphasis). It is for this reason that the behaviour of a complex system is not reducible to the behaviours of its constituent parts.

Despite these intricacies, it is not necessary for complexity to be perceived as convoluted or esoteric. In short, complex is the opposite of independent, while complicated is the opposite of simple. It does, however, introduce a lexicon and set of ideas somewhat unfamiliar in the social sciences. Complexity theory is furnished with an array of concepts that underpin this distinction between systems that are merely complicated and those that are complex. Therefore, in a generic sense, complex systems possess particular defining features and display certain systemic properties.[10] The first three relate to 'interconnections and interdependence', 'feedback' and 'emergence'.

All systems are comprised of multiple elements, however, it is the existence of *interconnections* between these parts, processes and dimensions that is emblematic of complex systems. Interactions between elements be they agents, processes, or indeed other (sub-)systems, lead to intricate *interdependent* relationships symptomatic of complex systems.[11] This means action by any part of the system can affect another and/or the whole. These are also dynamic such that interactions can be volatile and changing. The degree of interdependence, often referred to as 'connectivity',[12] dictates how change occurs in the system, the resilience or robustness of the system and with it the magnitude of the 'ripple effects' from disturbance and perturbations (both internal to and external on the environment).

Complex systems are 'controlled' by *feedback mechanisms and processes*. These drive systemic change and can be both negative and positive, which respectively dampen and amplify change.[13] Both types represent the way in which alterations in system components or system-level behaviour is related back to both its original source and other elements of the system. Negative feedback tends to counteract the activating change, reversing the direction of change/restoring initial conditions and acting as a 'control' or 'stabilizer'[14] – in effect reducing overall deviation in the system. Simple examples include the thermostat on central heating system or the plug-hole in relation to a bath filling up.[15] Positive feedback tends to propagate the vector or variety of change, 'destabilizing' the system, which can lead to significant quantitative and qualitative changes in the system.[16] An oft-used example is when logs are added to a bonfire which eventually exhausts its fuel and burns out.[17] Whilst similar feedback is present in simple systems, the difference in complex systems is that feedback is the conveyance to the system of its own non-linear, unpredictable and dynamical change.[18]

Furthermore, in complex systems these are not one-off feedback events, but on-going feedback 'processes'.[19]

Probably the most archetypal feature of a complex system is *emergence*.[20] Emergent properties refer to the structures, qualities or behavioural patterns of the system as a whole that are difficult to predict based on the characteristics of constituent parts. Emergence is therefore contingent on and produced by the myriad of possible interrelationships between elements within the system.[21] For example, a piano chord is often used as an analogy, as when three or more single notes are played together, the product – a chord – displays a "harmonious combination of sounds [that] has a new attribute which no one of its individual components had."[22] Emergent properties stem from the local 'rules' of interacting elements that are not necessarily known or understood at the macro-level and make systemic behaviour difficult to predict.

The three features explained above combine to have important ramifications for how complex systems change over time. Firstly, they dictate that change occurs in a *non-linear* fashion. That is, the causal interrelations in complex systems are not necessarily proportional and therefore defy a predictive and additive logic.[23] Feedback processes between interacting components and dimensions produce relations that create dynamical and unpredictable change.[24] Clear causal relationships cannot be identified or assumed due to the many and different influencing factors. Nonlinear systems are not anomalies or unusual. In reality, nonlinearity is likely to be the norm when studying systems.[25] Linear or 'tame' problems can be disaggregated and treated independently.[26] Once 'solved', the series of discrete explanations can be accumulated and integrated into a holistic solution – i.e. the whole is *equal* to the sum of its parts. However, linearity is often an approximation of a more complex reality, arrived at through regression techniques. In a complex system, an input to the system may have an uneven impact due to the irregular distribution of system elements and the nature of coupling between them.[27] This makes complex systems intrinsically hard to control or predict with any certainty.

Secondly, the properties of a complex system ensure that change can happen disproportionately. In complexity terms, this is referred to as *sensitive dependence* and emphasises a system's susceptibility to context and variations in any aspect of the situation.[28] A complex system's behaviour is extremely sensitive to the initial conditions as, due to the nonlinear relationships, minor adjustments in one component of a system may lead to major changes in outcomes under observation.[29] Positive feedback processes are particularly important in this. This phenomenon is often depicted by Lorenz's 'butterfly effect' whereby an event, seemingly trivial in size or importance (e.g. a butterfly flapping its wings in Brasil), can lead to large and significant event (e.g. a hurricane in Japan), through an unpredictable chain of interrelated events.[30]

Third, change in complex systems is said to happen when a system moves within and between peculiar loci (i.e. phase spaces) that frame systemic behaviour known in complexity terms as *attractors*. An attractor encapsulates the long-term qualitative behaviour of a system and expresses the patterns of ordering and phases of the system. This includes the possibility that complex systems may have many equilibria.[31] Eoyang describes how attractors host "emergent behaviour that has a finite bound and infinite variability within the bound."[32] In typological terms, these can be 'periodic' or 'fixed point' attractors,[33] however, it is the 'strange attractor' that is the hallmark of complex systems and relates to systemic behaviour at the 'edge of chaos'.[34]

Minor changes occur regularly within a phase space but occasionally some perturbation can shunt the system into a new attractor with associated global patterning. The nature of complex systems is such that it is not possible to know what type or magnitude of perturbation will constitute a sufficient shove. This creates the potential for a complex system trajectory of large upheavals separated by long periods of global stability, but energetic local activity known as 'punctuated equilibrium'.[35]

When complex systems have the inherent capacity to change, precisely because of the adaptive agency of their constitutive elements – i.e. their ability to respond consciously and strategically to peers and their environment – they fall into a sub-category known as *Complex Adaptive Systems*.[36] More recently, scholars such as Mitleton-Kelly have suggested that these phenomena are better described as *Complex Evolving Systems* (CES) as this better captures the nature of systemic change where elements are simultaneously evolving *with*, not just adapting *to*, a changing environment.[37]

This particular type of complex system is characterised by two further behaviours. Firstly, they are self-organising. *Self-organisation* refers to the reorganising and self-regulation of a system in response to a disturbance or external constraint. Whilst similar to emergence, this characteristic is a peculiar consequence of the interactions, interdependence and multiple feedback processes at play between agents who consciously structure their conduct in accordance with their own visions, goals and calculations of the predicament. In other words, self-organisation is the emergent product of interacting adaptive agents.[38] Chaos and order combine to produce conditions of self-organised complexity sometimes referred to as a 'chaordic' state.[39]

Secondly, CES are in a continuous process of *co-evolution*. That is to say, system elements interact intricately with each other and their environment (including its emergent properties) influencing the evolution of each. Intrinsic feedback processes cause the nature of relations between agents and between agents and the system to change – themselves subsequently adapting in response to a changed environment. Therefore, in CES, elements have adaptive agency and are engaged in a

continuous process of relational evolution.[40] This is critical to describing how complex adaptive systems change over the longer-term. Mitleton-Kelly summarises it astutely when she writes:

"Complex systems are…made up of interacting agents, whose interactions create emergent properties, qualities, and patterns of behaviour. It is the actions of individual agents and the immense variety of those actions that constantly influence and create emergent macro patterns or structures. In turn the macro structure of a complex ecosystem influences individual entities, and the evolutionary process moves constantly between micro behaviours and emergent structures, each influencing and recreating each other."[41]

In summary, a complex system is comprised of interactive and interdependent elements, with constitutive feedback processes which lead to emergent properties. These features mean that complex systems change and produce systemic outcomes through nonlinear trajectories, are sensitive to changes in initial conditions and these occur within and between distinct but variable phase spaces. Complex evolving systems consist of adaptive agents that have a latent capacity to self-organise in response to perturbations as well as co-evolve with each other and with the broader systemic environment.[42]

Complexity Theory in the Social Sciences

In the last 20 years, complexity theory has been advocated for and applied across the gamut of the social sciences – particularly when interaction within and between social entities is conspicuous but predictability of systemic behaviour is low.[43] In this domain, the referent is a *complex social system* whereby the important interactions are the relations between *agents* as opposed to simple components of a system. In the field of International Relations (IR), the unpredictability of episodes in global politics has led scholars to laud the utility of complexity theory and its main tenets as an alternative – or at least addition – to dominant reductive IR theories[44] for better understanding key events in world affairs.[45] In development studies complexity has drawn increasing attention in the last decade investigating the value of complexity concepts for better understanding how social change occurs and how this might impact upon development policy-making and implementation.[46] Even in Economics – a discipline synonymous with epistemological rigidity – there are signs that complexity theory is gaining traction in challenging neoclassical orthodoxy and advocating for evolving econometric and economic theory based on complexity concepts to explain economic phenomena such as growth and market failure.[47] Segments of organisational, business and management studies have embraced complexity theory in their work addressing practical organisational problems – such as organisational change management – in both the private and public sectors.[48] Complexity concepts have also had a significant effect on disciplines such as sociology,[49] social theory[50] and (social) psychology.[51]

Despite disciplinary difference, the central tenets of complexity theory have proven to be pertinent in the social sciences – particularly in understanding how and why change occurs within social systems. This interdisciplinary approach has enabled scholars to explore its utility for enhancing understanding of political, social and economic phenomena. However, these sentiments are not unanimous and there are many disagreements about the extent to which complexity concepts are transferable to human systems and organisations in the social sciences. Due to its genesis in the 'hard' sciences, there are those who advise caution when transposing complexity concepts into substantively different disciplinary domains. The following addresses the recurrent criticisms of applying complexity theory to social systems under methodological, practical and political concerns.

Hendrick identifies three main methological issues at stake for the critics.[52] Firstly, that there are those who believe it is dangerous to 'cherry pick' and apply only convenient concepts in isolation when complexity theory should be applied as a holistic explanatory framework. These critics argue that, like the elements of a complex system itself, we need to recognise that the complex characteristics of a system are closely related and it is them working in concert that creates new order. Second, there are those who are concerned about the proliferation and diversity of definitions for complexity concepts. The associated fear is that the meaning of terms may become imprecise or distorted, rendering their application arbitrary or even misleading. Finally, theoretical purists are averse to the use of complexity as a vague metaphor or analogy and conjecture that it is not yet fleshed out sufficiently to be useful theory in social science. Whilst these are all valid warnings, such methodological contentions are not alien to the social sciences. Disparate definitions and the corollary assumptions that underpin them are recurrent in research in international relations and peace and conflict studies. It is therefore important to proceed prudently and make explicit the delineation of definitions and the scope of what is – and equally what cannot be – expected from their application.[53]

In practical terms, a persistent criticism of complexity theory is the lack of clarity on how it manifests in practice. This is in part due to the lack of empirical case studies to evidence its utility and leads to the accusation that it does not state explicitly what is to be done. In these scenarios, as Ramalingam concedes, complexity often leads to perplexity amongst practitioners and policymakers;[54] or worse, to accusations that complexity is "just the latest management jargon" of consultants and complexologists selling their latest nostrum or "peddling managerial snake-oil".[55] Given its infancy in the social sciences, applications of complexity theory are vulnerable to this charge like any new paradigm. Moreover, the thrust of complexity theory is about process rather than product. In this sense, the perceived source of weakness should actually be viewed as the source of its strength – the complexity approach is not about providing *solutions for problems*, but *approaches to problems*.

There remains, however, a concomitant need to exercise restraint and to avoid overestimating the applicability of complexity concepts as a panacea to challenges in analysing human systems.

From a political perspective, critics have stated that central tenets of complexity theory such as emergence and self-organisation sound a lot like *laissez-faire* market ideologies.[56] The implication is that complexity is a cloak for a neo-liberal marketization agenda. However, complexity theory notes that not all emergence and self-organisation is objectively 'good'. For example, complexity theory aids a clearer understanding of how negative events such as financial crises or genocides are also emergent outcomes of complex systems. Its application therefore advocates and attempts to create systems that reside at the 'edge of chaos' – i.e. those which are most resilient and robust due to an optimal combination of flexibility and control rather than a dogmatic ideational set of beliefs.[57]

Notwithstanding these contentions, applications of complexity theory across the social sciences reflect common foundational ideas about how we can understand and use empirical sources to evidence change in social systems where interaction and interdependence is high but predictability of systemic outcomes is low. Importantly these ideas do not depend upon a rigid and linear Newtonian cause-and-effect logic. Whilst these developments are significant, to date there has been little research produced on the applicability of complexity theory to conflict prevention, management and resolution[58] and even less so with regard to peace operations.[59] However, the multidimensional nature of contemporary peace missions and their operating environments, make this field a prime candidate for just that. The following section argues that understanding peace operations environments as complex systems can assist in understanding how change occurs as a result of and/or in relation to the activities of a mission.

PEACE OPERATIONS ENVIRONMENTS AND THE CASE FOR COMPLEXITY

Peace operations environments can be depicted as CESs because they exhibit the core characteristics of a CES.[60] That is, when understood as a system they are replete with multiple actors that are interconnected in a plethora of ways leading to intricate interdependency. Furthermore, peace operations and the peace processes they assist in implementing are controlled by numerous positive and negative feedback processes. Finally, they continually produce emergent order as a result of their unique composition and partnerships as well as changeable goals and objectives.

Peace operations environments contain a myriad of international, national and local level stakeholders. Similar to Ramalingam *et al*'s description of international aid interventions, peace operations happen in "the context of a dense and globalised web of connections and relationships between individuals, communities, institutions, nations and groups of nations."[61] The peace

operations bureaucracy itself functions through a distorted hierarchy that includes member states in the SC and GA, managers in the Secretariat and DPKO, senior and middle managers in field operations and the peacekeepers on the ground. The interactions between these actors produce vertical relations between stakeholders at all levels of magnitude. Furthermore, multidimensional missions are comprised of different sectors *inter alia* the military, police and numerous civilian substantive sections, oversight and management entities as well as partnership and cooperation with host government and civil society. Consequently, peace operations locales are typified by multiple interlinked elements.

In addition, a broad spectrum of tasks and activities are performed by different configurations of those same stakeholders. The military, police and civilian elements of peace operations conduct programming in security, rule of law, humanitarian, economic, governance, political, developmental and human rights spheres. The relations within each of these pillars are extensive, but the increasingly integrated nature of programmes – such as Security Sector Reform (SSR), Disarmament, Demobilisation and Reintegration (DDR) or arranging and securing elections – has led to a proliferation of linkages and interdependencies across these functional areas. In this sense, multidimensional UN peace operations are invariably part of an overarching peacebuilding architecture tasked with cooperatively managing change in conflict-affected environments.[62] This adds another layer or dimension of interconnections. Similarly, the institutional capacity-building synonymous with modern missions implicates strong interdependencies between the mission and the host government and community. This means that peace operations environments contain a plethora of horizontal relationships between and across clusters of implementing agents as well as those with the host state and society.

This is a straightforward and uncontroversial account of how peace operations environments are replete with interconnections and interactions across agents and dimensions of social, economic and political order. This array of vertical and horizontal relations means that these settings display high connectivity and intricate interdependence between elements and dimensions of which peace operations are one. This is the archetypal quality of a complex social system. Although it is hardly new to highlight the multidimensionality of conflict-affected societies, complexity theory implies that acknowledging this reality and revealing the degree of connectivity between actors and programmes is a necessary precondition for understanding the intensity of feedback processes that 'control' emergent environmental outcomes.

In human systems, *feedback* relates to influence over action and behaviour, albeit dependent on the degree of connectivity between agents.[63] Given the notoriously *ad hoc* nature of peace operations,

they are perennially reacting to both positive and negative events and changing 'on the fly'. This happens in a number of different ways, however, each of the avenues relies upon *feedback* processes to propagate or inhibit the alterations in a peace operation's conduct in relation to its systemic context.

Positive feedback can have a large effect (i.e. amplification) at the HQ level where strategic decisions that influence the character of mission mandates are made. For example, the practice since 1999 to mandate missions to protect civilians substantively changed the nature of peace operations from the top down (i.e. positive feedback). However, the unprecedented nature of much activity in peace operations means that positive feedback can also emanate from the field when a particular mission pioneers new initiatives that prove successful. For example, the innovation of public information components in the missions in Sierra Leone and Liberia were instrumental to changing the way in which these elements have operated since.[64] Negative feedback processes are also prevalent at the strategic level. For example, the predilections of some members of the SC to remain steadfast to a particular conception of peacekeeping based on consent, impartiality, minimum use of force acts as a control for what peace operations can and cannot be designed to do with ramifications for expectations once deployed. In the field, negative feedback processes are omnipresent due to the prevalence of stringent policies, doctrinal frameworks and standard operating procedures that govern how mandates are implemented and the conduct of peacekeepers themselves.

Feedback processes in peace operations environments are both negative (i.e. they dampen the magnitude of deviation from current systemic behaviour) and positive (i.e. they amplify, and often substantively change, behaviour of the system). Moreover, the feedback processes are multidirectional. That is, they can be instigated from the bottom up, as well as from the top down. Consequently, these feedback processes common to all mission contexts are important to the way in which the actions and behaviours of peace operations transpire. Feedback in the systemic context is essential to the way a peace operation progresses over time and how it, in turn, impacts upon its environment. Complexity theory brings a focus on these feedback processes as well as an explanatory framework for understanding the direction and magnitude of their effects. In other words, enabling and disabling *emergent* behaviours through positive and/or negative feedback processes.

The system level structures and behavioural patterns of peace operations environments are difficult to predict based on simple knowledge of the individual traits and preferences of the agents and inputs involved.[65] For example, peace operations are mandated to accomplish certain core objectives such as DDR. It is straightforward to identify the overarching goals of a DDR programme – i.e. disarm ex-combatants, demobilise them from their chain of command and provide opportunities for them to reintegrate into civilian society. It is also likely that generic guidelines based on previous experiences

will inform the design and planning for such a process. However, it is the local rules of interaction between the constituent parts of the system – e.g. the UN and the international donor community, the mission and the host government, the DDR programme and the ex-combatants – that dictate how such processes unfold. These constitutive relationships have a significant impact on how a mission interoperates with its systemic environment that is not easily predictable by observing the behaviours of its constituent parts.

In the realm of policing, mission UNPOL components are made up of multiple national contingents and units. These contributions often possess extremely different backgrounds regarding training and policing philosophy. However, notwithstanding operational challenges, they work together in ways and towards goals that do not necessarily reflect what they would normally (or indeed, preferably) do. Similarly, when these UNPOL operatives are tasked with police reform, the intended impact – i.e. improved local police services – is the emergent property of international-national collaboration and may not be a predictable product of those contributing to the process. Systemic outcomes relating to UNPOL is a product of multiple contributions but different to what might be predicted based on their separate characteristics. Emergence is accentuated further in peace operations due to the high turnover and short tenure of personnel in field missions. The frequent influx of new personnel with little familiarity with the job or the context further contributes to the unpredictability of perpetually new emergent order.

Negative (maladaptive) emergence also occurs in peace operations. For example, a recurrent criticism of peace operations is their ineffective coordination, particularly between military and non-military components. The various civilian, police and military elements of a mission have distinct organisational cultures and operate under their own procedures (at times even sub-sections – e.g. national military contingents operating with national caveats). This is a way unpredictable order emerges in the mission environment – in this instance, undesirable systemic behaviour stemming from the local rules of individual units, leading to incoherence at the systemic/macro-level.[66]

Given the multiagency character of peace operations and the increasingly integrated nature of programming, the form and function of missions is contingent on idiosyncratic organisational cultures, identities and procedures and the myriad of ways in which they interact. Furthermore, peace operations are one element of the broader environment and systemic outcomes are contingent on the ways in which missions interoperate with other peacebuilding actors, host governments, civil society and local communities. The resultant emergent systemic identity and behaviour is consequently difficult to predict accurately based solely on knowledge of each in isolation. Whilst the challenges of integration and coordination at the systemic level are well-known,[67] complexity theory is a useful

framework for uncovering and explaining these phenomena.[68] Although emergence can and should be expected in peace operations environments, its substance is difficult to predict due to the nonlinearity of relationships within the system and therefore hard to achieve by design. Therefore, complexity theory adds weight to the argument that the unique context-specific solutions that transpire in these settings can be understood as leading to new and oftentimes unexpected order and coherence – i.e. the *emergent property* of the system. Importantly, Complexity theory also reminds us that this emergence is not always an objectively 'good' thing.

In summary, when a human society is affected by conflict – violent or otherwise – its complex adaptive nature is even more prevalent.[69] Societies embroiled in – or emerging from – conflict, are dynamical and complex environments.[70] Consequently, peace operations environments are multidimensional and have a range of stakeholders with different perspectives whose interrelationships are often non-linear. The feedback between these actors produces 'emergent' and often unpredictable outcomes. The impact of conflict on any specified level or unit of analysis will inevitably have consequences for higher and lower magnitudes purlieus within the same system, in turn influencing change in that domain. This means that the social outcomes of peace processes cannot be predicted from looking at single issues in isolation, but has to attend to the influence of constantly changing context – i.e. its dynamics. It is also important to note that the elements of such a system are conscious and creative agents with interests and memory such that history matters to how these system-level outcomes transpire.

Whilst relatively nascent, there is a fledgling community of academic and policy-oriented researchers that advocate using principles and perspectives synonymous with complexity theory to understand UN peace operations as complex social systems.[71] Whilst some of the concepts in complexity theory are clearly relevant to understanding change in the context of peace operations, this is not to suggest that all of the theory is applicable all of the time. For example, it would be to draw an extremely long bow to suggest that the notion of 'attractors' can be transposed to map conflict phases or spaces or that 'self-organisation' best describes how missions are shaped to address new and changing political and operational challenges. The above represents a modest contribution to demonstrating how UN peace operations environments can be understood to display the core characteristics of complex systems. This is not intended to be a conclusive account or proof of peace operations locales as complex evolving systems. However, it can be understood as part of an attempt to build such a case and to explore the possibilities that doing so creates. Whilst I believe there is compelling case, this can only be a point of departure and specific human systems such as peace operations need to be studied in their own right to overcome the limitations associated with such an importation of theory. Nevertheless, if this is to be believed, then hypothetically, the way in which change occurs in complex

systems – i.e. emergent outcomes through non-linear trajectories that are sensitive to initial conditions, bounded by unique loci, and in the extreme, display self-organising and co-evolutionary qualities – may be useful in understanding the impact of peace operations (i.e. the type, extent and rationale for change).

Complex aspects of peace operations environments have significant implications for how missions are implemented, how we can understand them and how these understandings can inform efforts to monitor and evaluate progress. Notwithstanding compelling arguments to the contrary, the majority of peace operations activities are monitored and evaluated as if they are addressing singular or isolated problems or puzzles. This belies the complexity, or 'wickedness', and the systemic nature of conflict, fractured social orders and the way in which attempts to resolve them and rebuild in their wake unfold.[72] The unique perspectives that complexity theory brings to the study of change in such settings might have the potential to shed light on how M&E can better reflect the impact of peace operations. In this vein, the following section demonstrates how the central claims and concepts of complexity theory correspond well with the challenges facing M&E in UNPOL.

COMPLEXITY THEORY FOR OVERCOMING THE SHORTCOMINGS WITH EXTANT M&E

Existing approaches to M&E in the context of peace operations suffer from a number of weaknesses. In the following section I explore how complexity theory might help overcome them.

Causal Ambiguity

The dominant views and theories of change undergirding M&E in peace operations tend to simplify the relationship between mission activities and system-level outcomes to a linear mechanistic results chain:

INPUTS → OUTPUTS → OUTCOMES→ IMPACT

These accounts of change are based on three central assumptions: 1) *ceteris paribus* holds; 2) inputs are broadly proportionate to outputs and outcomes; and, 3) system-level outcomes equate to the summative product of sub-system level contributions. On the contrary, complexity theory brings a new perspective to bear on these issues based on its intrinsic treatment of non-linearity as well as the feature of sensitive dependence.

Regarding *ceteris paribus* – i.e. 'all else remaining constant' – understanding of change rests upon the notion of an 'independent' variable and assumptions of linearity.[73] Complexity theory holds that in circumstances of multivariate change, this is an artificial construct and antithetical to the peace

operations setting where systemic effects are the product of multiple interactions, adaptive agency and emergence. For example, with the plethora of actors, inter-linkages and (sometimes competing) agendas discussed above, system-level outcomes such as the creation of sustainable peace are not necessarily a direct result of the activities conducted by a mission. The presence of external influences means that exogenous factors play a constitutive role in eventual outcomes. An example relates to the security conditions in neighbouring territories whereby given their proximity, spill-over effects and associated interdependence, the effectiveness of the MINURCAT mission in Chad/CAR was widely believed to be inextricably linked to security outcomes in Darfur.[74] The same can be said of meddlesome neighbouring governments.[75] Consequently, complexity theory contends that *ceteris paribus* does not hold and that, on the contrary, systemic outcomes in peace operations are driven by a large number of variables – none of which can be understood to be independent – and provides a justification and explanatory framework for how change emerges through non-linear functions.

In relation to *input-outcome proportionality*, common practice is to explain tangible changes observed in a system as being proportional to adjustments in the inputs and therefore allow for some degree of attribution to those responsible for the inputs. Complexity theory contends that in complex systems inputs and outputs cannot generally be correlated in a linear fashion with outcomes. It promotes two interrelated explanations for this. Firstly, inputs to a complex system tend to diffuse unevenly. This happens because elements often have an irregular distribution and manifest in unequally structured sub-systems. Moreover, the social, economic and political bonds responsible for these distributions in the peace operations context are not likely to be of uniform strength in all parts of the system.[76] For example, in the case of police training, there may be a difference between absorption capacity of police in urban centres as opposed to rural locales due to disparities in, *inter alia*, competency, capacity and career incentives.

Secondly, this internal irregularity leads to externalities or unintended consequences. Despite good intentions, peace operations do not have exclusively positive and objectively beneficial impacts. On the contrary, their presence in a host country is notorious for having multiple negative 'side-effects' as well.[77] These are often unintended, at least at the macro level. For example, whilst the creation of camps and provision of humanitarian assistance for the internally displaced is often a critical task of peace operations, this can have negative consequences. Camps and what is provided therein can distort the incentive structure for those who are not displaced to emulate displacement if life-sustaining support is more readily available by doing so. Complexity theory articulates how the likelihood of potential repercussions mean that system-level net outcomes are not only the direct result of inputs, but are also a product of unintended consequences, some of which may be positive but others may be negative.[78]

Whilst this causal ambiguity and unpredictability in peace operations leads to 'surprising' outcomes that are disproportionate to inputs, their occurrence should not be surprising. Rather they are a symptom of the fact that peace operations are embedded in complex systems.[79] Complexity theory, therefore, provides theoretical underpinning for the case that no intervention in a complex human system can guarantee an intended, or indeed a singular, effect.[80] In this way, it adds value to understandings of how inputs (i.e. peace operation activities) are related to overall outcomes (e.g. improvement in public security) in non-linear rather than linear ways.

Regarding *summative impacts*, a common simplification of current convention is the view that the outputs and outcomes of a peace operations action are additive. That is, the assumption that:

(Action X → Output A → Outcome 1) + (Action Y → Output B → Outcome 2) = (Action X + Action Y → Output A+B → Outcome 1+2)

For example, if Action X was technical assistance (e.g. provision of vehicles, uniforms, etc) and Action Y was capacity-building through training (e.g. human rights course), the arithmetic approach above would suggest that outcomes relating to improved technical capacity to perform duties and enhanced human rights awareness, respectively, might lead to better crime control and realisation of due legal process in addressing post-conflict criminality. In other words, technical interventions are commonly assumed to lead to the behavioural change (e.g. UNPOL efforts to reform domestic police and criminal justice sectors). However, this is often not the case as Actions X and Y and their associated outcomes/impacts will likely have some of the unintended consequences mentioned above and constitute exogenous factors for other interdependent parts of the system. Extending the example above, it has often been the case that improving the effectiveness of the police to arrest and humanely detain criminals has overwhelmed the capacity of the judiciary to try and sentence the suspects. This invariably leads to high rates of lengthy pre-trial detention in terrible conditions ahead of any verdict.

Complexity theory points to the systemic nature of peace operations outcomes and their contingent production (i.e. emergence) as the reason why they defy a simple additive logic when it comes to gauging the cumulative effect of micro-level activities on macro-level outcomes. Ultimately, complexity theory sheds new light on how accumulative conceptions of impact in peace operations may miss the detail of how actions and their outputs interact to create meta-outcomes that are not necessarily additive products of meso-outcomes. In complexity terms, this relates not only to emergence, nonlinearity and externalities, but also to the notion of perturbation of the system and sensitive dependence. Departing from this mechanistic arithmetic, complexity theory offers an alternative and more nuanced view of systemic outcomes based on the concept of sensitive dependence.[81]

In sum, peace operations and their settings are antithetical to linear representations.[82] It is not feasible to make assessments based on *ceteris paribus* conditionality, the relationship between inputs and outcomes is disproportionate due to exogenous factors and externalities, and those same outcomes cannot simply be added together and deemed representative of the whole. Complexity theory brings more clarity to discussions of non-linearity and causality in peace operations. The issue of nonlinear change – i.e. the way in which change intended/desired by a peace operation occurs – is one of the areas that complexity theory holds most promise for attempts to monitor and evaluate the impact of peace operations.

Context-(In)sensitivity

Another critique of extant M&E is that it is not sufficiently context-sensitive and that this has ramifications for understanding and interpreting change. Dominant approaches often involve generic indicators and rarely include accurate baseline assessments. Alternatively, complexity theory emphasises the centrality of a nuanced rendering of the context for two main reasons. First, it is important to have a clear picture of the relevant system elements (i.e. stakeholders) as well as the way they relate due the integral role of local rules of interaction in the emergence of system-level outcomes. That is, if outcomes are to be understood accurately, they need to heed their emergent nature which is contingent on an appreciation of the potential influence of multiple and disparate actors.

Second, a detailed baseline account of initial conditions is crucial to informing the effect of sensitive dependence when interpreting outcomes. Embedded in complex systems, the impact of peace operations activities (equivalent to a perturbation) will be subject to sensitive dependence and hence susceptible to variations in initial conditions such that the observed outcomes can vary dramatically. For example, although activity x was observed to have produced outcome Y, that cause-effect relationship is not necessarily replicable or scalable. That is to say, similar activities will not automatically have the same impact in a different context or time-period. Likewise, expanding or multiplying the amount of the activity will not lead to directly proportional increases in the observed outcome. This is already widely recognised in peacekeeping literature and practice, manifest in the rejection of one-size-fits-all philosophies,[83] however, complexity theory adds an extra level of detail in understanding this and provides a way of explaining how overall outcomes cannot be easily reduced and attributed to initiating actions and inputs.[84]

Un-systemic

The preeminent M&E tools in peace operations tend to focus on units of analysis that underplay the systemic nature of producing outcomes. That is, they are either overly narrow or broad. In the first instance, much of current orthodoxy was seen to artificially silo the activities of sections such as UNPOL and treat their goals and accomplishments as independent of the other mission actors and stakeholders. Oppositely, complexity theory compels analysts to understand outcomes in their systemic context. Here again, the concept of emergence is important to understanding how achievements of systemic change are collectively constituted. Outcomes are the product of multiple contributions, dynamic interrelationships and enabling conditions and thus cannot be easily reduced to the actions of any individual or group of system elements in particular. For example, given the multiagency nature of programming, outcomes such as effective police reform are the result of collaboration between the peace operation and its diverse UNPOL contingent, the host government and a range of other stakeholders and hence not easily attributed to individual actors such as UNPOL. In other words, complexity theory implies that system level outcomes are irreducible to the discrete actions of individual peacekeepers, the programmes of neatly separate units or even of the mission overall. This perspective has the potential to underpin M&E that situates the outcomes in the rule of law domain in the broader context of actors working collaboratively towards these goals and has important ramifications for M&E that contains a more sophisticated treatment of attribution.

On the other hand, strategic level M&E often treats a peace operation and the effort of the 'international community' as a single unit of analysis or monolithic entity. This underplays the agency of sub-sections of missions and indeed the way these sub-entities interact to create emergent order and outcomes. As pointed out by Durch and England, "[i]n peace operations the actions of even small groups…can have major implications for local stability and the achievement of the mission's mandate."[85] Complexity theory facilitates an analysis that emphasises the system and its inner workings and properties as a means of understanding, explaining and substantiating the emergent outcomes and behaviours observed at the systemic level.

Exclusive methods

Current M&E orthodoxy ensures that the approaches are designed and implemented as well as interpreted and utilised without the participation of a broad range of relevant stakeholders. Furthermore, dominant modalities are heavily dependent on narrow, homogenous and often scarce data sources. Complexity theory points out that desired outcomes in peace operations are likely to be emergent and therefore a product of the peculiar interactions and interdependencies between the elements that comprise the system. It therefore suggests that to understand change under conditions of complexity assessments cannot rely on the knowledge of only a limited set of actors or the

privileging of a particular type of 'knowledge'. In other words, a partial picture of change in these settings will produce only a partial account of how change has transpired and why. Whilst some scholars have recognised the importance of local and cultural dimensions of conflict environments,[86] complexity theory adds to these perspectives by providing a holistic vision of the relationship between a peace operation and its environment and, therefore, a means of interrogating change in such settings. Consequently, complexity theory presents the rationale to aim for a broad-based and inclusive approach to M&E if the nature and trajectory of emergent outcomes are to be educed and captured.

Anti-learning

The final, but crucial, critique relates to the notion that dominant M&E in peace operations are primarily focused on accountability rather than learning. This has two significant consequences. First, this proclivity renders extant approaches rigid and inflexible. The unresponsive and inappropriate timeframes synonymous with this accountability modality constrain the frequency and timing of opportunities to update implementation plans and correct course. This periodic modality also inhibits the continuous gathering and accumulating knowledge from field experiences in real-time. Complexity theory contends that in order for a system (i.e. peace operation) to be resilient and to adapt to dynamic situations with rapidly changing conditions and objectives as well as harness new knowledge (i.e. learn) it is dependent on feedback processes. That is, a reliance upon on-going and frequent ways in which the system's non-linear, inconsistent and emergent change is conveyed back to the elements of the system to inform adjustments (i.e. first-level learning).

Second, as a result of the breakdown or absence of feedback loops, the ability of M&E in the mission to contribute to an organisational learning process (i.e. second-level) is severely restricted. Complexity theory highlights the role of co-evolution in organisational learning. Peace operations and their environments are comprised of adaptive agents that possess the capacity to act consciously.[87] That is, an adaptive agent can perceive one's own state, as well as the state of other actors and their environment.[88] According to complexity theory, this adaptive agency plays a significant role in shaping the system, particularly in the way that feedback occurs, and leads to phenomena akin to self-organisation and co-evolution in peace operations. It further posits that co-evolution occurs when entities are highly connected[89] and, as a result, the evolution of each becomes contingent on the other. In peace operations, this happens between agents of the operation as well as between the mission and its operating environment. For learning-oriented M&E, this clearly points to the need for close connections (via feedback processes) between the learning infrastructure in the peace operations bureaucracy and field missions.

A complexity lens allows us to see that peace operations environments are comprised of adaptive agents who learn and adapt their behaviours, albeit in non-linear and unpredictable ways. This directly impacts upon the system's resilience/adaptability to external changes.[90] Therefore, complexity theory provides the justification that learning already occurs in peace operations continuously in collaborative and relational ways. It furthermore provides the foundation to argue that M&E intended to feed into organisational learning should look to capture these experiences whilst offering some guidance on how holistic M&E can harness the centrality of feedback to the process of co-evolution which is synonymous with iterative learning.[91]

Summary

The central claims and concepts of complexity theory correspond to the challenges to gauging impact of missions and contributing to organisational learning in the peace operations bureaucracy. Therefore complexity theory may hold potential to guide the design of M&E that can overcome the prevailing challenges relating to causal ambiguity, context-sensitivity, systemic understanding of change and outcomes, knowledge sources and participation, and learning objectives.[92]

There are now a growing number of researchers analysing the value of applying complexity thinking to M&E.[93] Furthermore, albeit very recently, there have been some efforts to develop practical approaches for doing so.[94] Similarly, communities of practice have promoted dialogue around the value of integrating complexity concepts into M&E – particularly in aid and humanitarian programming. All contend that complexity theory offers a useful framework for developing M&E that is better able to reflect unsteady and unpredictable progress towards goals in complex social systems.[95] Eoyang and Berkas clearly state the need for alternative approaches, claiming that as complex adaptive systems, "…human systems are dynamic, entangled, scale independent, transformative and emergent. These characteristics challenge the basic assumptions of traditional evaluation methods. They necessitate new evaluation approaches that are as rich and varied as the human systems they are designed to assess."[96] Others have conjectured that, "complexity [monitoring and] evaluation…may provide useful insights to help overcome the serious flaws in current practice."[97] However, meeting this challenge – i.e. recognising and facing up to complex realities – has been described as "the greatest torment" of monitoring and evaluating experts.[98]

The purported benefits are pertinent to the challenge of M&E in peace operations that have become increasingly engaged in early peacebuilding efforts, regularly engaging in institutional change in support of social transformation. One of the most significant components of these efforts is the increasingly transformational aims and objectives of UNPOL regarding police and rule of law reform. That is, peace operations and their UNPOL components are in the business of addressing 'wicked

problems'. However, as yet, there has been little attempt to draw on complexity concepts in the design of M&E for peace operations and their police components. The following section identifies a number of ramifications of applying a complexity-lens to the task of designing M&E for peace operations including how it can address and potentially remedy the deficiencies of extant approaches.

RAMIFICATIONS OF COMPLEXITY THEORY AUGMENTED M&E FOR PEACE OPERATIONS

M&E in complex systems requires a different approach to measuring and describing, causal analysis and reporting and using findings.[99] M&E underpinned by the central tenets of complexity theory therefore has a number of implications for extant practice in peace operations.[100]

Firstly, it implies a shift in its *purpose and scope*. Whilst conventional M&E is often conceived of as a top-down "compliance function",[101] complexity-oriented-M&E is about 'what is (not) working and why' and hence the approach needs to facilitate learning and adaptation.[102] That is, its purpose is not *causal attribution* and *credit-taking* but contribution-centric *impact assessment* and *learning*. The general aims of traditional M&E to account to political masters[103] are superseded by the production of context-sensitive impact assessments based on rapid and iterative feedback that can enable site and situation specific learning for real-time adaptive management of missions in dynamic and unpredictable conditions.[104] Regarding scope, it constitutes a move away from the empirical 'testing' of prescriptive intervention logics, towards a framework that facilitates knowledge acquisition and enables innovation and reflexivity. It is therefore introspective vis-à-vis change theories – continuously reflecting on the extent to which the actions and strategy of the mission suit the system under assessment for longer-term organisational adaptation (i.e. second-level learning). Both of these promise to enhance a mission's agility to learn from experiences as well as its ability to adapt strategies and tactics accordingly to support emergent outcomes 'as it goes' over the periodic packaging of successes and failures for strategic accountability purposes.[105] Ultimately, the purpose is to shift away from the 'fear of failure' engendered by existing modalities, towards a 'hunger for learning'.[106]

Secondly, complexity-oriented-M&E constitutes subtle but important adjustments to the referent such that there is a *re-focussing* of M&E. In order to correct the narrow focus of conventional M&E, complexity-oriented approaches focus on the system and its systemic properties and behaviour.[107] This demands assessments that uncover the ways in which a peace operation is intertwined with its systemic environment creating interdependencies, how this occurs in numerous ways, across multiple units of analysis and all different levels and dimensions of the overarching system, as well as what this means for understanding progress and change.[108] Furthermore, in order to reflect the prevalence

of emergence, complexity-oriented approaches focus on identifying non-linear and dynamical change,[109] rather than dynamic or static, capturing and harnessing the reality that expectations and outcomes are emergent, rather than predetermined.[110] This means it is fundamentally concerned with identifying critical feedback processes and seeking out the unexpected and surprising, including a focus on the effect of exogenous factors and the nature of unintended consequences rather than retrospectively rationalising the ones that were intended by design.[111] Ultimately, this demands more focus on the 'M' of 'M&E'[112]

Thirdly, given these shifts in the purpose, scope and focus, complexity-oriented-M&E demands new thinking about the task at hand and therefore requires alterations and augmentation to the *methods and approach* employed. The intrinsic uncertainty and unpredictability implies analysis more akin to historical research that changes the question from 'did x cause y?' to 'what is happening and why'? This requires different and multiple approaches and tools that reveal more effective and triangulated results and identify vicious and virtuous circles to produce dynamic and emergent results about what is happening.[113] Similarly, to reflect the diversity of system elements under analysis, M&E needs to be cognisant and inclusive of divergent and changing perspectives on what is happening as well as what is valued and should be measured, what constitutes credible evidence and how it should be weighed in the interpretation of findings.[114] This demands inclusive and participatory approaches to the selection information sources and interpretation, including the construction of narratives about events and processes capable of making sense of nonlinearity, sensitive dependence and emergence. Furthermore, the methods and approach employed must be flexible and adaptive grounded in the belief that M&E must be as nimble and supple as possible to reflect the dynamic nature of the system under analysis.[115] This means privileging the continuous reappraisal of monitoring sources and evaluative criteria so as to retain currency as the system evolves and conditions and objectives change.[116]

Fourthly, M&E itself needs to be understood and embraced as part of the complex system it is assessing. Conventional M&E has traditionally been perceived as a rational – even apolitical/neutral – technocratic, data-producing endeavour.[117] Monitors and evaluators are generally characterised as – and often profess to be – external and independent. They usually claim to employ an objective methodology, accordingly designed without much, if any, participation beyond the M&E experts and their commissioners. However, in reality M&E processes co-exist alongside the change they are designed to track. As Imam et al note: "[M&E] can be seen both as a system itself, and as a sub-system that provides feedback to a broader system."[118] Complexity-oriented-M&E therefore recognises its own role in the system – relinquishing any claims to objectivity or impartiality – and attends to its latent capacity to contribute to change as well as track it.[119] Furthermore, the findings

of current orthodoxy are invariably targeted at and tailored towards political masters and funders as a primary means of justifying expenditures, demonstrating success and occasionally explaining hold-ups or failures. The implications for methodologies and approach discussed above lead to an inclusive and participatory process as opposed to a tool with its intellectual engine-room consisting of a centralised pool of M&E 'experts'. Complexity-oriented-M&E further reflects its part in the system by ensuring that the findings are fed back into this stakeholder forum to support local ownership of the process, as well as the M&E itself.

For peace operations complexity theory presents a framework through which M&E can embrace what have to date been seen as 'messy realities' – a flexible and adaptive alternative to reductive linear modelling with the potential to strengthen understandings of change and progress as well as elucidating a menu of promising options for action emanating from M&E findings. To realise these benefits requires subtle but significant adjustments to the purpose, scope and focus of assessments, a reconfiguration of the methods employed and an awareness of the intrinsic nature of M&E to affecting as well as tracking change. The qualities and potential insights promised by complexity-oriented M&E offer a possible corrective/antidote to the shortcomings of current orthodoxy. In relation to UNPOL, this is particularly salient in the realm of police reform. It seems that the stage is set for the arrival of complexity thinking in M&E where peace operations are tasked with assisting and managing change in complex social systems.

However, this does not render obsolete existing approaches that are well-established and often entrenched in institutional practice.[120] Some elements of a peace operations work are more amenable to linear/mechanistic modelling and assessment than others. For example, the Disarmament and Demobilisation components of a DDR programme are often accurately measured using tangible, quantitative indicators and their impact assessed according to linear logic. It is straightforward to suggest that the number of small arms and light weapons collected at a cantonment site is a good measure of effective disarmament. However the difficultly of assessing the impact of the 'reintegration' component of DDR reiterates why linear models often fall short when it comes to M&E of holistic programmes. Many variables are important to an ex-combatant successfully reinserting themselves into society, ranging from acceptance by family/community through to access and commitment to educational/vocational training as a means of finding alternative gainful employment. Outcomes relating to this cannot be captured using quantitative metrics of how many people enrolled in the reintegration programme or attended an arbitrary amount of classes. This requires M&E that targets behavioural change and social impact.

Ultimately, the range of different activities undertaken in peace operations demands the employment of a range of methods and approaches as appropriate. What is crucial is that they are utilised in a theoretically coherent fashion and their respective weaknesses are revealed and, where possible, mitigated.[121] In this sense, complexity-oriented M&E is a means to an end, not a means in and of itself.

CONCLUSION

In this paper I have highlighted how complexity concepts can be utilised to better understand peace operations and their conflict-affected host societies. The case has been made across the social sciences that the characteristics of natural complex systems are both germane to and appropriate for a human social system. It was argued herein that peace operations' environments can be seen to display the defining features of complex systems and that consequently many of the challenges facing contemporary peace operations are akin to multidimensional and interdependent 'messes' rather than simple, isolated and easily solvable 'puzzles'.[122] Furthermore, the societies that peace operations assist and interact with are open and dynamical systems, reproducing and evolving along contingent trajectories – that is, trajectories influenced but never fully determined by a large number of factors, some of which are intended by the peace operations, others not. Therefore, this is not about saying 'the problem is complex' in a superficial manner or attaching a label to peace operations to describe how complicated their planning, implementation and management might be. Peace operations always have been and always will be difficult endeavours. Rather, it is about representing the peace operations realm as a complex system that has idiosyncratic behaviours, some of which are antithetical to understanding and observing through the exclusive application of simple logics and linear philosophies.

As de Coning suggests, "Peacekeeping operations and the conflict systems within which they operate are truly complex. It follows that planning something that is complex would require an approach that is quite different."[123] Consequently, it is important to understand what complexity theory adds and introduces to our understandings of peace operations. Firstly, complexity theory brings together into a holistic theoretical framework what are otherwise disparate theoretical vignettes. Therefore, complexity theory is not promoted here as a substitute for existing theories of peace operations and how they function, rather as an augmentation and supplement to extant analytical frameworks to plug the important gaps that they leave. However, for all that it simply reinforces in existing theories about peace operations, complexity theory also has novelty value. It offers new insights and perspectives on processes in peace operations environments that are simply deemed to be illogical or idiosyncratic when viewed through the prism of traditional social scientific theory.[124] In particular, complexity

theory adds value by providing an explanatory framework that: makes sense of non-linear dynamics and causal ambiguity; prioritises sensitivity to context and initial conditions; privileges a systemic perspective; encourages an inclusive and participatory approach; and promotes a learning-orientation for 'improving' rather than 'proving'. In these ways it offers genuine promise for overcoming the shortcomings associated with current thinking and practice regarding M&E. Furthermore, the complexity approach is not about providing 'solutions *for* problems', but 'approaches *to* problems'.

Based upon this proposition, it was demonstrated that the main claims and concepts of complexity theory map neatly to the challenges facing M&E in peace operations. It was therefore argued that these concepts could have important implications for the design of M&E that is tailored to these endeavours. In particular, it was argued that complexity-oriented-M&E has the potential to illuminate the dynamics of change in the context of peace operations. The paper proceeded to identify the main ramifications of complexity-oriented-M&E as an adjunct to – and means to overcome the deficiencies associated with – extant approaches. It highlighted important alterations to the purpose, scope, focus, methods and perception of M&E such that it can be more outcome and impact focused, flexible, multi-source, context-sensitive, systemic, inclusive and learning oriented.

If there is acknowledgement that peace operations environments behave akin to complex systems then the aim should be to work with those features and properties, rather than ignore, or worse reject, them in the way we engage them analytically. It is therefore important to recognise what this means for their planning, implementation and management. The latent unpredictability dictates that such complexity cannot be overcome or solved. Rather, it must be revealed and attempts made to manage it. As Clement and Smith explain, "In a complex environment predictability is low, unintended consequences are many, and effectively organizing and managing resources becomes both more daunting and more essential."[125] One of the foremost tools at the disposal of peace operations for guiding the employment of scarce resources is M&E. It seems logical that attempts to assess progress in these settings should countenance and reflect that complexity. Whilst this realisation seems straightforward, unlocking the potential benefits of applying complexity concepts in M&E will not only require a change in what is done, but a substantive change and focus on how it is done.

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[1] "United Nations Peacekeeping Operations: Principles and Guidelines," ed. Peacekeeping Best Practive Section (New York; UN, 2008) 8, 18, 66; Robert Egnell, *Complex Peace Operations and Civil-Military Relations: Winning the Peace*, Cass Military Studies (Routledge, 2009); Kristine St-Pierre, *Then and Now: Understanding the Spectrum of Complex Peace Operations* (Ottawa: Pearson Peacekeeping Centre, 2008).

[2] Cedric de Coning, "Planning for Success," in *Managing Complexity: Political and Managerial Challenges in United Nations Peace Operations*, ed. Caty Clement and Adam C. Smith (New York: International Peace Institute, 2009), 24-25; Cedric de Coning and Paul Romita, "Monitoring and Evaluation of Peace Operations," (New York, Oslo; International Peace Institute & Norwegian Institute of International Affairs, November 2009) 4-6.

[3] See, for example: Norbert Wiener, *Cybernetics* (Cambridge, MA: MIT Press, 1948); Ludwig von Bertalanffy, *General System Theory: Foundations, Development, Applications* (New York: George Braziller, 1968); Gregoire Nicolis and Ilya Prigogine, *Exploring Complexity* (New York: Freeman and Co, 1989).
[4] Melanie Mitchell, *Complexity: A Guided Tour* (Oxford: Oxford University Press, 2011); Neil Johnson, *Simply Complexity: A Clear Guide to Complexity Theory* (Oneworld, 2009).
[5] For further explanation of differences between simple, complicated, complex (and chaotic) systems, see: R. Ackoff, *Redesigning the Future: A Systems Approach to Societal Problems* (New York: John Wiley and Sons, 1974); D. Snowden, "Cynefin: A Sense of Time and Space, the Social Ecology of Knowledge Management," in *Knowledge Horizons: The Present and the Promise of Knowledge Management*, ed. C. Despres and D. Chauvel (Oxford: Butterworth-Heinemann, 2000).
[6] Frances Westley, Brenda Zimmerman, and Michael Q. Patton, *Getting to Maybe: How the World Is Changed?* (Canada: Random House, 2006), 9.
[7] Peter Allen, "What Is Complexity Science? Knowledge of the Limits of Knowledge," *Emergence: Complexity & Organization* 3, no. 1 (2001): 27-29, 36-39.
[8] P. Coveney and R. Highfield, *Frontiers of Complexity: The Search for Order in a Chaotic World* (London: Faber & Faber, 1996), 5-10.
[9] Robert Jervis, *System Effects: Complexity in Political and Social Science* (Princeton, New Jersey: Princeton University Press, 1997), 12-13.
[10] The following features and properties are a synthesised list drawing on numerous attempts across different disciplines to summarise the core characteristics of complex systems. See, *inter alia*: D. Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," in *Working Paper* (Bradford: Department of Peace Studies, University of Bradford, 2009), 6-7; B. Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts " in *Working Paper 285* (London: Overseas Development Institute, 2008); Eve Mitleton-Kelly, "Ten Principles of Complexity and Enabling Infrastructures," in *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations*, ed. Eve Mitleton-Kelly (Oxford: Elsevier, 2003).
[11] P. H. Longstaff, "Security, Resilience, and Communication in Unpredictable Environments Such as Terrorism, Natural Disasters and Complex Technology," (Harvard University Program on Information Resources Policy, 2005), 88.
[12] Connectivity is defined by tight and loose 'coupling' – i.e. degree of 'epistatic interaction'
[13] Russ Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems* (Thousand Oaks: Sage, 1999), 74-79.
[14] Jervis, *System Effects: Complexity in Political and Social Science*, 125.
[15] Glenda H. Eoyang, "A Brief Introduction to Complexity in Organizations," (Circle Pines, MN: Chaos Limited, Inc., 1996), 5; S. Kauffman, *At Home in the Universe: The Search for Laws of Complexity* (Oxford: Oxford University Press, 1996), 21.
[16] F. Heylighen, *The Science of Self-Organization and Adaptivity* (Brussels, Belgium: Center Leo Apostel, Free University of Brussels, 2001); Jervis, *System Effects: Complexity in Political and Social Science*, 125.
[17] Eoyang, "A Brief Introduction to Complexity in Organizations," 5.
[18] D. Byrne, *Complexity Theory and the Social Sciences: An Introduction* (London: Routledge, 1998), 172.
[19] Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts ", 17.
[20] J. McGlade and E. Garnsey, "The Nature of Complexity," in *Complexity and Co-Evolution: Continuity and Change in Socio-Economic Systems*, ed. E. Garnsey and J. McGlade (Cheltenham, UK: Edward Elgar, 2006), 5; Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems*, 29-32.
[21] S. Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities and Software* (New York: Penguin Books, 2001), 11-17.
[22] Reuben Ablowitz, "The Theory of Emergence," *Philosophy of Science* January(1939): 2-3.
[23] Westley, Zimmerman, and Patton, *Getting to Maybe: How the World Is Changed?*
[24] R. Stacey, *Complexity and Creativity in Organisations* (San Francisco: Berrett-Koehler Publishers, 1996), 23-28.
[25] To emphasise the point, Ulam compared the prevailing view of nonlinear systems to the idea of 'non-elephant animals at the zoo'. Ulam cited D. Campbell et al., "Experimental Mathematics: The Role of Computation in Nonlinear Science," *Communications of the Association for Computing Machinery* 28, no. 4 (1985).
[26] S. Rihani, *Complex Systems Theory and Development Practice* (London: Zed Books, 2002), 3.
[27] Longstaff, "Security, Resilience, and Communication in Unpredictable Environments Such as Terrorism, Natural Disasters and Complex Technology," 88.
[28] Stacey, *Complexity and Creativity in Organisations*, 65; Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems*, 41.
[29] McGlade and Garnsey, "The Nature of Complexity," 5.
[30] See, for example: Edward N. Lorenz, "Deterministic Nonperiodic Flow," *Journal of the Atmospheric Sciences* 20, no. 2 (1963); Edward N. Lorenz, "Predictability: Does the Flap of a Butterfly's Wings in Brazil Set Off a Tornado in Texas?," in *Amercian Association for the Advancement of Science, 139th Meeting* (Sheraton Park Hotel,1972).
[31] Rihani, *Complex Systems Theory and Development Practice*, 8.

[32] Glenda H. Eoyang, "The Practitioner's Landscape," *Emergence: Complexity & Organization* 6, no. 1-2 (2004): 58.
[33] A 'Periodic Attractor' is where a system moves through its phase space repeatedly and periodically (e.g. un-dampened pendulum), whilst a 'fixed point attractor' is a system phase space where the system behaviour tends towards a single centre of gravity (e.g. dampened pendulum).
[34] The 'edge of chaos' is a systemic state that occurs between two extreme states where a system's equilibrium is never fixed, nor disintegrated entirely - also referred to as the 'Chaotic', 'Butterfly' or 'Lorenz' attractor.
[35] Coveney and Highfield, *Frontiers of Complexity: The Search for Order in a Chaotic World*, 232.
[36] K. Dooley, "A Nominal Definition of Complex Adaptive Systems," *The Chaos Network* 8, no. 1 (1996).
[37] Mitleton-Kelly, "Ten Principles of Complexity and Enabling Infrastructures," 1, 7.
[38] Heylighen, *The Science of Self-Organization and Adaptivity*, 4-5.
[39] Frans M. van Eijnatten, "Chaordic Systems Thinking: Some Suggestions for a Complexity Framework to Inform a Learning Organization," *The Learning Organization* 11, no. 6 (2004).
[40] E. Garnsey and J. McGlade, eds., *Complexity and Co-Evolution: Continuity and Change in Socio-Economic Systems* (Cheltenham, UK: Edward Elgar, 2006), 3-4.
[41] Mitleton-Kelly, "Ten Principles of Complexity and Enabling Infrastructures," 26.
[42] Mitchell, *Complexity: A Guided Tour*, 13.
[43] See: Byrne, *Complexity Theory and the Social Sciences: An Introduction*.
[44] For example, realism and liberalism, that have implicitly grown out of linear paradigms borrowed from Newtonian science although it has been argued that the linear paradigm emerged from ideas of Hobbes, Descartes and Locke – see: Rihani, *Complex Systems Theory and Development Practice*, 3. When the study of complexity is applied to human systems, it is often assumed to imply constructivist perspectives. This confusion is easy to understand because both complexity and constructivism share some basic principles, including emergence, high levels of interdependence in a system, unreliable causality and continuing transformation over time. Indeed, these common principles result in overlapping practices between the two perspectives. G. Eoyang and T. H. Berkas, *Evaluating Performance in a Complex Adaptive System* (Chaos Limited / Search Institute, 1998), 2-3.
[45] See, for example: Jervis, *System Effects: Complexity in Political and Social Science*; N. E. Harrison, ed. *Complexity in World Politics, Concepts and Methods of a New Paradigm* (Albany: State University of New York,2006); Emilian Kavalski, "The Fifth Debate and the Emergence of Complex International Relations Theory: Notes on the Application of Complexity Theory to the Study of International Life," *Cambridge Review of International Affairs* 20, no. 3 (2007); Antoine Bousquet and Simon Curtis, "Beyond Models and Metaphors: Complexity Theory, Systems Thinking and International Relations," *Cambridge Review of International Affairs* 24, no. 1 (2011); Robert Geyer and Steve Pickering, "Applying the Tools of Complexity to the International Realm: From Fitness Landscapes to Complexity Cascades," *Cambridge Review of International Affairs* 24, no. 1 (2011); J. Urry, *Global Complexity* (Cambridge: Polity Press, 2003).
[46] See, for example: Rihani, *Complex Systems Theory and Development Practice*; Ben Ramalingam, *Aid on the Edge of Chaos: Rethinking International Cooperation in a Complex World* (New York: Oxford University Press, 2013); Robert Chambers, *Whose Reality Counts? Putting the First Last* (s.l.: Stylus Publishers Llc, 1997); Alan Fowler, "Complexity Thinking and Social Development, Connecting the Dots," *The Broker*, no. 7 (2008); Mark Cabaj, *Understanding Poverty as a Complex Issue and Why That Matters* (Ottawa, Ontario: Caledon Institute for Social Policy, 2009).
[47] See, for example: Lawrence E. Blume and Steven N. Durlauf, eds., *The Economy as an Evolving Complex System, III: Current Perspectives and Future Directions*, Santa Fe Institute Studies on the Sciences of Complexity (Oxford: Oxford University Press, 2005); R. H. Day, *Complex Economic Dynamics: An Introduction to Dynamical Systems and Market Mechanisms* (Cambridge, MA: MIT Press, 1994); W.B. Arthur, "Complexity and the Economy," *Science* 284(1999); P. Krugman, "What Economists Can Learn from Evolutionary Theorists," in *European Association for Evolutionary Political Economy* (1996); P. Ormerod, *Butterfly Economics: A New General Theory of Social and Economic Behaviour* (London: Faber and Faber, 1998); Erik Beinhocker, *The Origin of Wealth: Evolution, Complexity and the Radical Remaking of Economics* (Harvard Business School Press, 2007).
[48] See, for example: Peter Senge, Charlotte Roberts, and Bryan J. Smith, *The Fifth Discipline: The Art and Practice of the Learning Organization* (Bantam Dell, 1990); Eve Mitleton-Kelly, ed. *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations* (Oxford: Elsevier, 2003); R. D. Stacey, *Strategic Management and Organisational Dynamics: The Challenge of Complexity to Ways of Thinking About Organisations* (New York: Prentice Hall, 2007).
[49] Sylvia Walby, "Complexity Theory, Systems Theory and Multiple Intersecting Social Inequalities," *Philosophy of the Social Sciences* 37, no. 4 (2007); R. Mayntz, "Chaos in Society: Reflections on the Impact of Chaos Theory on Sociology," in *The Impact of Chaos on Science and Society*, ed. C. Grebogi and J. A. Yorke (Tokyo: United Nations University Press, 1997).
[50] John A. Smith and Chris Jenks, *Qualitative Complexity: Ecology, Cognitive Processes and the Re-Emergence of Structures in Post-Humanist Social Theory* (New York: Routledge, 2006).
[51] R. Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984); Niklas Luhmann, *Social Systems* (Stanford: Stanford University Press, 1995).
[52] Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 17-21.
[53] Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 20. However, Mitleton-Kelly states that we mustn't be afraid to move beyond metaphor in applying Complexity to the social

world as human communities are complex evolving systems in their own right. See: Mitleton-Kelly, "Ten Principles of Complexity and Enabling Infrastructures," 4.

[54] Ben Ramalingam, "Aid on the Edge of Chaos: Exploring Complexity Sciences in International Development and Humanitarian Work" (paper presented at the LSE Complexity Research Programme, Events 2010, London, 22 April 2010).

[55] O. Sorenson, "'Book Review' of Eve, R., Horsfall, S. And Lee, M. 'Emergence'," *Chaos, Complexity and Sociology* 1, no. 149-151 (1999); Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts ", 7; J. Paley, "Complex Adaptive Systems and Nursing," *Nursing Inquiry* 14, no. 3 (2007): 234.

[56] Ben Ramalingam, "Evaluation and the Science of Complexity," in *International Conference on Evaluating the Complex* (Oslo, Norway: Norwegian Agency for Development Cooperation (NORAD), 2008), 78.

[57] Ramalingam, "Evaluation and the Science of Complexity," 78.

[58] Notable exceptions all emanating in the last decade, include: Walter C. Clemens Jr., "Complexity Theory as a Tool for Understanding and Coping with Ethnic Conflict and Development Issues in Post-Soviet Eurasia." *International Journal of Peace Studies* 6, no. 2 (2011); D. Körppen, N. Ropers, and Hans J. Gießmann, eds., *The Non-Linearity of Peace Processes: Theory and Practice of Systemic Conflict Transformation* (Opladen/Farmington Hills: Barbara Budrich Verlag,2011); Wendell. Jones, "Complexity, Conflict Resolution, and How the Mind Works," *Conflict Resolution Quarterly* 20, no. 4 (2003); Peter T. Coleman, "Conflict, Complexity, and Change: A Meta-Framework for Addressing Protracted, Intractable Conflict - III," *Journal of Peace Psychology* 12, no. 4 (2006); P. T. Coleman et al., "Protracted Conflicts as Dynamical Systems: Guidelines and Methods for Intervention," in *The Negotiator's Fieldbook*, ed. A. Schneider and C. Honeyman (Chicago: American Bar Association, 2006); G. Eoyang and Lois Yellowthunder, "Complexity Models and Conflict: A Case Study from Kosovo," in *Conference on Conflict and Complexity* (University of Kent, Canterbury: Conflict Research Society and Conflict Analysis Research Centre, 2008); Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications."

[59] For recent examples that touch on this, see: S.P. Campbell, "(Dis)Integration, Incoherence and Complexity in UN Post-Conflict Interventions," *International Peacekeeping* 15, no. 4 (2008); de Coning, "Planning for Success."; Clement and Smith, "Managing Complexity: Political and Managerial Challenges in United Nations Peace Operations."

[60] By 'peace operations environment', I mean systemic context within which peace operations exist and function.

[61] Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts ", 12.

[62] C. H. de Coning, "Coherence and Coordination in United Nations Peacebuilding and Integrated Missions: A Norwegian Perspective," (Oslo: Norwegian Institute of International Affairs, 2007), 14; Chiyuki Aoi, Cedric de Coning, and Ramesh Thakur, "Unintended Consequences, Complex Peace Operations and Peacebuilding Systems," in *Unintended Consequences of Peacekeeping Operations*, ed. Chiyuki Aoi, Cedric de Coning, and Ramesh Thakur (Tokyo: United Nations University Press, 2007), 5; de Coning, "Planning for Success," 26-27.

[63] Mitleton-Kelly, "Ten Principles of Complexity and Enabling Infrastructures," 16.

[64] C. Hunt, "Public Information as a Mission Critical Component of West African Peace Operations," in *KAIPTC Monograph No. 5* (Accra, Ghana / New York: Kofi Annan International Peacekeeping Training Centre / United Nations Peacekeeping Best Practices Section, 2006).

[65] Others have labelled this uncertainty in terms of 'peacekeeping ambiguity'. See, for example: Michael Lipson, "Performance under Ambiguity: International Organization Performance in UN Peacekeeping." *The Review of International Organizations* 5, no. 3 (2010).

[66] Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems*, 29-32.

[67] See, for example: Kathleen Jennings and Anja Kaspersen, "Introduction: Integration Revisited." *International Peacekeeping* 15, no. 4 (2008).

[68] Campbell, "(Dis)Integration, Incoherence and Complexity in UN Post-Conflict Interventions."

[69] Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 55.

[70] See, for example: Oliver Wils et al., *The Systemic Approach to Conflict Transformation Concept and Fields of Application* (Berghof Foundation for Peace Support, 2006), 35-36; Coleman et al., "Intractable Conflict as an Attractor: Presenting a Dynamical Model of Conflict, Escalation, and Intractability," 341-43; Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 24-31.

[71] See for example: Clement and Smith, "Managing Complexity: Political and Managerial Challenges in United Nations Peace Operations."; de Coning, "Planning for Success," 24; + Cedric thesis

[72] This reality has become more pertinent as these operations have increasingly engaged in early peacebuilding efforts, regularly engaging in institutional change in support of social transformation. See: Menkhaus, "State Fragility as a Wicked Problem," 85-98.

[73] See for example: Paul Diehl and Daniel Druckman, *Evaluating Peace Operations* (Boulder; Lynne Rienner, 2010)

[74] Interview: Office of Operations Official, UN DPKO – New York, February 2009

[75] "Exit Strategies and Peace Consolidation in State-Building Operations," In *Report on Wilton Park Conference 965* (CIS; University of Oxford, 2009), 4.

[76] Longstaff, "Security, Resilience, and Communication in Unpredictable Environments Such as Terrorism, Natural Disasters and Complex Technology," 88.

[77] Commonly cited examples are: incentivising and/or contributing to corruption and organised criminality such as trafficking in people, arms and drugs; producing distortions of the host country economy and labour markets; and, peacekeepers have at times perpetrated sexual gender-based violence as well as contributed to the transmission of HIV/Aids. See: Aoi, de Coning, and Thakur, "Unintended Consequences, Complex Peace Operations and Peacebuilding Systems."

[78] The likely existence of exogenous factors and the impact of unintended consequences further violate the principle of *ceteris paribus*.

[79] Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation," 124.

[80] Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 14.

[81] See section on 'Context-(In)Sensitivity' below.

[82] Schumacher, "What to Measure in Peace Operations," *The Pearson Papers* 10, no. 1 (2007), 45; Downs and Stedman, "Evaluation Issues in Peace Implementation," In *Ending Civil Wars: The Implementation of Peace Agreements,* ed. Stedman, Rothchild, & Cousens. (Boulder; Lynne Rienner, 2002), 43.

[83] See, for example: Michael Barnett, "Illiberal Peacebuilding and Liberal States," in *Roundtable on Humanitarian Action* (Social Science Research Council, 2005).

[84] Jervis, *System Effects: Complexity in Political and Social Science*, 35.

[85] William J. Durch and Madeline L. England, "The Purposes of Peace Operations," in *Annual Review of Global Peace Operations 2009* (New York: Centre on International Cooperation, 2009).

[86] See, for example: Roland Paris, "Peacekeeping and the Constraints of Global Culture," *European Journal of International Relations* 9, no. 3 (2003); Séverine Autesserre, *The Trouble with the Congo: Local Violence and the Failure of International Peacebuilding*, Cambridge Studies in International Relations (Cambridge: Cambridge University Press, 2010).

[87] McGlade, "Ecohistorical Regimes and La Longue Duree: An Approach to Mapping Long-Term Societal Change," In *Complexity and Co-Evolution: Continuity and Change in Socio Economic Systems,* ed. Garnsey & McGlade (Cheltenham, UK; Edward Elgar, 2006), 82-83.

[88] Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts ", 44.

[89] That is, tightly coupled or intimately interacting.

[90] That is, human agents: sense and react to their environment in different ways; process information; make decisions; take actions; have diverse goals; react and adapt to the system; self-organise with each other. Adaptive agents bring perception, reflection and conscious action into the complexity science lens.

[91] Marion, *The Edge of Organization: Chaos and Complexity Theories of Formal Social Systems*, 173-76.

[92] Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation," 138.

[93] See, for example: Bob Williams and Iraj Imam, eds., *Systems Concepts in Evaluation – an Expert Anthology*, Aea Monograph (Point Reyes, CA: EdgePress / American Evaluation Association,2006); R. Schwartz, K. Forss, and M. Marra, eds., *Evaluating the Complex* (New Brunswick, USA: Transaction Publishers, 2011); Marian Barnes, Elizabeth Matka, and Helen Sullivan, "Evidence, Understanding and Complexity," *Evaluation* 9, no. 3 (2003); Eoyang and Berkas, *Evaluating Performance in a Complex Adaptive System*.

[94] See, for example: Michael Quinn Patton, *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use* (Guilford Press, 2010); Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation." See also: real-time evaluation; emergent evaluation; action evaluation; and, adaptive evaluation in Michael Quinn Patton, "Evaluating the Complex: Getting to Maybe," in *International Conference on Evaluating the Complex* (Oslo, Norway: Norwegian Agency for Development Cooperation ((NORAD), 2008), 102.

[95] Eoyang and Berkas, *Evaluating Performance in a Complex Adaptive System*, 2. See also: P. Rogers, "Implications of Complicated and Complex Characteristics for Key Tasks in Evaluation," in *Evaluating the Complex*, ed. R. Schwartz, K. Forss, and M. Marra (New Brunswick, USA: Transaction Publishers, 2011); I. Guijt, *Seeking Surprise. Rethinking Monitoring for Collective Learning in Rural Resource Management* (Wageningen, The Netherlands: Wageningen University Press, 2008); Gerald Midgley, "Systems Thinking for Evaluation," in *Systems Concepts in Evaluation – an Expert Anthology*, ed. Bob Williams and Iraj Imam (Point Reyes, CA: EdgePress / American Evaluation Association, 2006); J.A. Morell, *Evaluation in the Face of Uncertainty: Anticipating Surprise and Responding to the Inevitable* (New York: Guilford Press, 2010); Bob Williams and Richard Hummelbrunner, *Systems Concepts in Action: A Practitioners Toolkit* (Stanford, CA: Stanford University Press, 2011).

[96] Eoyang and Berkas, *Evaluating Performance in a Complex Adaptive System*, 9.

[97] Otto Hospes, "Evaluation Evolution?," *The Broker*, no. 8 (2008): 24.

[98] Ray Pawson, "Nothing as Practical as a Good Theory," *Evaluation* 9, no. 4 (2003): 472.

[99] Rogers, "Implications of Complicated and Complex Characteristics for Key Tasks in Evaluation."

[100] List from: Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation," 126.

[101] Patton, "Evaluating the Complex: Getting to Maybe."; Westley, Zimmerman, and Patton, *Getting to Maybe: How the World Is Changed?*

[102] Rogers, "Implications of Complicated and Complex Characteristics for Key Tasks in Evaluation."; Rogers, "Matching Impact Evaluation Design to the Nature of the Intervention and the Purpose of the Evaluation."

[103] Albeit with some motivation to render 'best practices' for the subsequent application across temporal and spatial difference

[104] Peter Woodrow and Diana Chigas, "Connecting the Dots: Evaluating Whether and How Programmes Address Conflict Systems," in *The Non-Linearity of Peace Processes: Theory and Practice of Systemic Conflict Transformation,* ed. D Korppen, N. Ropers, and Hans J. Giebmann (Opladen/Farmington Hills: Barbara Budrich Verlag, 2011), 210-11; Midgley, "Systems Thinking for Evaluation," 18-19.

[105] Patton, "Evaluating the Complex: Getting to Maybe," 71; Fowler, "Complexity Thinking and Social Development, Connecting the Dots," 12; PANOS, "How Can Complexity Theory Contribute to More Effective Development and Aid Evaluation?," (London; PANOS, 2009), 4.

[106] Patton, "Evaluating the Complex: Getting to Maybe," 113.

[107] Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation," 127-28.

[108] Paul Cilliers, "Complexity, Deconstruction and Relativism," *Theory, Culture & Society* 22, no. 5 (2005): 257.

[109] Patton, *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*, 151.

[110] Eoyang, "Human Systems Dynamics: Complexity-Based Approach to a Complex Evaluation," 126; Patton, *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*, 126-31, 50.

[111] Jonathan A. Morell, *Evaluation in the Face of Uncertainty: Anticipating Surprise and Responding to the Inevitable* (New York: Guilford Press, 2010); Guijt, *Seeking Surprise. Rethinking Monitoring for Collective Learning in Rural Resource Management*.

[112] Woodrow and Chigas, "Connecting the Dots: Evaluating Whether and How Programmes Address Conflict Systems," 226.

[113] Eoyang and Berkas, *Evaluating Performance in a Complex Adaptive System*, 3; Gürkaynak, Dayton, and Paffenholz, "Evaluation in Conflict Resolution and Peacebuilding," 290-93.

[114] Patton, *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*, 132, 150-51.

[115] Eoyang and Berkas, *Evaluating Performance in a Complex Adaptive System*, 1.

[116] Patton, *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*, 131-33.

[117] Ramalingam, "Evaluation and the Science of Complexity," 67-68.

[118] Iraj Imam, Amy LaGoy, and Bob Williams, "Now What? How to Promote Systems Concepts in Evaluation," in *Systems Concepts in Evaluation – an Expert Anthology*, ed. Bob Williams and Iraj Imam (Point Reyes, CA: EdgePress / American Evaluation Association, 2006), 212.

[119] Woodrow and Chigas, "Connecting the Dots: Evaluating Whether and How Programmes Address Conflict Systems," 226.

[120] Hendrick, "Complexity Theory and Conflict Transformation: An Exploration of Potential and Implications," 72.

[121] Boyd et al., "Systemic Evaluation: A Participative, Multi-Method Approach," 1306.

[122] Treat 'fixing a mess' by identifying/isolating a 'problem' then attempting to solve it as if it were a 'puzzle' – i.e. as reasonably predictable activity that responds to universally applicable 'laws'. See: Ackoff, *Redesigning the Future: A Systems Approach to Societal Problems*; Ramalingam, "Exploring the Science of Complexity Ideas and Implications for Development and Humanitarian Efforts ", 11.

[123] de Coning, "Planning for Success," 25.

[124] Virginia Lacayo, "What Complexity Science Teaches Us About Social Change," in *MAZI Articles* (South Orange, NJ: Communication For Social Change Consortium, 2007).

[125] Clement and Smith, "Managing Complexity: Political and Managerial Challenges in United Nations Peace Operations," 2.