Understanding the Dynamics of System-of-Systems in Complex
Regional Conflicts

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Abstract

The notion of complex regional conflicts are explored from the point of view of complexity theory. Complexity reflected in conflicts relates to a strong resistancy to any kind of resolutions and presents socially, economically and politically sophisticated issues to be dealt with. Although the innate nature of the complexity in conflicts has been acknowledged, existing methodologies do not directly embrace the SoS concept to address the dynamics of the inter-connectedness in complex conflicts. The purpose of the study is to recognize the importance of integrative methodologies which could be crucial in achieving sustainable outcomes leading to imperative security in regions. Furthermore, management of complex emergent system behaviour as well as complexity needs to be of a supplement to SoS.

Keywords: System of Systems (SoS); Complex Regional Conflicts; Complexity Management; Emergent System Behaviour

1. Introduction

The purpose of this paper is to examine regional conflicts from the standpoint of complexity theory and to identify if there are any lessons that could be learned by including processes used by complexity theory and SoS methodologies. A previous paper [1] on similar topic by Rapaport et al also addressed this issue, where it predominantly emphasized complexities around international negotiations and the importance of behavioural leadership during negotiations; however this paper examines different aspects, including a potential solution process.

It is worth noting that core aspects of SoS are autonomy, belonging, diversity, connectivity and emergence as reported [23,24], which can be applicable to complex regional conflicts in a sense that the very nature of the clash between two disparate and warring cultures can be considered as autonomous and independent systems, and by
applying the SoS components, we are driving these independent systems to ‘belong and be connected’ to each other, which ultimately may contribute substantially to more efficient peace processes.

According to Stern and Druckman, international conflict mainly refers to violent clashes of nation states, with at least one state fighting outside its borders. However, the post-Cold War era and its global socio-economic and political consequences have gradually transformed the notion of the international conflict to include traits of threat to international peace and security, even though there is no evident and direct violence between the two states. It has been highlighted, that though, the conflict emerges within the borders of a particular country, yet violation of concerted international actions shift the notion of the conflict into a regional and consequently international dimension [2].

Brown comments that the main features of complexity are associated with high levels of uncertainty with respect to a broad diversity of views’ of various stakeholders [3, 4]. Complexity’s structure relates to non-linearity, interconnectedness and interdependency of different parts within the environment [5]. Although some studies put an argument forth of adopting a more reductionist approach to solving complex problems, nonetheless, by implication, the complexity theorem withstands and has a strong argument that the system should be looked at as a whole and not as separate parts [5].

2. Complexity within Regional Conflicts

Vayrynen states that the nature of regional conflicts is so complex and intertwined that they cannot be subordinated or split into minor conflicts [6]. Complex conflicts can be referred to as wicked problems and are characterized as being highly resistant to resolutions and are socially, economically and politically sophisticated issues to be dealt with [3]. Their main characteristics are associated with high levels of uncertainty as to the agreeable outcomes due to diversity of stakeholders’ views, and due to the interconnection of issues, which often leads them to political gridlock rather than to political resolution [4].

Moreover, regional complex conflicts result in lack of uniformity on an intra-regional level and are the products of dominant relationship between global systems and regional subsystems [6]. As a consequence, there are strong linkages between global systems and regional subsystems, where the dominance of the global system puts constraints on alternatives that the regional subsystems may have with regards to their unequal positions in the global hierarchy [6].

Further, complex regional conflicts evolve from the environment with socio-economic, political and military tensions/unrest [7], where state neighbours are prone to power regimes, territorial ambitions, disputes over natural resources, national identity, religious affiliations and more. This clearly constitutes to irreversible consequences related to prolonged civil wars encompassing armed conflicts, high levels of terrorism, violations of human rights, ethnic conflicts and overall socio-economic and political instability [8]. The complexity involved in regional conflicts has had an adverse impact beyond the concerned parties of the conflict, since there is a gradual (malicious) expansion of the conflict to other regions ultimately reaching global dimension. Hence, there is an evident correlation between characteristics of multidimensionality, chaos [9] and high levels of unpredictability, which positions regional conflicts under complex systems and non-traditional project management [10].

For instance, according to the Reut Institute, due to regional and emerging global trends, Israel faces uncertainties and political tensions with respect to relationships, with so far the most stable strategic allies, such as Egypt, Jordan and Turkey. In addition, complexities around the conflict refer to conflict-ridden opinions among Jewish communities around the world and Israelis themselves with respect to the establishment of the Palestinian state. Moreover, among many other examples, ethnic tensions between the Government of Israel, Arab citizens of Israel and Bedouins pose further clashes and contribute to lack of unity among communities and promote further uncertainty in the region [11].
Further, recognition of the fact that politics and violence in various regions across the world are highly interconnected and intertwined, demonstrates multidimensional relationship between these two issues and acknowledges complexity. This connection has been clearly seen in complex regional conflicts such as ‘West Africa’, ‘Central Asia’ and ‘the Great Lakes region’, ‘the Balkans and Central Asia’ [12]. According to Rubin, the complexities surrounding these conflicts are around the four ‘transnational networks’ [12]:

- ‘Military’;
- ‘Political’;
- ‘Economic’;
- ‘Social’.

Whereas, ‘military’ mainly refers to movement of weapons and mercenaries; ‘political’ accommodates political networking and relationships; ‘economic’ points out to cross border issues related to trade of illegal goods; and ‘social’ refers to issues of occupation, cross border migration and diaspora. As a consequence, the interconnectedness and relationship between these conflicts is so strong, that they cannot be reduced to single intra-state conflict [12].

It is important to note that the applicability of complexity and SoS into multilateral and bilateral negotiations, as well as international conflicts is a relatively new area of research, and some key figures comment that the approach has not been fully explored [25]. In this manner, the importance of the study is to explore inter-connectedness in complex regional conflicts and recognize integrative SoS methodologies with the particular emphasis on complex emergent system behavior, and complexity and their relations to complex regional conflicts.

3. Application of SoS methodologies to tackle complexity in conflicts

Given, the facts of inherent complexity found in regional conflicts, an examination of applied systems thinking and recognition of the importance of integrative SoS methodologies is crucial to this research. In this light, Jackson provides theoretical examination and offers a framework which classifies extremely complex systems into various subsystems with different levels of interaction. The structure of these systems evolves and changes over time due to frequent turbulences found within the environment [13]. Another significant factor of Jackson’s approach is recognition of three types of relationship of participants, such as ‘unitary’, ‘pluralist’ and ‘coercive’. While unitary relationships are based on common purposes and agreed objectives, pluralist and coercive relationships are in nature more conflict driven. Specifically, coercive relationships among participants claim to have few common interests, conflicting values and beliefs. Hence, decisions are made with little compromise and mainly based on power and command [13].

To elaborate further, the interaction on the political level in the organization causes tensions, leading to further conflicts when settling disputes [14]. In the context of complex regional conflicts, the increasing importance are coercive relationships where there are multiple parties and sides to the conflict, which often pursue their own self-seeking inclinations, disregarding cooperation, and ultimately leading to complex conflicts.

From the foregoing, Ulrich suggests the need for Critical System Heuristics (CSH), which allows inclusion of citizens who are affected by the problem, however unable to participate in discussions or debate during the process of decision making. CSH focuses on ‘purposeful’ systems and introduces the concept of ‘boundary’, which assists monitoring the process of the problem. In the context of complex regional conflicts an establishment of boundaries and systematic inclusion of affected citizens in the process of decision making and debate may significantly contribute to the problem solving [15].

On the other hand, Beer points out the need for ‘Team Syntegrity’, which mainly focuses on ‘setting up’ the field, with adequate procedures, which will enable participants to openly and in democratic way to participate in discussions and debate [16].
4. Emergent System Behaviour in Complex Regional Conflicts

The concept of emergence refers to behaviour of system as a whole rather than the behaviour of systems’ elements separately. The theory draws attention to the global as opposed to local system behaviour, where the term ‘Gestalt’ explains how various patterns of elements are unified in such way that they cannot be viewed as separate entities or be the parts of the sum, while emergence itself focuses on a dynamics paradigm which emerges over time. It could also be said that emergence and self-organization are closely related to each other, where in fact both definitions are quite distinct, nevertheless their features are interconnected and hence they can jointly co-habit or be recognised separately. Fundamentally, emergence transforms lower level inputs into higher level outputs. Further, one of the characteristics of emergent behaviour in complex systems is the notion of adaptive systems, which evolves from agents’ interaction on macro level [17].

Bar-Yam highlights that due to constantly changing and increased complexity in the environment together with humans’ inability to tackle problems in individual and simplistic systems, causes for SoSs to emerge. He extends his argument to military environment, by pointing out that an integration of existing systems with future SoS methodologies would be more effective in addressing complex problems of military nature [18]. Furthermore, Bar-Yam emphasizes emergence of ‘systems of social systems’, where the core activity for SoS in twenty first century is based on:

- ‘Addressing second order complex problems’;
- ‘Building connective infrastructure and seeding social evolution’;
- ‘Generating influence fields’.

Lichtenstein and Plowman point out that emergence occurs when participants from a lower level system interact, communicate and exchange information without the involvement of the central authority, which eventually leads to unplanned changes at higher levels of the organization. Emergence relates to specific behaviours and actions of participants in different levels within the organization. Furthermore, they point to the ‘leadership of emergence’, which is created out of the dynamics of emergence (and not directive management). Further, Lichtenstein and Plowman propose a conceptual framework for leadership to foster emergence. Firstly, it focuses on implementation of uncertainty which supposed to disrupt normative patterns within the system. Secondly, it encourages novelty, interaction and innovative experiments within the system. Thirdly, is based on ‘sensemaking’ and ‘sensegiving’ which relates to correlation through ‘language and symbols’, ‘recombined resources’, ‘leaders accept ‘tags’’ and finally it relates to integration of local constraints in the system. The framework, through four behaviour types, offers a new emergent order [19].

5. Systems Thinking Framework to International Disputes

To sum up, Ireland et al suggests a framework which highlights the dynamics of stakeholders’ interaction with various SoS elements within the system prior and throughout the decision making. Vernon emphasizes the bottom-up approach to problem solving, which also can be applicable to conflict resolution strategies when resolving complex regional conflicts [20]. In order to test the process in Fig 1, opinions of up to twenty international negotiators will be sought, as it appears difficult to examine otherwise, and propositions developed from the model in Fig 1 will be available to these international negotiators as well.
Figure 1: A systems thinking process to address protracted international disputes

6. Conclusions

The literature review prompts participants to understand complexity in all its facets and aspects embedded within the regional conflicts. Therefore, the advancement of complexity methodologies would meaningfully benefit parties and participants in regional disputes at all levels of emerging social systems/systems of systems. Hence conceptualization of the framework would serve as a linking point between SoS strategies and complex regional conflicts. In addition, there is a strong need for international community, which involved in decision making processes, to recognize the notion of complexity and the emergence of social systems, to acknowledge the fact that the world cannot be viewed in a fragmented manner. Following are the findings:

Recognition and acknowledgement by various stakeholders of the complexities, interdependencies and interconnectivities surrounding regional conflicts is important;

Recognition by the international community of new emerging systems, which require novel approaches to conflict resolution as the world constantly changes and is on the move;

Recognition of systems thinking methodologies such as CSH, and other aspects in the systems thinking process proposed in Figure 1, and emergent system behaviour within complex systems as it is within complex regional conflicts is necessary; CSH would allow expansion of existing boundaries and accommodation of viewpoints of those who are affected by the problem and external to the process of decision making [21];

Figure 1 needs to be tested;

Adoption of a complexity which offers direct approach and emphasizes the bottom-up approach to problem solving may have been neglected so far. In closing, complexity science emphasizes non-hierarchical, but self-organizational paradigm. A novel leadership framework is fundamentally based on adaptive capacities of leaders of being able to self-emerge, create and learn to achieve change [22].

We would like to thank two anonymous referees for their comments that led to improvements in the paper.
References

15. M. Jackson, Systems Thinking - Creative Holism for Managers, John Wiley and Sons, Chichester, UK, 2003, 229;