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A Preliminary Framework for Understanding Complexity Theory, and Parallels with C2.

C2 Concepts, Theory, and Policy

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Abstract

A set of four criteria defining a preliminary framework is proposed for classifying the elements of Complexity Theory. The framework resulted from an extensive literature review, analysis and synthesis (Couture, 2006abcd) that integrate the essential of recent works dedicated to this science.

Selected concepts, properties, mechanisms and phenomena related to Complex Adaptive Systems (CASs) are then overviewed using this framework. Challenging aspects of CASs are described, structured and interrelated in ways that ease the building of integrated pictures. The conclusions of a 3-day workshop aiming at validating the elements of this framework are also summarized.

Such holistic approaches, methodologies and framework are promising for current processes and systems that are related to military materiel and operations. They complement the traditional reductionist approaches by considering the whole as being “greater” than the linear sum of its parts. They also ease the discovery of conditions, mechanisms and behaviour patterns that give military systems more opportunities for finding solutions to complex problems and situations. Such optimized systems that operate in hostile complex environments and contexts self-organize and self-adapt more easily, and become more resilient in case of unforeseen attacks.

Structured Enumeration of Ideas to be Discussed in this Paper

1 Introduction

- Intro – Brief introduction on our complex world, complexity theory, complex adaptive systems (CAS) and the approach used at the Santa Fe Institute.
- Problematic – There is a huge amount of scientific papers on Complexity Theory and CASs. Building an integrated picture of understanding is not easy. There is a need for a structured description that takes into account important concepts, properties, mechanisms and complex phenomena and that establishes interrelationships between them while making parallels with military operations and systems.
- This work makes use of extensive literature review, analysis and synthesis (Couture, 2006abcd).

2 A Framework for Grouping the Elements of Complexity Theory

- Solution – The proposed framework (description, justification, how, when, where, and by whom it should be used).
- Presentation of conclusions of the Complexity Tutorial/Workshop 2006 to be held on December 2006 at DRDC Valcartier. This event aims among other things at validating some elements of the proposed framework.

3 An Overview of Selected Elements of Complexity Theory, and Parallels with C2

- Application – Description of selected elements of Complexity Theory (and interrelationships between them) using the proposed framework.
- Parallels with military systems and operations (how to improve the understanding of complexity aspects).

4 Conclusion

- Direct and indirect advantages of this framework.
- Future work (expanding the framework).

References

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