



A Q-Methodology Study Evaluating the Emergence of Complex Adaptive Systems in Organizations

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Abstract

The purpose of this study was to explore whether conditions within military organizations create a level of adaptive tension that leads to self-organization and the emergence of complex adaptive systems (CAS). The study's findings suggest that there is a considerable amount of tension between the requirements and acquisition systems.

Problem

- Incongruence between the Services' requirements and acquisition organizations may lead to tensions that result in the formation of informal CAS structures that operate outside the bounds of DoD statutes and regulations.
- Poor integration creates **stovepipe systems** that can be incapable of functioning in an integrated manner.
- The tension resulting from the clash of stovepipe systems may be one cause of **emergence of a new adaptive structure**.

Purpose

The purpose of this mixed methods study was to explore whether different boundary and initial conditions within each Service creates adaptive tension that leads to self-organization and the emergence of a CAS at the junction of the two of the DoD's systems.

Because empirical methods to test for the existence of a CAS were not found during the literature review, this study attempted to fill that gap using measures of workforce perceptions to search for commonality of experiences within and across the DAS and JCIDS organizations. Q Methodology uses quantitative techniques to test for common points of view among subjects.

Relevant Literature

CAS theory has a foundation that can be traced back to general systems theory, through complexity and chaos theories, as well as cybernetics.

- CAS derives from the natural sciences and is a way of attempting to find and apply simple rules, though nonlinear and dynamic, which is capable of explaining complex systems. However, there are epistemological and ontological disagreements over the nature of organizations and whether they can, or should, be modeled descriptively, prescriptively, or normatively.
- Because of the relative recent emergence of CAS theory, and the nature of complex systems, little empirical evidence exists that the rules found in nature apply to human social systems. Despite multiple attempts at modeling organizations, a sound methodology inclusive of both quantitative and qualitative measures does not appear to have been developed. The vast majority of the literature on complex adaptive systems is theoretical rather than empirical research.

Research Questions

RQ1 - How do the Marine Corps and Army acquisitions and requirements workforce perceive the nature of their integrated systems?

RQ2 - How do perceptions regarding the emergence of complex adaptive systems, where the requirements and acquisitions systems integrate, differ between employees of the DAS and JCIDS organizations in each Service?

RQ3 - How do perceptions regarding the emergence of complex adaptive systems differ between Services with different organizational structures?

Procedures

Design

- An exploratory, embedded case study

Sample

- In Q-Methodology, the sample is the statements to be sorted. 48 statements were sorted by 12 volunteers from three organizations.

Q-Methodology

- Each Service's respondents were asked to perform a sort of the sample statements derived from the topics of organizational emergence, CAS theory, and cross-boundary integration.
- Each Service's set of survey respondents were analyzed as its own case, and then cases were combined to provide different views of requirements and acquisition integration in the DoD.

Data Analysis

Analysis of the respondents' Q Sorts using the PQMethod software resulted in the correlation of the Q Sorts with each other, the identification of significant factors via principal components analysis, and a varimax rotation of those factors to understand which clusters of statements reflected trends in perceptions.

Findings

Analysis of the Q Sorts revealed six perspectives operant within individual organizations; **Complexity Induced Tension, Tension Induced Stability, Complexity Induced Paralysis, Tension Induced Self-Organization, Synergistic Self-Organization, and Complex Adaptive Emergence**.

The only combined system-level analysis concerned Army and Marine Corps requirements, and produced one perspective shared by members of both organizations - **Complex Stability without Emergence**.

One Service provided enough participants from the two different types of organizations to combine for a Service-level perspective. The single factor extracted from that dataset, **Emergence from Chaos**, provided the strongest evidence that JCIDS/DAS integration may produce an emergent complex adaptive system.

Limitations

Because the Marine Corps was the only Service to provide volunteers from both an acquisition and requirements organization, it was impossible to compare perceptions of CAS between Services. This outcome limited the answer to research question 3 to the results of a single Service perspective.

Further, only one system-level factor analysis was completed in support of research question two. Combining the Army and Marine Corps requirements participants enabled the extraction of a JCIDS-unique perspective, though without a DAS-unique perspective with which to compare it.

Conclusions

Almost all of the participants viewed the integration of their organizational processes as a permanent, and sometimes independent, structure.

In addition, most teams were characterized by high levels of interpersonal communication and stability.

The results provided some evidence of the emergence of complex adaptive systems within the Defense Acquisition Structure.

Social Change Implications

This particular application of CAS theory comes at a time when sequestration and other budget pressures demand that the DoD streamline and better integrate its processes. This research supports that effort.

Understanding how complex adaptive systems form facilitates the development of better policies to effectively integrate these systems, producing a greater return on America's investment in its armed forces.

