Systems Governance in Joint Military Acquisition Requirements Generation: A Systems Thinking Approach

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***Abstract*—Acquisition latency has been a topic of interest for both systems researchers and the United States government. Using a systems thinking approach, we argue that current reform efforts for the Joint Capabilities Integration and Development System (JCIDS) wrongly focus on process improvement when latencies are more closely tied to inadequate systems governance.**

Keywords-systems thinking; systems dynamics; acquisition; governance.

I. INTRODUCTION

House Armed Services Committee report 116-120 ordered an assessment of the timeliness of the Joint Capabilities Integration and Development System (JCIDS) in creating and validating requirements documents for the US military [1]. JCIDS, the process by which military capability gaps are addressed and turned into requirements documents, has been marred by inefficiencies, thus prompting the assessment. It takes far too long for warfighter effectiveness. As a result, military services have opted to pursue alternate capability development pathways, notably the Middle Tier of Acquisition (MTA), as a way to rapidly prototype solutions and circumvent JCIDS entirely. This is problematic, as JCIDS is meant to ensure interoperability between service branches. Joint operation is an increasingly important function of the US military and breakdowns can prove catastrophic.

In summary, JCIDS consists of a series of document writing and review activities that result in a validated document that can be used to request proposals from private military contractors. Military services submit their capability requirement documents to JCIDS which, along with representatives from other services, review it to make sure the capability is interoperable across the joint warfighter. The submitting service may adjudicate comments offered by the reviewers. After a series of reviews and rewrites, a validated requirement document emerges that describes a military system that will maintain interoperability.

The system was developed in response to the interoperability failures in the joint military effort in the early 2000s. For example, the case of the Second Battle of Fallujah, or Operation Al Fajr (November - December 2004), highlights the danger of interoperability breakdown. During this episode, Army and Marine forces were working together to destroy enemy targets in the city. However, the two forces struggled to communicate with each other due to incompatible communication technologies: the Army used radios while the Marines primarily used Internet chat like Microsoft Chat [2].

The governance issues in JCIDS perpetuate a distrust of the JCIDS process. Service branches refuse to engage with JCIDS because they do not believe that their capability gaps will be addressed fast enough.

Using a systems thinking approach, we fully characterize JCIDS and its issues related to process latency. By considering the whole of JCIDS and its relation to other systems, instead of breaking it down into its constituent parts, we capture a richer depiction of the system. We argue that the latencies in JCIDS are not a result of a poorly designed process, but rather come from less obvious forces like misaligned incentives or poor organizational culture. Thus, we believe that the House Armed Services Committee is misled in requesting a review of the process and not the actual sources of latency.

The rest of the paper is structured as follows. In Section II, we present a literature review that addresses the use of systems thinking as well as other research on military acquisition. In Section III, we describe the methodology used for this work. In Section IV, we describe and map the relevant stakeholders of JCIDS. Section V makes account of the value adding processes in JCIDS. Next, Section VI analyzes the shaping forces of JCIDS. Section VII presents two conceptual models, a systemigram and systems dynamics representation of JCIDS. In Section VIII, we synthesize the information into an analysis of the system as a whole. Then, in Section IX, we contextualize the analysis within the topic of systems governance and JCIDS latency. Finally, in Section X, we offer concluding remarks and suggest future research.

II. LITERATURE REVIEW

Systems thinking has been useful in assessing many complex systems. Boardman et al. use a systems thinking approach to characterize enterprise resilience in maritime system of systems [3]. The approach is also amenable to different scenarios and at many different levels of abstraction. Along with maritime systems, systems thinking has been used to develop a framework for energy behavior in smart cities [4].

Relevant to this work, systems thinking has also been used to analyze military acquisition. Assidmi et al. use a systems thinking approach to incorporate human-centered factors into projections of cost growth in weapon system acquisitions [5].

 ISBN: 978-1-61208-941-6

Finally, the concept of governance is very relevant to systems thinking as emergent behavior is influenced by governance structures. Systems thinking is used to identify four domains that impact public trust in healthcare: medical errors and malpractice lawsuits, the roles of third-party beneficiaries in medical lawsuits and the conflicts presented on mass and social media, the public trust of healthcare services, and the healthcare quality improvement efforts [6]. These public health outcomes are dependent on systems governance. Research on systems governance is still in its infancy and lacks a robust literature.

We seek to enrich the literature by providing a systems thinking analysis of governance within a complex enterprise system. We use JCIDS as a case study in our work.

III. METHODOLOGY

We use a combination of document analysis and interviews to pursue our systems thinking approach. Much of the details on the operation, including the required documents and reviews, of JCIDS were taken from the JCIDS manual, Manual for the Operation of the Joint Capabilities Integration and Development System [7].

Next, we conducted a series of unstructured interviews with acquisition experts. The interviews were coded for common themes. The insights from the interviews were critical in the development of our systems thinking analysis. The interviews help in developing an understanding of JCIDS that is not addressed in official documents, like sources of latency or collaborative culture.

IV. STAKEHOLDERS

First, we identify the stakeholders in JCIDS. These actors are the most important in shaping the behavior of the system. Fig. 1 lists these stakeholders, their relationship to JCIDS, and a description.

TABLE 1. NOTABLE STAKEHOLDERS IN JCIDS.

Name	Type	Description
Gatekeeper	Active	The key facilitator of JCIDS and the first to receive documents from the sponsor.
FCB	Active	The Functional Capabilities Board is a review body that is dedicated to a particular area of military capability.
JROC	Active	The Joint Requirements Oversight Committee is the ultimate approval body in JCIDS.
Sponsors	Active	The sponsor of an acquisition project drafts the JCIDS documents.

A key consideration is how the stakeholders interact with each other. The behaviors of the stakeholders are shaped by their personal incentives. The incentives can cause reinforcing behavior or mitigating behavior. These interactions define the emergent behaviors of a system and ultimately shape the success of the system. In terms of JCIDS, a hierarchical military system, there are prescribed behaviors. Fig. 2 illustrates the stakeholder interactions that occur in JCIDS.

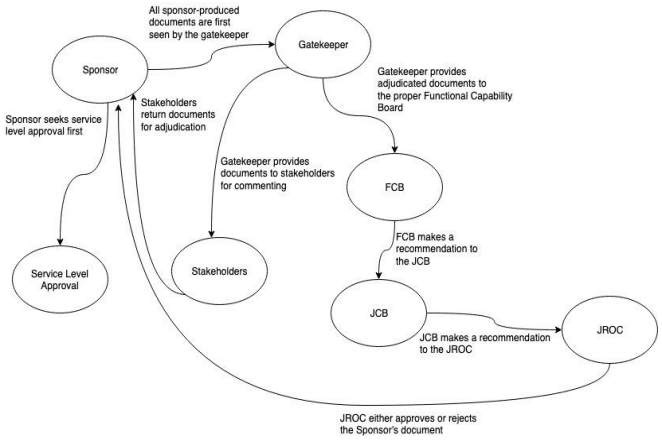

Figure 1. Stakeholder interaction map within JCIDS.

V. VALUE ADDING PROCESSES

Next, we address the idea of added value in JCIDS. First, we will consider the factors that add value to JCIDS. These things help JCIDS accomplish its goal of efficiently validating requirements documents.

A. Information Technology

Information technology facilitates the requirement validation process. JCIDS staff use Knowledge Management/Decision Support (KM/DS) to coordinate and archive requirements documents. However, the KM/DS system often has missing and incorrect data points.

B. Training

Training is key in empowering JCIDS personnel. Knowing how to write and comment on requirements documents results in quicker validation times because less adjudication will be needed.

C. Experience

Similar to training, experience empowers JCIDS personnel. Experience within JCIDS makes JCIDS staff more knowledgeable about document writing and also reduces confusion. Experienced personnel knows exactly how JCIDS is supposed to operate. Yet, there is rapid personnel turnover in JCIDS.

 ISBN: 978-1-61208-941-6

D. *Warfighter Goal Clarity*

When warfighter goals are clearly defined, JCIDS approval bodies can easily determine whether an acquisition project is necessary. In this situation, acquisition projects will not even be pursued if they do not align with warfighter needs.

The purpose of JCIDS is to add value to the military acquisition system. After considering the variables that add value to JCIDS, we consider the things that JCIDS adds value to.

E. *Warfighter*

JCIDS is supposed to address capability gaps and enhance joint capability. This will result in better outcomes on the battlefield

F. *"Little a" Acquisition*

Considering the output of JCIDS is the input of contracting, better defined projects help with project contracting. Well defined requirements are useful for contractors that are making bids.

VI. SHAPING FORCES

JCIDS operates in a well-defined environment. It is a part of the US military acquisition ecosystem, which consists of itself, budgeting, and "little a" acquisition. Because it is so well bound, it is relatively easy to identify the shaping forces of JCIDS. We start by identifying the internal forces that are not explicitly mentioned in the JCIDS manual, but still impact acquisition outcomes.

A. *Culture*

Organizational culture is important in determining acquisition outcomes. One facet of culture is risk tolerance. JCIDS, a risk averse organization, will take a considerable amount of time in making sure requirements documents are very well defined. Further, a culture of complacency in JCIDS does not inspire innovation. Personnel are satisfied with the latencies within the system.

B. *Collaboration*

Collaborative design is commonplace in the private sector. It shapes project outcomes by incorporating multiple perspectives throughout the design process. There is not a uniform practice of collaboration in JCIDS. The Army utilizes Cross-Functional Teams [8] while the other services are less collaborative. These differences in collaborative structure impact acquisition timelines.

After analyzing the internal shaping forces of JCIDS, we move onto the forces that affect the environment that JCIDS operates in, and induce action. These forces influence either the inputs to JCIDS or help dictate what an output looks like.

C. *Adversarial Developments*

Adversarial developments refer to the changes in threats to US security. This can be the emergence of a new threat, like an antagonistic state, or a new capability among existing US enemies. These developments inspire a reaction by the US military, which ultimately results in a JCIDS process.

D. *Innovation*

Private sector or academic innovation pushes the state of the art, and results in a military capability gap. Many US adversaries can adopt innovation very quickly as well, further hindering the US's warfighter capability. Thus, innovation spurs acquisition and, thus, JCIDS.

E. *Political influence*

Acquisition can have political value for a great number of reasons. First, politicians have an interest in national security. They should want to protect the safety of Americans. Acquisition can be useful in accomplishing that. Second, there are economic incentives for a lot of politicians. Acquisition can employ a lot of people in a politician's district. A politician may also be interested in acquisition oversight, which will force accountability in JCIDS. Political pressure can speed up the JCIDS process but is only used in certain, advantageous, cases.

F. *Budgeting*

Budgeting is a major shaping force in JCIDS because acquisition projects cannot be realized if there are no funds available to finance them. In fact, there is an affordability analysis built into the JCIDS process.

VII. CONCEPTUAL MODELS

We develop conceptual models to further our understanding of the system and how system governance impacts JCIDS effectiveness.

The following systemigram, displayed in Fig. 2., creates a series of narratives concerning JCIDS. The systemigram was created to help visualize the nature of a system [9]. The main line of the diagram shows the standard story whereby capability gaps are developed into validated requirements documents. Yet, there are also peripheral narratives regarding innovation, personnel, and leadership that are key in JCIDS.

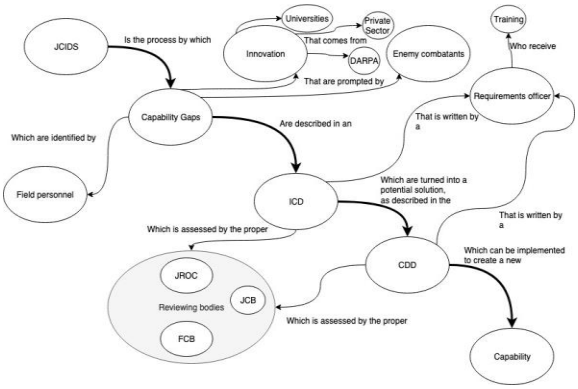

Figure 2. JCIDS systemigram.

Finally, Fig. 3 illustrates the system dynamics of JCIDS. It shows how different aspects of JCIDS reinforce and balance each other. The United States and its adversaries are in an effective arms race for better capabilities, which is only balanced by budgeting restraints. Therefore, acquisition speed is a key military priority, which is hindered by the latency of JCIDS.

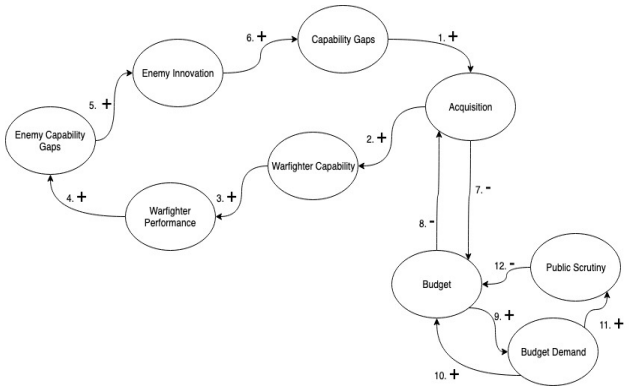

Figure 3. JCIDS systems dynamics.

VIII. SYSTEMS ANALYSIS

Our systems thinking analysis illustrates why JCIDS is ineffective in validating requirements documents. At a high level, warfighter needs require that JCIDS operate quickly; troops on the battlefield need acquisition to quickly fulfill capability gaps. The US military needs to adopt innovation at the same rate as their adversaries in order to maintain a tactical advantage. Yet, acquisition processes are the subject to oversight. The American public and Congress demand fiscal responsibility. This results in regulation and policy that slows down JCIDS. Requirements documents require a lot of reviews to ensure that the acquisition is necessary, so funds are not being misused. The pressures to be fast and deliberate at the same time are at odds with each other. This reality puts JCIDS in a precarious position. It cannot adequately satisfy both stakeholders, and often fails both.

In a system with opposing forces, an equilibrium is often reached. JCIDS operates in a unique environment because there are limited resources in the form of budgeting and the government is a monopsonist in purchasing military equipment. So, the oversight bodies, including Congress, exert the most influence on JCIDS. Therefore, the equilibrium favors the stakeholders who want a deliberate process. Yet, it is the service branches that are actually interacting with the system by creating requirements documents.

At a lower level, JCIDS does not have governance structures in place to facilitate rapid development of requirements documents. There is very little collaboration in the development of these documents, which could speed up the process. There is also an inadequate infrastructure for information technology; data collection is insufficient and often inaccurate [10].

Considering the contradictory influences in JCIDS, service branches often circumvent the process by using the Middle Tier of Acquisition. This acquisition track gives sponsors the ability to rapidly prototype and field capability without dealing with JCIDS. The faster acquisition time and reduced oversight has made MTA an attractive option. The threat of interoperability failure remains in MTA, but the consequences are delayed, which makes sponsors discount them.

IX. SYSTEMS GOVERNANCE

A crucial result of the inadequate governance of JCIDS is a lack of trust in the system. The opposing forces of speed and oversight in JCIDS indicate why there is a lack of trust among stakeholders. If JCIDS cannot field materiel fast and cheap enough, then sponsors will place their trust in other acquisition processes, like MTA, that will deliver capabilities much faster, even at the expense of interoperability.

An important consideration in addressing stakeholder trust in JCIDS is the incentives of the constituent stakeholders. Each part of the system has their own incentive and will try to maximize their own interest. Considering JCIDS has stakeholders from all service branches, joint staff, legislative bodies, and more, there are many agents pulling the system in their direction. With increased competition for resources and influence, stakeholders may develop a distrust of the system.

Furthermore, personnel development shortcomings, which are caused by lack of training and scheduled personnel rotations, hinder the development of trust among stakeholders. Since JCIDS staff and service level requirements officers are frequently leaving their departments, there is no opportunity for services to develop a trusting relationship with JCIDS. This problem is magnified when leadership turns over, as their policies are abandoned upon leaving.

X. CONCLUSION

We lay out a comprehensive analysis of JCIDS. The system is best understood by its relationships to the whole rather than taking apart its components. Through the systems thinking approach, we describe the critical stakeholders, value adding processes, shaping forces, and conceptual modeling of JCIDS.

The purpose of this work is not to suggest solutions for improving JCIDS. Rather, we seek to holistically characterize the problems in JCIDS. Often the true root of a problem is not the most visible. Our systems thinking analysis highlights some of the factors that are hindering JCIDS that may normally be overlooked, especially by those in power who have the ability to enact change. Our analysis shows that the latency in JCIDS is not wholly a result of poorly designed processes, but the culmination of poor

 ISBN: 978-1-61208-941-6

systems governance including the misalignment of incentives, lack of technological infrastructure, and personnel shortcomings.

Future research should analyze possible solutions to overcome JCIDS inefficiency. Scenario analysis and surveys can help ground this conceptual analysis.

While it is not a well-known system, JCIDS is incredibly important in American society. It determines how American troops are equipped and impacts the public's tax burden. Understanding and improving this system is crucial to American interests both at home and abroad.

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