

C4ISR, THE FINC METHODOLOGY, AND OPERATIONS IN URBAN TERRAIN

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Abstract. In this paper, we describe the FINC methodology for analysing C4ISR and NCW architectures. We utilise the “Black Hawk Down” incident in Mogadishu as a case study, in order to demonstrate how the FINC Intelligence Coefficient metric is calculated. We show how the FINC methodology can be used to evaluate possible improvements to the C4ISR architecture used in Mogadishu, and to NCW architectures more generally.

INTRODUCTION

The topic of C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance) architectures is of enduring importance for military operations. This is particularly so given the current interest in Network Centric Warfare (NCW) [1] and the increasing requirement for new kinds of Operations Other Than War (OOTW) in complex and urban terrain.

The FINC (Force, Intelligence, Networking, and C2) methodology [2–4] analyses NCW or C4ISR architectures in terms of:

- Force nodes, which conduct activities (F);
- Intelligence or information-generating nodes (I);
- Network links (N); and
- C2 nodes (C).

Figure 1 shows an example (discussed in more detail in the body of the paper). C2 nodes are indicated by circles, Intelligence nodes by rounded boxes, and Force nodes by square boxes (Force nodes can also generate information, as well as carrying out activities). Network links provide communication between nodes, indicated by lines or arrows in Figure 1, depending on whether information flow is bidirectional or unidirectional.

The FINC methodology provides a way of quantifying the information sources and network links in a C4ISR architecture. This allows the calculation of a number of metrics for evaluating C4ISR architectures, including the Intelligence Coefficient, described below.

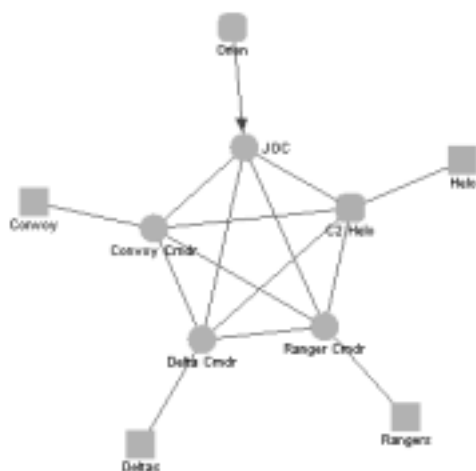


Figure 1. Simplified architecture for Mogadishu scenario.

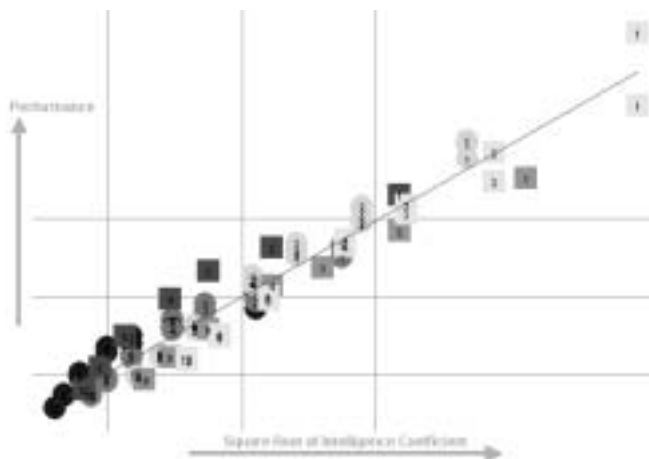


Figure 2. Prediction of performance by the Intelligence Coefficient for a target search scenario.

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The FINC methodology has been validated through a number of simulation experiments [2–4] and has been effective in predicting performance in several different kinds of scenario. In particular, the Intelligence Coefficient correlates well with performance in simulations of an air-strike scenario [2], a target-search scenario [3], and a combat scenario [4]. Figure 2 shows the prediction of performance by the Intelligence Coefficient in the second case. In each of these simulations, increasing the Intelligence Coefficient has led to an increase in performance. A study of the US Civil War [3] suggests that this relationship continues to hold in the real world.

In this paper, we describe the FINC methodology by working through another real-world example, based on the well-known “Black Hawk Down” incident in Somalia in 1993. The lessons of this incident are worth re-examining, since C4ISR for operations in urban terrain is a topic of great importance in the current era. This incident also provides a good example for illustrating the methodology, since the various features of the FINC methodology need to be explained in terms of a concrete example.

Although the FINC methodology still requires further validation and refinement, the Mogadishu case study provides a demonstration of its potential for examining improvements to C4ISR and NCW architectures.

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