

Mapping the Information Environment

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Editorial Abstract: A follow-on discussion from last issue's article, "A Theory Based View of IO," authors Robert Cordray and Marc Romanych present a methodology to "map" the information environment, much like a commander's J2 maps the physical characteristics of the area of operations. Giving clarity to the information environment, in turn, allows the commander to gain an understanding of its impact and importance, ultimately leading to a more effective information operation.

If information operations (IO) are to be fully integrated and executed by the Joint Force, then the commander and staff's visualization of the area of operations must be expanded to include the information environment. However, graphic representation of the information environment remains a challenge for IO staffs. The problem confronting the staff is how to analyze and succinctly describe the character and effects of an operating environment that is largely non-physical and abstract.

This article presents a methodology that, as part of Joint Intelligence Preparation of the Battlespace (JIPB), can be used to "map" the information environment in a manner similar to how the J2 maps the physical characteristics of the area of operations.¹ The result is a product called the "combined information overlay;" a concise graphic that depicts where and how information flowing in and through a given geographic area will impact military operations.

What is the Information Environment?

The information environment is a construct based upon the idea that the existence and proliferation of information and information systems creates a distinct operating dimension or environment. As a combination of tangible (physical information systems and networks) and intangible elements (information and decision-making), the information environment is both a resource for military operations and a medium in which armed forces operate.

For the practitioner of IO, the most intangible element of the information environment – information – is of supreme importance. This is because, in spite of its lack of physical existence, the content and flow of information within a specific geographic area produces real, tangible effects in the physical world and on military forces present in the operating environment. For these reasons, our understanding of the information environment must ultimately include how information content and flow affect the execution of military operations.²

A Model of the Information Environment

To rationally analyze the information environment and the relationship between its constituent elements, a framework

is needed to organize our view of the environment. For this purpose, a model – the three domains of conflict – developed by the Department of Defense Command and Control Research Program (DoD CCRP) is particularly appropriate.³ The CCRP model describes three distinct, but closely interconnected domains – physical, information, and cognitive – that, in sum, explain the importance of information to military operations and, for the purposes of analysis, the character of the information environment. The three domains can be very briefly described as follows (see Figure 1).⁴

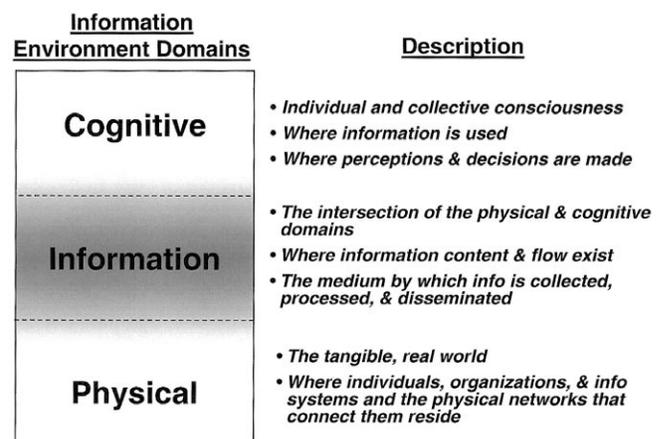
The physical domain is the real world environments of land, sea, air, and space. It is where maneuver and conventional combat operations occur. As part of the information environment, it is where individuals, organizations,

information systems, and the physical networks that support them reside.

The cognitive domain is where individual and organizational collective consciousness exists. It is where information is used to form perceptions and attitudes and make decisions.

The information domain is formed by the intersection of the physical and cognitive domains, and is the abstract space where information exists. The domain consists of information and is where the functions of information systems (i.e., information collection, processing, and dissemination) create information content and flow. The information domain is the link between the reality of the physical domain and human perceptions and

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Information Environment Construct



The cognitive aspects of media can have a dramatic impact on the influence of the civilian populace.

decision-making in cognitive domain. As such it is critical to the command and control of military forces.

It should be noted that the three domains overlap and, therefore, are closely interconnected.⁵ Information systems in the physical domain create and direct the flow of information in the information domain which, in turn, affects human perceptions, attitudes, and ultimately decision-making in the cognitive domain. Furthermore, decisions made in the cognitive domain are transmitted as orders and intent through the information domain and executed as actions in the physical domain. Although discussion of the information environment is often segregated by domain, in truth, any domain boundaries are arbitrary due to interdependences between the domains. Consequently, an understanding of the information environment requires knowledge of all three domains and how they are linked to conventional military operations.

Application of the Model

JIPB products often dwell on the characteristics of the physical and cognitive domains while only briefly addressing the information domain. However, to have utility to the planning and execution of an information operation, analysis must explain how information affects military decision-making in the cognitive domain and actions in the physical domain. This “so what” of analysis can be developed only if the information domain is included in JIPB.

To ensure all three domains are adequately addressed during analysis, it is necessary to “visualize” the structure of the information environment and the relationship between its components. Doctrinally, the first two steps of JIPB result in a series of graphic products, such as a Modified Combined Obstacle Overlay (MCOO), that help the commander visualize the militarily significant aspects of the physical environment. Unfortunately, joint doctrine does not provide a ready example of a graphical product for the information environment, and therefore, information’s importance to the joint force often goes unrecognized. A solution is a non-doctrinal intelligence product called a Combined Information Overlay, or CIO.

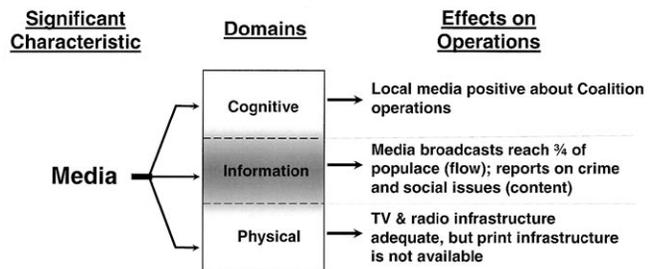
Define the Battlespace Environment. Visualization of the information environment begins with the identification of

significant characteristics of the battlespace during Step 1 of JIPB. Significant characteristics are defined as “battlespace characteristics of possible significance or relevance to the joint force and its mission.”⁶ For IO, this equates to identifying existing and projected characteristics that are relevant to the content and flow of information in and through the operational area. Typically, these identified significant characteristics are broad elements the employment of information systems and networks (which, in turn, direct information content and flow).

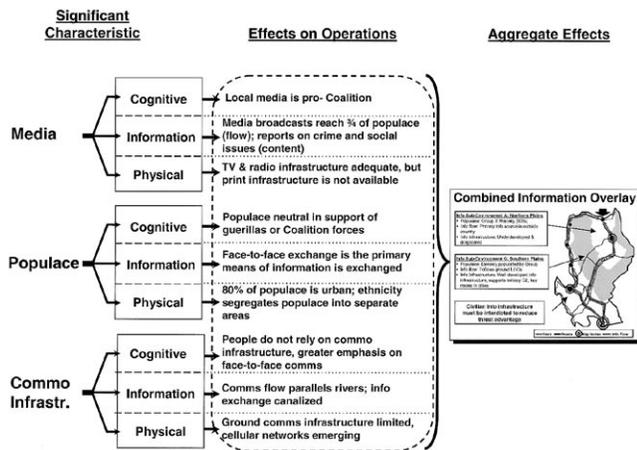
The information environment’s militarily significant characteristics vary widely depending on the operational area. This is because, like terrain, the information environment is not uniform in its composition. Therefore, there is no single set of characteristics useful for analyzing every information environment. However, for the purposes of example, some broad characteristics that can serve as a starting point are: geography, populace, communications infrastructure, media, and societal organizations.

Describe the Battlespace’s Effects. During Step 2 of JIPB the previously identified significant characteristics are evaluated using the three domain construct to determine specific impacts on operations in the information environment. To accomplish this task, the three domains are applied individually to each characteristic. The result is an understanding of how each characteristic affects the employment of physical information systems and networks (physical domain), the use of information for decision-making (cognitive domain), and information content and flow (information domain):

- **Physical Domain.** Applying the physical domain to the significant characteristics focuses on what information systems in the operational area collect, process, and disseminate information. Identification should include the tangible aspects of each significant characteristic such as technical information systems and networks (e.g., radio towers, fiber-optic networks, and telephone networks) and non-technical (human) information network nodes and links such as key leaders and face-to-face communications networks. Additionally, analysis should also show where those information systems and networks are located in the physical environment.
- **Cognitive Domain.** This analysis focuses on the values, beliefs, and perceptions of key individuals and organizations in the operational area that make decisions, as well as how those decisions are formulated. This analysis



Media’s effect on operations.



Information environment characteristics, with their corresponding individual effects on operations, are analyzed to produce a comprehensive CIO which gives entire picture for the commander.

should show how this “human mental programming” affects the value of specific information to those key individuals and organizations in the battlespace.

- Information Domain. Analysis of this domain focuses on how information flows and the content of that information. Flow describes the exchange of information in terms of conduits, form, and speed. Content includes the major subjects or topics circulating in the area of operations.

As an example, the media can be easily analyzed using the three domains (see Figure 2). First, key physical features of the media, such as important radio and television broadcast towers, print production facilities, and other services associated with the production and dissemination of news reporting, are identified and located. Next, the cognitive aspects of each media outlet’s influence on the civilian populace, third party organizations, and military forces’ perceptions are ascertained. Finally, the information domain is evaluated in terms of media’s range and distribution (information flow), as well as subject matter and bias (information content) of specific media sources. The aggregate of the analysis should show which media outlets can affect military operations, and therefore must be addressed to affect information content and flow in the area of operations.

Building the CIO

To understand the information environment, it is necessary to aggregate the effects of the physical, information, and cognitive domains on friendly and adversary forces. To help that visualization, analysts can build a graphic visualization tool – the CIO – that depicts the information environment’s effects on military operations. It provides an overview of the information environment derived from analysis conducted during the first two steps of JIPB.

Building a CIO begins with a map of the operational area (ideally the same map used by the intelligence and operations staffs). The effects of the significant characteristics are

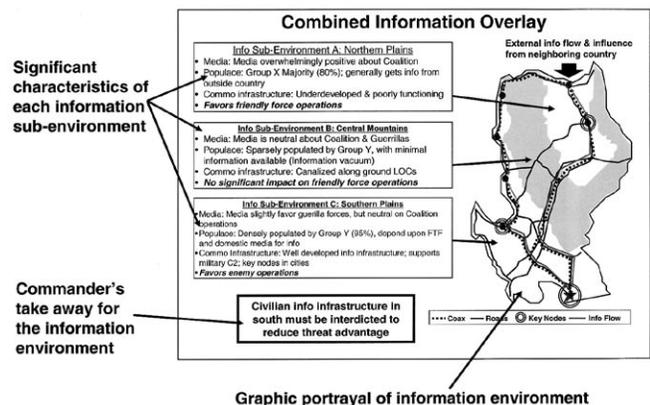
combined and plotted on the map to show an aggregate of the effects in relation to the geography of the operational area (see Figure 3). Therefore, the information plotted on the CIO summarizes key aspects of the significant characteristics and the three domains. For example, a CIO may include physical components such as key information nodes and networks (both technological and human), the primary paths by which information flows in and through the operational area, information content generally disseminated along each path, and cognitive aspects such as beliefs and perceptions that are important to the mission.

The CIO is a guide, not a rigid template. The information included in the graphic can quickly become overwhelming if not presented in a concise manner. A refined and clearly presented CIO will usually have a greater effect on the commander than an overly complex graphic. One way to show more complex information in a relatively succinct manner is to break the operational area into sub-information environments.

Sub-Information Environments

Rarely will the composition of the information environment be uniform. The characteristics and impact of the information environment vary within a specific geographic area. Often, distinct sub-information environments are identified; that is, areas in which the information environment’s significant characteristics and effects notably differ from adjacent areas. These sub-environments can be further analyzed to determine their composition and character. Ideally, analysis will identify those parts of the operational area that favor either friendly or adversary operations.

For example, sub-information environments may be based on the significant characteristics of ethnicity, media presence, and/or information access. One sub-environment may have a single ethnic group with wide-spread access to media and information, while another sub-information environment may have an entirely different populace group with limited or no access to outside media. Figure 4 shows an example CIO which breaks the operational area into three distinct sub-information environments, and then explains how each sub-environment is different by comparing each environment’s significant characteristics.



Graphic portrayal of information environment
An example of a Combined Information Overlay (CIO).

Whatever final form the CIO takes, it must present an operationally relevant overview of the information environment. Yet, every CIO will be unique because every information environment is different. Depending on the operational area, level of war, and assigned mission, the information environment's militarily significant characteristics will vary, as well as the relative importance of each domain to military operations.

Conclusion

The three domains of conflict provide a useful framework for analyzing and characterizing the information environment. Applying the structure of the domains to the operating environment's significant characteristics helps guide and organize analysis and provides a tool, the CIO, that graphically depicts where and how the information environment will impact military forces. Recent experiences during exercises and contingency operations demonstrate that this approach is readily understood by commanders and staffs.

Visualization of the information environment and its effects on military operations is essential to planning and executing an information operation. By providing a clear and succinct picture of the information environment, the commander can readily grasp the importance and impact of information on military operations. When the commander understands the information environment's importance, the IO staff is more likely to gain the support and guidance needed to develop an effective information operation.

Endnotes

¹ Emerging policy may exchange the term "battlespace" with "environment" (e.g., Intelligence Preparation of the Environment).

² The information and content aspects of the information environment originate from the two primary views of information – information-as-message and information-as-medium. For a further discussion see *In Athena's Camp: Preparing for*

“By providing a clear and succinct picture of the information environment, the commander can readily grasp the importance and impact of information on military operations.”

Conflict in the Information Age by John Arquilla and David Ronfeldt (Santa Monica, California: RAND, 1997).

³ Further information about DoD CCRP's three domain model can be found in *Understanding Information Age Warfare*, by David S. Alberts., John J. Garstka,

Richard E. Hayes, and David A. Signori (DoD Command and Control Research Program, Washington D.C., August 2001, pages 10-14).

⁴ The text and diagram of the three domains is adapted from "Visualizing the Information Environment" by Marc J. Romanych (*Military Intelligence Professional Bulletin*, Volume 29, Number 3).

⁵ Not mentioned in this discussion the idea of a fourth domain – that of culture. Culture is an elusive dynamic that affects the attributes of all three domains, from social structures in the physical domain to language in the information domain, to values and beliefs in the cognitive domain. More work is needed to determine the place of culture in the three domain model.

⁶ JP 2-01.3, *Joint Tactics, Techniques and Procedures for Joint Intelligence Preparations of the Battlespace*, 24 May 2000. 