

Understanding and Pursuing Information Advantage

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The information environment (IE) and operations in and through the IE are currently a particular point of emphasis within the Department of Defense (DoD). Information is the newest joint function (joining command and control, intelligence, fires, movement and maneuver, protection, and sustainment). The Marine Corps has followed suit and made information a warfighting function, and the Army is considering a similar move. 2016 saw the first DoD *Strategy for Operations in the Information Environment*, and 2017 saw the development of the *Joint Concept for Operating in the Information Environment*, signed and released (and the subject of a capabilities-based assessment) in 2018. Senior leaders across the department have repeatedly expounded on the importance of the IE for military operations and declared it a priority.

Part and parcel of this renaissance surrounding the role of information in military operations are new concepts and terms. One that is prominent in new foundational documents and frequently appears in stakeholder discussions is *information advantage*. This article tries to unpack this concept and explore what it might mean and how it should be thought about by the U.S. Army and the joint force more broadly.

“INFORMATION ADVANTAGE” APPEARS FREQUENTLY, BUT IS NOT DEFINED

The *Strategy for Operations in the Information Environment* makes repeated mention of information advantage, as the purpose of the strategy is to lay out a path for the DoD to “gain advantage in the IE.”^[1] The strategy includes four lines of effort and a host of other elements that will contribute to creating and sustaining advantage, but spends curiously little attention to what having an advantage in the IE looks like. Similarly, the *Joint Concept for Operating in the Information Environment* is a concept focused on the things required “in order to gain and maintain an information advantage,” but describes only the concepts and capabilities necessary to gain such an advantage, without making clear what the information advantage itself entails.^[2] The 2018 *National Defense Strategy* mentions information advantage, again without definition or elaboration.^[3]

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Information advantage does not appear anywhere in U.S. Joint doctrine, and so is not defined in the *Department of Defense Dictionary of Military and Associated Terms*. Joint Publication (JP) 3-13, *Information Operations*, comes close, as it defines *information superiority* in a way that includes advantage: "The operational advantage derived from the ability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same."^[4] *Information advantage* does not appear in current service doctrine, either.

Looking to the doctrinal documents of US allies and partners reveals the term in use elsewhere, and defined there. The United Kingdom Ministry of Defence has a joint concept note with the title *Information Advantage* that also contains a definition: "the credible advantage gained through the continuous, adaptive, decisive and resilient employment of information and information systems."^[5] This definition is somewhat lacking as far as definitions go, however, as it uses both "information" and "advantage" prominently in the definition, and boils down to defining information advantage as the advantage gained through the employment of information. The Australian Department of Defence includes a definition in its doctrine publication 3.13, *Information Activities*: "An information advantage is a favourable information situation relative to a group, organisation or adversary."^[6] This is the most robust definition available, but it still begs some elaboration.

Having read these different strategies, concepts, and discussions, I find their overall arguments compelling. I want the joint force to operate more effectively in the IE and to seek and achieve *information advantage*... I'm just not entirely sure what exactly that means.

INFORMATION ADVANTAGE: I WANT THAT, BUT WHAT IS IT?

Perhaps the term is left un- or under-defined because it is held to be self-evident? *Information environment* is defined, and *information* is broadly understood. *Advantage* is a classic military principle, with Strategist Robert Leonhard reminding us, “The history of human warfare is a saga of continuous attempts to gain the advantage over the foe in battle.”^[7] The foundation of maneuver warfare is about gaining a position of advantage and seeking to apply strength to weakness to maximize advantage.^[8] Though classic and foundational, neither “advantage” nor “military advantage” is defined in joint doctrine. “Advantage” repeatedly appears in both *Joint Operations* (JP 3-0) and *Joint Planning* (JP 5-0), but is not defined in either publication. “Position of advantage” also appears in several joint pubs but is not formally defined. In annex A, JP 3-0 notes that the goal of maneuver is “to secure or retain a positional advantage, usually to deliver—or threaten the delivery of—the direct and indirect fires of the maneuvering force.”^[9]

U.S. Army doctrine makes similarly heavy use of “advantage” without formal definition. The Army Doctrine Publication (ADP) 3-0, *Operations*, comes closest in describing a fairly generic type of advantage, a *position of relative advantage*:^[10]

4-31. A position of relative advantage is a location or the establishment of a favorable condition within the area of operations that provides the commander with temporary freedom of action to enhance combat power over an enemy or influence the enemy to accept risk and move to a position of disadvantage. Positions of relative advantage may extend across multiple domains to provide opportunities for units to compel, persuade, or deter enemy decisions or actions. Commanders seek and create positions of advantage to exploit through action, and they continually assess friendly and enemy forces in relation to each other for opportunities to exploit. [emphasis in original]

To avoid potential incorrect assumptions about *information advantage* as necessarily a form of positional advantage (since information often lacks a meaningful location or position), I am still left wanting a clear description of advantage or military advantage. Turning to the dictionary reveals the following four definitions for *advantage*:^[11]

1. any state, circumstance, opportunity, or means especially favorable to success, interest, or any desired end: the advantage of a good education.
2. benefit; gain; profit: It will be to his advantage to learn Chinese before going to China.
3. superiority or ascendancy (often followed by over or of): His height gave him an advantage over his opponent.
4. a position of superiority (often followed by over or of): their advantage in experienced players.

Given the dictionary definitions appear to be quite adequate, the lack of a definition of *advantage* in doctrine and strategic theory may not be an oversight. I am content to allow *advantage* in a military context to be something like “circumstances favorable to success” or “a position

of superiority.” This is consistent with ADP 3-0 on position of relative advantage, which is described as “the establishment of favorable conditions...”^[12] One thing that is noteworthy about the first dictionary definition is that, under this definition, the advantage is clearly and explicitly a *means*, something that is favorable to prospects of successfully achieving the desired *end*. The “ends, ways, means” construct is quite common in military thinking, and here advantage is circumstances that enable reaching ends, but not an end in itself. This is also consistent with ADP 3-0 and the position of relative advantage, in which such a position “provides” or “enhances” or creates opportunities a commander can “exploit” rather than being something sought for its own benefit.^[13]

In this, ADP 3-0 is a notable exception, as in many presentations of military theory or discussions of *advantage* (be it *information advantage* or some other form), *advantage* is at least sometimes presented as if it is an end unto itself. Many discussions of maneuver warfare emphasize the gaining of advantage, rather than carrying the logic through and describing the gaining of advantage and then exploiting it to achieve objectives. Similarly, both the *Strategy for Operations in the Information Environment* and the *Joint Concept for Operating in the Information Environment* emphasize gaining an advantage in the IE but stop short of discussing how to use that advantage to accomplish the ends.

Advantage is always good to have, but having the advantage is not the same as accomplishing objectives and achieving desired ends. Is there something else important hiding within the concept of advantage that is not captured by a dictionary or common English-language understanding? Before trying to lash up *information* with *advantage*, I want to unpack “advantage” a little further in the military context.

ON THE NATURE OF ADVANTAGE

What do we really mean by *advantage*? “Circumstances favorable to success” is fine but is still pretty generic. What kind of circumstances? When a strategy, or a commander, or a soldier seeks an advantage, what is really sought, and how does one go about getting it? By exploring the mechanisms behind traditional and intuitively understood forms of advantage, I hope to provide some levers by which I can pry open a better understanding of *information advantage* later in the article.

Anything that can provide circumstances or conditions favorable to success can be labeled as a form of advantage, and that label is spread quite broadly. In the relevant literature, I have encountered numerous types of labeled advantages, including: numerical advantage; relative advantage; position of advantage; position of relative advantage;^[14] advantages conferred by geography, or climate, or surprise, or technological advancement;^[5] temporal advantage; political, economic, or cultural advantage;^[16] physical, moral, and mental advantage;^[17] capability advantage, decision-making advantage;^[18] and, of course, informational or psychological advantage.^[19] I’m sure there are other forms of advantage, too. In what follows, I unpack, repack,

and discuss some of these and sort them into categories in the hope that some important general characteristics and properties of advantage emerge.

One of the most obvious possible forms of military advantage is a simple numerical advantage. Though history is replete with examples of smaller forces prevailing over larger ones, those smaller forces all had to overcome their opponents' numerical advantage. Quantity has a quality all its own. Numerical advantage belongs to the first category of advantage I have identified, *capacity advantage*. Having more of something than the adversary, or more throughput of something, is a capacity advantage. This can be more troops, more vehicles (either for fighting, or transportation, or both), more ammunition, more logistics capacity, more reserves, or more GDP to contribute to the war effort. Advantages of capacity can contribute to the military principle of mass (be it mass of troops, firepower, effects, etc.),^[20] and can also be relevant to the law of economy of force.^[21]

The second category of advantage is *capability advantage*. This category captures the ability to do something the enemy cannot, or at least to do something routinely better than an adversary. Various technological advantages belong in this category, such as having air mobility when the adversary does not or having artillery when the adversary does not. Technological capability advantages need not be absolute to convey advantage: even if both sides have fighter aircraft, the side with *better* fighters has an advantage, as does the side whose rifles have noticeably greater effective range. Capability advantage does not accrue only from better technology, but also from other factors related to capability, such as training, morale, and leadership.

Both *capacity advantage* and *capability advantage* are *persistent advantages*. That is, they stem from some enduring property or characteristic of a force that is unlikely to change dynamically with circumstances. Such advantages are not permanent or wholly unchanging: a capacity advantage like numerical superiority can change if a force is subjected to far higher attrition than its opponent, or if a battle produces an encirclement and mass surrender, or if a commander intentionally divides a force. Similarly, a capability advantage like superior artillery range can fade when competitors develop or procure better guns. Still, these *persistent advantages* can be distinguished from *fleeting advantages*, advantages that are more circumstantial and dynamic.

The category of *fleeting advantage* covers things like positional advantage, temporal advantage, or advantage due to surprise. A position of advantage remains advantageous only until the enemy reorients toward that position or moves away from it. ADP 3-0 explicitly acknowledges that positions of relative advantage are "likely to be temporary."^[22] Similarly, surprise is often a huge advantage that can beget further advantage through shock and cascading surprise, but eventually, an enemy is no longer surprised. Given time to recover, a surprised foe can restore its equilibrium and deprive its opponent of further advantage due to surprise. The advantage sought in maneuver warfare is most often in the category of *fleeting advantage* (though, of course, the good maneuverist will happily use *persistent advantages* such as superior mobility or dynamic junior leaders to create more *fleeting advantages*).

In addition to being either *persistent* or *fleeting*, advantage can also be *known* or *unknown*. A *known* advantage is one that is understood by or obvious to foes (though the full extent of the advantage may not be known). A numerical advantage is usually known; some positions of advantage, such as forces on higher ground or in a fortified position are also usually typically known unless movement to these positions was concealed. An *unknown* advantage is one that foes or competitors are not aware of, or not sufficiently aware of the details of, to anticipate or respond to the advantage. For example, the existence of a new weapon or vehicle may be known, but the capability advantage it conveys may be unknown. Some positions of advantage rely on being unknown to be effectively exploited: an ambush works because it is unanticipated, and troops in a position where they can surprise, or flank, opposed forces would lose their advantage were their enemies forewarned.

Known and *unknown* advantages differ in the mechanisms by which they can be favorable to success. *Unknown* advantages must be exploited to convey any advantage. If a force has no idea their adversary has an advantage, it will remain in ignorance (and unaffected) until something is done with it (like an ambush or highly effective demonstration of new capabilities). *Known* advantages can function through being actively exploited but can also function through *display* or *presentation*. Troops arriving on higher ground will have an advantage in any ensuing combat but may also exert influence on the battlefield strictly by their observed presence, as the opposed commander may choose to withdraw forces from the vicinity of the hill. *Known* advantages can contribute to shaping or deterrence even if they are not explicitly exploited.

In addition to these categories (capacity and capability, persistent vs. fleeting, known vs. unknown), advantage appears to have several properties. First, *advantage is always relative*. If “circumstances favorable to success” was a good start on a definition of advantage, a more comprehensive definition needs to include an opponent or other opposition, someone who will resist the accomplishment of the end or objective. The extent to which capacity or capability conveys an advantage is dependent on the relative capacity and capability of the adversary, as is the duration of one’s advantage.

Second, *advantage is always conditional*. Just because one has a certain general advantage does not necessarily mean it is going to give any benefit (that is, be favorable to success) in every situation. Being able to increase prospects for success based on superior capacity or capability, or based on position, depends on the end being sought and on other conditions. For example, night vision equipment only conveys advantage in the dark, and an advantage in weapon range is not an advantage when engagement range is inside both sides’ weapons’ maximum range, such as in jungle or other dense terrains. Similarly, a host of advantages in sea power (numerical, technological) is not advantageous for land operations far from the coast. Often, advantage is conditioned on time (the main distinction between *persistent* and *fleeting* advantage, and what can determine just how fleeting a fleeting advantage is). Left enough time to react, an enemy will try to deprive adversaries of advantages—either the

years it takes to develop a counter-technology or the much shorter amount of time it takes a formation to reorient to a foe on its flank or to move away from a position of enfilade or other positional disadvantage.

The third property of advantage is that *benefit from advantage comes from exploiting it*. Consider the language of advantage: one *takes* advantage, or one presses one's advantage. The benefit from advantage comes from the verb action associated with it. Advantage may be circumstances favorable to success, but if one does not seize on that advantage and exploit it to progress actively toward objectives, one has failed to take advantage. Similarly, forces placed in a position of advantage that fail to act on or exploit that advantage, lose the advantage. *Having* an advantage is nice, but *taking* advantage gets you something. Of course, sometimes, you can capitalize on an advantage simply by *displaying* it. The defensive advantage of a fortified position presents an adversary with a dilemma: either attack the strong point at great cost or decline to pay that cost and leave the defense intact. Either outcome is favorable to the defender.^[23] Displaying an advantage (that is, allowing it to become a *known* advantage, or presenting the capability related to a known advantage) can shape or deter an adversary's behavior. Moreover, the type or quality of advantage gained may depend on whether it is an advantage *pressed* or an advantage *displayed*, or it may depend on the adversary's choice. When presented with a dilemma, an adversary will choose an available course of action, but may not choose the one most preferred by the force holding an advantage. Still, the nature of a dilemma is such that the advantaged force should stand to gain in some way regardless.

A fourth property of advantage is that *the best advantages match strength against weakness, rather than just overmatching strength against strength*. The best technological advantages do not just let one do something the adversary can do, but better; the best technological advantage lets one do something the enemy cannot do *at all*. Similarly, having a local firepower advantage is a good thing, but being able to direct firepower into an unprepared and undefended enemy is even better. Therefore, advantage is foundational in maneuver warfare, as maneuver always seeks to pit strength against weakness, to dislocate enemy strength and to put often otherwise relatively evenly matched forces in a position of advantage relative to foes.

The fifth and final property is that *advantage is a means, not an end*. Although this was mentioned earlier, it merits repeating as a property. Not only is advantage a means and not an end, but it is also conditional on the nature of the end. For example, if the tactical objective is clandestine monitoring of a route, a numerical advantage is no advantage at all, as it is much harder to hide a large force than a small one. Similarly, a firepower advantage is not much of an advantage when conducting a humanitarian assistance mission. What constitutes advantage at the tactical, operational, and strategic levels will vary in part because the nature of objectives at the tactical, operational, and strategic levels vary, and so too will the kinds of things that are favorable to success in those different levels of objectives.

WHAT DO WE MEAN BY “INFORMATION”?

Having described some categories of advantage and having offered some properties of advantage, I now turn to *information*. *Information* is used even more frequently in doctrine than *advantage* and is discussed and defined therein. In fact, JP 1-02 includes fully ten separate terms that begin with the word “information” and even more that include it as a second or subsequent term, and even more still that include “information” in their definitions. The information environment is “the aggregate of individuals, organizations, and systems that collect, process, disseminate, or act on information.”^[24] Though defined, *information* is an incredibly broad term. Taking a term as broad as *advantage* and putting it next to a term as broad as *information*, it is no wonder that *information advantage* threatens some ambiguity.

Information in warfare and other military operations covers a very broad space. To make some sense of what is meant by *information advantage*, we need to parse some of the disparate things that gather under the broad tent of “information.” I have identified at least six different ways in which “information” is described as relevant in warfare or other military operations: (1) situational awareness and situational understanding; (2) command and control, including communications and knowledge management; (3) command and control warfare (C2W) and other factors that degrade situational awareness or C2; (4) information or aspects of the IE that can cause subordinates to behave in ways contrary to the commander’s orders or preferences; (5) efforts to protect against the factors of (4) or inflict them on adversaries; and (6) factors in and through the IE that affect the perceptions or behaviors of relevant actors other than adversaries.^[25] Each is described in greater detail below.

The first category of information in warfare is information about the operating environment or battlespace, where one’s forces are, where enemy forces are, where other relevant actors are, the state of those actors or forces, and what features of the environment might affect operations. This is commonly described as situational awareness or situational understanding, and during actual operations is opposed by the natural forces of uncertainty collectively called “the fog of war.” The fog of war is fought through sensors and intelligence, surveillance, and reconnaissance (ISR). Opposition from opponents is separated as a distinct category (category 3).

The second category of information concerns command and control, especially the ability to communicate and transfer changes in understanding and instructions. This category recognizes the truth that the commander in the headquarters does not know about contact with an enemy formation the exact moment the first scout in the field spots the first sign of movement, but that there are delays inherent in the system as new ISR is received, digested, and disseminated, and similar delays as orders are developed and communicated to subordinates. This category of information depends on networks and nodes, communication radii, chains of command, numbers of echelons, etc. This category also includes knowledge management, the integration of both new information and old information into meaningful information, and then making that available to those who need it to support their decision-making.

The second category of information concerns command and control, especially the ability to communicate and transfer changes in understanding and instructions. This category is about the sharing of information (specifically ISR and orders) between commanders and subordinates and delays and impediments to that sharing. Because information takes time to pass between echelons, a commander in a higher headquarters will not know about contact with an enemy formation the exact moment the first scout in the field spots the first sign of movement. Similarly, once headquarters becomes aware of a change in the situation, it will take time for new orders and instructions to reach the tactical edge. This category of information depends on networks and nodes, communication radii, chains of command, numbers of echelons, etc. This category also includes knowledge management, the integration of both new information and old information into meaningful information, and then making that available to those who need it to support their decision-making.

The third category is a subset of what is often called *information warfare*. It is an important transition in these categories of information from describing things forces need to at least some extent to operate (the first two categories) to describing an optional activity: fighting with, or against, information. This category is about attacking the functioning of categories (1) and (2). This category includes what has historically been called *command and control warfare* (C2W) and includes other attacks on situational awareness/situational understanding or the systems that convey that knowledge.^[26] Thought about differently, this is about using information capabilities to amplify the fog of war either to promote general uncertainty or to lead enemies to specific incorrect conclusions about some aspect of the location, disposition, and possible courses of action of friendly forces.

The fourth category is about information or aspects of the IE or operating environment that can cause subordinates to behave in ways contrary to a commander's preferences. This exposes another important relationship with information: namely, how information affects behavior. Why might subordinates not do what a commander wants? There are numerous possible reasons. Subordinates might not know what a commander wants because of failures in C2 (category 2), or because of inflicted failures in C2 (category 3). Subordinates might be incapable of following a commander's orders (if they lack sufficient fuel or ammunition or have sustained so much damage that they are physically disrupted), but the commander may not know that because of failures in situational awareness. Subordinates might perceive the situation differently than the commander (either correctly or incorrectly, but differently) and thus act following the principles of mission command and in a way that is consistent with the overall commander's intent and that subordinate's perception of the situation. Subordinates might also act in contravention of the commander's wishes due to factors that are not strictly rational and are governed by psychology or emotion. This could be the baseline personality and proclivities of a subordinate (bold, or timid, or reckless), or due to effects wrought by battlefield circumstances such as distraction, suppression, panic, fear, shock, surprise, or rage.

The fifth category of information concerns things done in or through the information environment to mitigate or counter the effects of (4) on one's own forces, or to inflict such effects on adversary forces. One might call this "information for effect." This encompasses more of the range of possible operations in the IE and includes efforts to harness the inherent informational aspects of military operations, as well as the employment of various information-related capabilities to affect and influence enemies.

The sixth and final category is factors in and through the IE that affect the perceptions or behaviors of relevant actors other than adversaries, basically category (5) against targets other than enemy troops. This could include other actors in the immediate operating environment (such as non-state actors, or relevant civilian populations, or partner-nation forces) or relevant actors outside the area of physical operations (such as the domestic constituencies that support the adversary, or one's own domestic constituents, or senior leadership/national command authority on either side, or citizens and leaders in nations not a party to the conflict that contribute to the overall accord of international legitimacy). This category is fairly like (5) but includes a broader scope, not only geographic scope but types of relevant actors and timescale as well. While (5) is more focused on things that affect action and behavior in combat, this category includes things that affect perceptions and behavior more broadly and over time. Thus, this category requires tracking and understanding things like narratives, baseline attitudes, and legitimizing processes. Of course, narratives and other longer-term processes can also contribute to shaping baseline proclivities or vulnerability to other effects; thus, they might blur into other categories as a minor influence.

These six categories are distinct but also contain other divisions. Notably a division between rational processing of information and decision-making under various human conditions, such as culture, personality, individuality, psychology, emotion, stress, etc. Categories (1), (2), and (3) all focus on rational processes, and assume that units and subordinates will do what they "should" based on their situational awareness and their orders. Category (4) crosses the boundary and allows that various units and subordinates might have different rationales in their rationality, or might do things based on psychology, personality, or circumstances. Categories (5) and (6) are also on the human conditions side of this division.

Each of these different kinds of information can support different kinds of advantages. By reviewing each of these categories of information in light of what we have already discovered about advantage, we can put some further bounds on *information advantage*.

PUTTING IT ALL TOGETHER: INFORMATION ADVANTAGE

To review: I have offered six categories of advantage (capacity and capability advantage, persistent vs. fleeting advantage, known vs. unknown advantage), five properties of advantage (relative, conditional, active/displayed, best when asymmetrical, and a means not an end), and six categories of information (1 - situational awareness, 2 - command and control, 3 - factors that degrade C2 and SA, 4 - factors that cause subordinates to behave contrary to orders, 5

– efforts to prevent or impose that, and 6 – efforts to affect perceptions and behaviors more broadly). The Table summarizes the *information advantage*.

Table 1: Categories and Properties of Advantage, Categories of Information

Properties of Advantage	Categories of Advantage	Categories of Information
Relative	Capacity	(1) Situational awareness
Conditional	Capability	(2) Command and control
Must be exploited	Persistent	(3) Factors that degrade C2 and SA
Best when asymmetrical	Fleeting	(4) Factors leading to contrary behavior
A means not an end	Unknown	(5) Efforts to affect behavior
	Known	(6) Efforts to affect behavior more broadly

In this section, I review each of the six categories of information looking to provide some specificity or categories of things that might constitute *information advantage*.

Beginning, then, with situational awareness. One can have *persistent advantage* in both *capability* and *capacity* regarding situational awareness, having more sensors, better analytic capability, systems that update more rapidly, etc. Advantage relative to a competitor might come from extending awareness over a greater area, or with greater fidelity, or with greater tempo (either refreshing more frequently, or with fewer delays between sensing and updates to the common operating picture), or through better interpretation or understanding of what is sensed. Likely related to better general capability and capacity (but not necessarily), one might also have a *fleeting* advantage in situational awareness, successfully finding and fixing an elusive, high-value individual, or gaining indications and warnings of a planned enemy movement or aggressive action. The side with the general advantage in situational awareness will not always have the advantage regarding the discovery of every position and movement by the other side, as fewer, less capable systems can still be in the right place at the right time. Advantage in situational awareness can be both *known* and *unknown*, or even a mix of the two. A commander might know an opponent has generally better ISR, but not know if it has detected his/her flanking force; this knowledge of the opponent’s superior ISR might prevent him/her from attempting to send a flanking force in the first place, expecting that his/her forces will be detected and countered. Advantage in this category comes from more and better ISR, perhaps combined with good fortune or other favorable circumstances.

Command and control advantages generally stem from relative reach and speed of decisions, and the communication of them. Commanders who can more rapidly formulate and convey orders to subordinate echelons than their enemies gain the advantage, and commanders who are in communication with more of their more distant subordinate forces than their enemy similarly gain an advantage. Command and control advantage is central in Colonel John Boyd’s thinking about warfare as embodied in the OODA loop (observe–orient–decide–act).^[27] Advantages in the

tempo of situational awareness and command and control (cycling OODA faster than the opponent) will eventually cause an adversary to fall behind and thus surrender other advantages.

C2 advantage can be both *persistent* and *fleeting*, and sometimes both. A persistent capability advantage in C2 leads to generally faster and more efficient decisions and communications but can also produce a fleeting advantage in which the commander of the force with advantage can perceive and react to changing circumstances before its opponent can. Many forms of C2 advantage involve tempo, either the actual tempo of decision-making or the potential tempo supported by the information, networks, and systems. Note that just because one *can* OODA faster than the opponent does not necessarily mean that you are doing so at any given moment: an indecisive commander within a superior situational awareness and command and control system can still cede the initiative (and thus the advantage).

The use of a C2 system that involves mission tactics, mission command, or mission-type orders can provide an advantage over those which do not. Under mission command, even when out of communication and unable to receive orders from higher echelons, subordinate leaders continue to act based on their understanding of the situation and the commander's intent.^[28]

Forces that do both category 1 (SA) and category 2 (C2) better than their foes will have a consistent and persistent advantage: decision advantage. The force with better SA and C2 will usually make decisions faster (due to an advantage in decision speed) and better (due to an advantage in decision quality). Not every decision will be optimal or without delay but, on average the side with decision advantage will make better, faster decisions.

Information categories 1 and 2 focus on doing things (SA and C2) better than an opponent. Information category 3 makes this a contested competition, including activities that degrade others' SA and C2 (or protect one's own C2 and SA from such efforts). This includes efforts to deceive sensors (such as camouflage or decoys), efforts to prevent sensors from reporting (such as the destruction, jamming, or hacking of reporting networks), and efforts to promote mistaken conclusions about what is observed. This also includes efforts to avoid exposing plans and actions, such as counterintelligence, operations security, and signature management. This includes any effort to corrupt or slow enemy OODA, including efforts to jam or interrupt conveyance of orders (the seam between deciding and acting, where the decision must be conveyed to those who should act). Further, anything that can threaten the confidentiality, availability, or integrity of information or information systems could contribute to this category.

Advantage in the third category comes from persistently better capability (either ISR capable of piercing enemy deceptions, or sophisticated equipment routinely able to avoid detection or otherwise affect adversary systems), or as fleeting advantages through clever combinations of stratagem, ruse, and thoughtful application of capability. Known and unknown advantages can be particularly powerful here. If one side has a known advantage in stealth or camouflage, the other side may not fully trust its own situational awareness and thus cede further advantage to the advantaged force. An unknown and undetected advantage could

allow a force to affect enemy SA or C2 without their knowledge, enabling extensive further advantage through the manipulation of enemy perceptions and actions. When seeking to deny an opponent of decision advantage, anything that threatens either decision speed or decision quality can be effective.

The fourth category of information encompasses factors that might make a subordinate act in a way that is inconsistent with the preferences of superiors. Advantages in this category stem from aspects of context and from persistent qualities of forces. Better leadership, better morale, better training, and combat experience could convey advantage in this area. Other effects of operations, such as reduced communications availability, casualties, shock, surprise, and suppression, can also convey a fleeting advantage to the side suffering less from these effects. To unpack sources of advantage related to category 4 requires the inclusion of category 5, efforts to intentionally promote contrary behavior. In this related category, advantage could come from the intentional use of shock or surprise to promote a rout, or the combination of various physical and informational capabilities to increase the likelihood of desired battlefield behaviors. Advantage in this category falls to the side that better understands the human, cultural, and other dynamics that drive battlefield behavior and best exploits them. A persistent capability advantage in understanding human dynamics may lead to repeated fleeting advantages as windows of opportunity to leverage that understanding through the application of other capabilities. Further advantage might accrue to the side which seeks to scrutinize and better understand the individual enemy subordinate leaders whose preferences and proclivities might be leveraged. Advantage in this category also falls to the side that emphasizes moral and mental effects from combat and other operations, and specifies objectives in terms of actions desired from enemy forces; over a side that employs attritionist thinking and focuses only on the physical effects of combat.

The sixth and final category of information includes factors and efforts that influence a broader range of relevant actors, including government authorities, civilian constituencies, and non-combatants in an area of operations. While these sorts of groups and individuals are certainly affected by the presence and action of military forces, advantage in this category likely accrues on the side that has better messaging and engagement (whether by the military, across other parts of government, or leveraged in partnership with civil society). Further advantage likely accrues to the side whose relevant actors and supporters are most resilient to influence and manipulation. Similarly, the side whose objectives require only modest influence to achieve, or whose objectives can be met through the influence of groups predisposed toward the desired behaviors, are also advantaged. This is an area in which both capability and capacity advantage are relevant, as a small number of excellent influencers will likely not be advantaged against a much larger number of only adequate influencers. In this category, quantity clearly has a quality all its own.^[29]

As is the case in other information categories, persistent capability or capacity advantage does not ensure advantage in all instances across this category. Some efforts from the side with lower capability and capacity will still lead to advantageous results, especially with some groups and populations. Further, the uncertainty associated with human dynamics and influence will sometimes cause success to follow the side with a less apparent relative advantage in this category.

CONCLUSION: SPECIFY THE INFORMATION ADVANTAGE SOUGHT

On further reflection, I am now wholly convinced that the joint force should seek to establish and maintain information advantages, but that greater specificity is required in that pursuit. Advantage is a means to an end; it needs to pertain to specific objectives relative to (or over) specific adversaries and competitors. I have identified six categories of advantage and six categories of information. Future discussions of “information advantage” would do well to specify what kind of advantage is desired in which category of information, and relative to whom. Here are some examples of specific forms and objects of information advantage:

- ◆ The US tradition of mission command gives US forces a persistent command and control advantage over Russian forces trained on Soviet models when communication networks are degraded; the joint force should seek to sustain the factors that contribute to that advantage.
- ◆ Russia’s propaganda apparatus demonstrates a persistent capacity and capability advantage over the United States and NATO allies in the area of influencing perceptions and behaviors of various civilian groups by virtue of the large number of distribution sources and modes they employ, their willingness to employ them, and their understanding of human dynamics and societal vulnerabilities; the United States should seek ways to reduce this advantage.
- ◆ US cyber capabilities might provide a capability advantage in the area of affecting an adversary’s command and control and situation awareness during major combat operations that is presently unknown to near-peer competitors; the US should seek to grow this potential advantage and sustain its status as an unknown advantage.

These are just examples. They are not meant to suggest priorities or specific ways the US should seek information advantage, but only to demonstrate the shape of expressions of information advantage that specify the type of advantage, the type of information, and over whom advantage is sought. I encourage stakeholders across the joint force to be similarly specific when thinking, speaking, and writing about information advantage. I am sure there are additional relevant categories of advantage, and possibly additional relevant categories of information, than the ones I have identified here. I would be very pleased to see the lists expanded through use.

NOTES

1. U.S. Department of Defense, *Strategy for Operations in the Information Environment*, Washington, D.C., June 2016, 4.
2. *Joint Concept for Operating in the Information Environment*, Washington, D.C.: U.S. Joint Chiefs of Staff, July 2018, preface.
3. *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, 6 & 8.
4. Joint Publication 3-13, *Information Operations*, Washington, D.C.: U.S. Joint Chiefs of Staff, incorporating change 1, November 20, 2014, GL-3.
5. Ministry of Defence, *Information Advantage*, Joint Concept Note 2/18, November 2018, 7.
6. Australian Department of Defence, *Operation Series: Information Activities*, Australian Defence Doctrine Publication 3.13, third edition, 2013, 1-3.
7. Robert R. Leonhard, *The Principles of War for the Information Age*, New York: Ballentine Books, 1998, 54.
8. See the discussion of Maneuver Warfare in Marine Corps Doctrinal Publication 1, *Warfighting*, Washington, D.C., June 20, 1997.
9. Joint Publication 3-0, *Joint Operations*, Washington, D.C.: U.S. Joint Chiefs of staff, incorporating change 1, October 22, 2018, A-2.
10. Headquarters, U.S. Department of the Army, *Operations*, Army Doctrine Publication 3-0, Washington, D.C., July 2019, 4-5.
11. Four definitions for advantage, dictionary.com.
12. Headquarters, U.S. Department of the Army, *Operations*, Army Doctrine Publication 3-0.
13. Ibid.
14. Ibid.
15. From Marine Corps Doctrinal Publication 1, *Warfighting*, Washington, D.C., June 20, 1997.
16. Leonhard, 58.
17. Jim Storr, *The Human Face of War*, United Kingdom: Continuum, 2009, 94.
18. UK JDN 2/18, *Information Advantage*.
19. Mentioned in the 2018 NSS, as well as other places.
20. Antulio J. Echevarria II, *Military Strategy: A Very Short Introduction*, Oxford University Press, 2017.
21. See John Frederick Charles Fuller, *The Foundations of the Science of War*, London, Hutchinson, 1926; reprinted by Forgotten Books, 2018, and Robert R. Leonhard, *The Principles of War for the Information Age*, New York: Ballentine Books, 1998.
22. Headquarters, U.S. Department of the Army, *Operations*, Army Doctrine Publication 3-0, Washington, D.C., July 2019, 4-5.
23. If one of the outcomes is *not* favorable to your success, then your enemy can easily thwart your advantage. Consider, for example, the World War II-era German offensive through the Ardennes to avoid the Maginot Line.
24. JP 3-13, ix.
25. These six categories and their description are drawn from Christopher Paul, Yuna Huh Wong, and Elizabeth M. Bartels, *Opportunities for Including the Information Environment in U.S. Marine Corps Wargames*, RAND Corporation: Forthcoming.
26. Consider some of the examples provided in Patricia Frost, Clifton McClung, and Christopher Walls, "Tactical Considerations for a Commander to Fight and Win in the Electromagnetic Spectrum," *The Cyber Defense Review*, Spring 2018, 15-26.
27. See, for example, John R. Boyd, "The Essence of Winning and Losing," unpublished briefing, June 28, 1995.
28. Headquarters, U.S. Department of the Army, *Mission Command*, Army Doctrine Publication 6-0, Washington, D.C., May 2012.