

WARFARE IN THE INFORMATION AGE

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Abstract: *The paper is focused on changes occurred in military organizations in Information Age. During Industrial Age the military structure of forces evolved according with principles of decomposition, specialization, hierarchy, optimization, deconfliction, centralized planning, and decentralized execution. But now the solutions based upon Industrial Age assumptions and practices will break down and fail in the Information Age. This will happen no matter how well intentioned, hardworking, or dedicated the leadership and the force are. Two key force capabilities needed by Information Age militaries are interoperability and agility. Both interoperability and agility are provided by Network centric warfare theory of war.*

Keywords: *information, warfare, network, command, control,*

1. INFORMATION AGE

“Ages” are proclaimed when something happens to cause a discontinuity in multiple dimensions that affect civilization. Economics and power are historically closely related. What distinguish the Information Age from the Industrial Age are the economics of information and the nature of the power of information. With the coming of the Information Age, there is an opportunity to provide widespread access to information-related services and capabilities only dreamed about in previous eras. This increased access to information provides an opportunity to rethink the ways that we organize, manage, and control. For the very first time in history the information power burst the efficiency at such level which

is very difficult and expensive to be overcome by mass.

The original precept, *knowledge is power*, conveyed the notion that an individual’s worth was related to their possession of information. The more exclusivity associated with the possession, the more valuable the information. Hence, information was a commodity like any other commodity, whose value was related to scarcity. Individual and organizational behaviors reflected this value paradigm. Hoarding information and exploiting its scarcity have been the norm for some time.

These behaviors can no longer be tolerated because the economics of information have changed. With the cost of information and its dissemination dropping dramatically, information has become a dominant factor in the value chain for almost

every product or service. As the costs drop, so do the barriers to entry. Hence, competitors in many domains are seizing on the opportunity provided by “cheap” information and communications to redefine business processes and products. These trends apply to the realm of national security as well. Information Age concepts and technologies are being adopted by many nations.

The military response to the Information Age is Network Centric Warfare.

2. INDUSTRIAL AGE LEGACY

The term network-centric warfare broadly describes the combination of strategies, emerging tactics, techniques, and procedures, and organizations that a fully or even a partially networked force can employ to create a decisive war fighting advantage. The key to understand the term network centric warfare is command and control (C2) approach. Command and Control (C2) is the common military term for management of personnel and resources. The principles underlying traditional command and control apply not only to Industrial Age warfare, but also to Industrial Age economies and businesses, are decomposition, specialization, hierarchy, optimization, deconfliction, centralized planning, and decentralized execution.

The principle of decomposition is applying a “divide and conquer” mentality to all problems. The practices of separating combat into land, sea, and air (and space), are

an example of decomposing warfare into manageable pieces.

If a sound set of decompositions is made, then these organizational subsets of the organization can develop professional specialties that help the overall organization to perform its mission and achieve its objectives. In military affairs, specialization (creation of career branches and very specialized organizations) enabled much more efficient career development and training. During military operations, the specialized capabilities often generated capacities that simply could not be created by groups of generalists.

The organizational consequence of Industrial Age specialization is hierarchy. The efforts of individuals and highly specialized entities must be focused and controlled so that they act in concert to achieve the goals of the larger organizations that they support. The size and the number of levels that separate the leader(s) of an enterprise and the specialists that are needed to accomplish the tasks at hand are a function of the overall size of the enterprise and the effective span of control. The number of layers is a function of the span of control. As the span of control decreases, the number of layers that are needed (for an organization of the same size) increases. In such hierarchies, information needs to flow up and down the chain of command. This is true of policy information, plans, orders, and information about the battlespace (both reports about the enemy and reports about friendly forces). The more layers, the longer this takes and the higher the probability of

an error or distortion. Even today, correspondence to a member of a military command is formally addressed to the commanding officer of the unit and is then distributed by the headquarters. In other words, all information intended for subordinates is recognized as belonging to and flowing through the hierarchy. Indeed, control of information was a major tool for controlling Industrial Age organizations.

Industrial Age militaries decomposed the battlespace, created layered organizations, divided into specializations, and organized forces into hierarchies. Thinking that this approach transformed the complexity of war and large operations into a collection of simple, manageable tasks and problems, the Industrial Age military felt that they were able to focus on the optimization of processes. Virtually all Industrial Age militaries created “approved scenarios” against which their threat-based decisions were optimized. Of course, they experienced difficulties when forced to fight against military organizations other than those they had planned against.

Given that the elements of military forces were optimized for specific missions under well known and understood circumstances, Industrial Age command and control processes relied heavily on control measures that would deconflict the elements of the force. The ultimate goal was to provide each element of the force with the best possible operating environment.

This was a natural consequence of specialization and optimization. Deconfliction is far better than

conflicted operations (where friendly units impede one another), but it falls well short of the performance possible when military assets are employed synergistically.

Planning became a crucial part of Industrial Age command and control because it enabled commanders to arrange forces and events in time and space so as to maximize the likelihood of success (mission accomplishment).

Industrial Age commanders were, however, aware of the fragility of plans in the face of the harsh and dynamic operating environment of combat. One of the most famous quotations about planning is, “No plan survives first contact with the enemy.” Understanding the limits of military plans, commanders (particularly in highly professional forces) encouraged initiative (innovation and aggressive actions) and decentralized execution within the overall commander’s intent. This was not just a concession to the inherent difficulty of foreseeing all eventualities. It was also a reflection of the fact that the commander on the scene often had better information than those removed from the battlespace.

Taken together, they create a pattern analogous to control theory. The Industrial Age principles and practices of decomposition, specialization, hierarchy, optimization, and deconfliction, combined with Industrial Age command and control based on centralized planning and decentralized execution, will not permit an organization to bring all of its information (and expertise) or its

assets to bear. In addition, Industrial Age organizations are not optimized for interoperability or agility. Thus, solutions based upon Industrial Age assumptions and practices will break down and fail in the Information Age. This will happen no matter how well intentioned, hardworking, or dedicated the leadership and the force are.

Two key force capabilities needed by Information Age militaries are *interoperability* and *agility*. Organizations that are products of Industrial Age thinking are not well suited for significant improvements in interoperability or agility [1].

3. NETWORK CENTRIC WARFARE

Network centric warfare (NCW) is an emerging theory of war in the Information Age. The term network-centric warfare broadly describes the combination of strategies, emerging tactics, techniques, and procedures, and organizations that a fully or even a partially networked force can employ to create a decisive war fighting advantage.

A networked force conducting network centric operations (NCO) is an essential enabler for the conduct of effects based operations. Effects based operations (EBO) are “sets of actions directed at shaping the behavior of friends, neutrals, and foes in peace, crisis, and war.”

NCW generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, high tempo of operations, greater lethality,

increased survivability, and a degree of self-synchronization. In essence, it translates information advantage into combat power by effectively linking friendly forces within the battlespace, providing a much improved shared awareness of the situation, enabling more rapid and effective decision making at all levels of military operations, and thereby allowing for increased speed of execution.

Information technology advances in the areas of command and control (C2); intelligence, surveillance, and reconnaissance (ISR); and precision weapons delivery are dramatically reshaping the conduct of warfare in the 21st century. NCW will accelerate the decision cycle by linking sensors, communications networks, and weapons systems via an interconnected grid, thereby enhancing our ability to achieve information and decision superiority over an adversary during the conduct of military operations. While NCW is the theory, network centric operations (NCO) is the theory put into action. In other words, the conduct of NCO represents the implementation of NCW.

The objective of decision superiority is to turn an information advantage into a competitive advantage. This competitive advantage is readily apparent when comparing forces conducting NCO and those operating under the old paradigm of platform centric operations. Platform centric forces lack the ability to leverage the synergies created through a networked force. A force implementing NCW is more adaptive, ready to respond to uncertainty in the very dynamic

environment of the future at all levels of warfare and across the range of military operations.

Over thousands of years of recorded history, the vast majority of innovations that created significant war fighting advantages were concentrated in the physical domain as opposed to the information domain. These innovations translated primarily into advantages at the tactical level of warfare, but they also had an impact on what are now generally referred to as the operational and strategic levels of warfare. They resulted in such battlefield advantages as: increased range of engagement, increased lethality, increased speed of maneuver and increased protection and survivability.

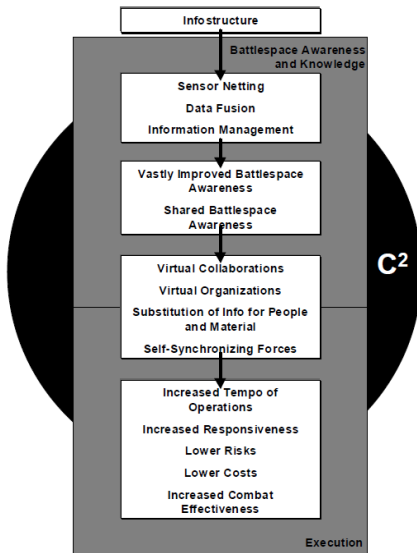


Fig. 1 The Military as a Network-Centric Enterprise

In a more technical sense, a networked force improves operational tempo by accelerating the Observation-Oriented phases of Boyd's Observation-Oriented-

Decision-Action (OODA) loop.

Identified during the 1970s by US Air Force strategist John Boyd, the OODA is an abstraction which describes the sequence of events while must take place in any military engagement. The opponent must be observed to gather information then the attacker must orient himself to the situation or context, then decide and act accordingly. The OODA loop is thus fundamental to all military operations, from strategic down to individual combat. It loop is an inevitable part of reality and has been so since the first tribal wars of 25,000 years ago, as it is fundamental to any predator-prey interaction in the biological world. Sadly, its proper understanding had to wait until the 1970s.

At a philosophical and practical level what confers a key advantage in engagements is the ability to stay ahead of an opponent and dictate the tempo of the engagement - to maintain the initiative and keep an opponent off balance. In effect, the attacker forces his opponent into a reactive posture and denies the opponent any opportunity to drive the engagement to an advantage.

The player with the faster OODA loop, all else being equal, will defeat the opponent with the slower OODA loop by blocking or pre-empting any move the opponent with the slower OODA loop attempts to make.

The four components of the OODA loop can be split into three which are associated with processing information, and one which is associated with movement and application of firepower. Observation-Oriented-Decision is

information centric while Action is kinematic or centered in movement, position and firepower. If we aim to accelerate our OODA loops to achieve higher operational tempo than an enemy, we have to accelerate all four components of the loop.

Much of twentieth century war fighting technique and technology dealt with accelerating the kinetic portion of the OODA loop. Mobility, precision and firepower increases were the result of this evolution. There are practical limits as to how far we can push the kinetic aspect of the OODA loop - more destructive weapons produce collateral damage, faster platforms and weapons incur ever increasing costs. Accordingly we have seen evolution slow down in this domain since the 1960s. Many weapons and platforms widely used today were designed in the 1950s may remain in use for decades to come.

Observation-Orientation-Decision are all about gathering information, distributing information, analyzing information, understanding information and deciding how to act upon this information. The faster we can gather, distribute, analyze, understand information, the faster we can decide, and arguably the better we can decide how and when to act in combat. Networking is a mechanism via which the Observation-Orientation phases of the loop can be accelerated, and the Decision phase facilitated [3].

4. CONCLUSION

The warfare in Information Age will be different than warfare in

Industrial Age. In order to achieve a military superiority the military forces should adapt to the new conditions. The simple networking of the present structure of army is not enough. A new structure of army must be creating which should allow exchange of information at a high speed.

At this point the speed of action will have a great impact on the command and control. Command and control can not obey the management function of planning, organizing, staffing, directing and controlling. During the fight the command and control should obey OODA loop.

In fact during the building of force the commander should be a skilled manager but during the fight the commander should apply control theory that deals with the behavior of dynamic systems.

The OODA loop is a simple and efficient model to describe the reality of fight.

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