

**DECENTRALIZING DECISION MAKING IN MODERN
MILITARY ORGANIZATIONS**

by

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ABSTRACT

For organizations, the value of information is to improve decision making. In the military in particular, information's role in warfare has always been to affect decisions at all levels – from strategic to tactical - to put one's forces in a position of advantage. In the information age, the cost of communicating such information has been so phenomenally reduced that it now becomes possible for individuals and entire organizations to tap vast amounts of information. This thesis seeks to address the question of how the modern military can best be designed to harness the power of the information revolution to enhance its ability to make faster, better decisions and thus to become more effective in war as well as in times of peace.

To do so, the thesis first considers lessons from military history on the essence of decision making, analyzes the implications of the declining cost of communications and examines new organizational trends in both the corporate world and the military. With this foundation, new organizational designs for the military are proposed and scenarios for their use are described. These new organizational designs are optimized for the information age and incorporate increasingly decentralized making structures. Noting that such formal organizational restructuring by itself is inadequate, the thesis then looks at the shifts in leadership orientation and organizational culture necessary to create the environment that encourages empowerment of individuals as well as the competencies for the individual that are becoming increasingly important in an increasingly decentralized world. Finally, a framework that synthesizes the different ingredients necessary for designing the military organization in the 21st century is proposed.

Thesis Supervisor: Thomas W. Malone
Title: Patrick J. McGovern Professor of Information Systems

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Ever set out on a project in one direction and radically changing course mid-stream? How I ended up researching on this topic for my thesis was such a story. I had initially picked a technology management topic and had already started some research groundwork on it. Then I attended a “Distributed Leadership” workshop conducted by Professors Thomas Malone and Wanda Orlikowski. The point made by Prof Malone that managers in the corporation of the future would need to shift their leadership approach from command and control to coordinate and cultivate as well as the growing need for leadership to be distributed throughout the organization struck a chord in me. Being an officer in the Singapore Armed Forces, it stirred a passion within me to want to study further the applicability of this and the related idea of decentralizing decision making for the military organization.

As such, I would like to first thank Profs Malone and Orlikowski for inspiring me toward this topic. In particular, I am grateful to Prof Malone for agreeing on short notice to accept the ‘liability’ of conducting such workshops and supervise the thesis despite his heavy workload. I am also very appreciative of all the guidance he provided. This thesis is a testament of the applicability of the distributed leadership concept that the motivation of individuals should come from within and the resulting energy would be greater if the individual is passionate about the work. While it was extremely trying to work on a compressed timeline for the thesis, I thoroughly enjoyed myself and felt that I really learnt much from the whole process.

I also want to thank Mr. Dick O’Neill, Director of the Highlands Forum for kindly taking time to share his insights on decentralizing decision making in the military, allowing me to access the wealth of materials in the Highland Forums website as well as pointing to useful references on the topic. They had been most helpful.

My wife, Lay Yen, has provided unstinting support for me throughout. I want to express my sincere gratitude for all her love and encouragement, and for managing the house which two active kids reside so well. Isaac and Kimberly, my lovely children, have provided me much joy and the necessary breaks from the rigors of Sloan School.

Finally, I want to thank my mum, relatives and friends for their prayers for me and my family while we spent the year here in MIT. Jesus, my Savior and Lord, has truly been our fortress and strength throughout and I want to dedicate this thesis to Him.

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CHAPTER 1: INTRODUCTION

For organizations, the value of information is to improve decision making. In the military in particular, information's role in warfare has always been to affect decisions at all levels – from strategic to tactical - to put one's forces in a position of advantage. In the information age, the cost of communicating such information has been so phenomenally reduced that it now becomes possible for individuals and entire organizations to tap vast amounts of information. With the convergence of wireless technology and the requirements of enterprise networks and the internet projected to be achieved by 2005¹ in developed countries like the US, communications will also become increasingly ubiquitous, providing the capability for communications devices to be used in any place, at any time, regardless of the access and the administrative domains.

The question for the modern military is how as an organization it can most effectively harness the power of this information revolution to enhance its ability to make faster, better decisions such that it becomes more effective in war as well as in times of peace. The modern military organization here refers to military organizations in countries where an advanced information technology (IT) infrastructure exists at a national level and where the military is actively incorporating the use of IT for its operations. The most prominent, but certainly not the only, example of such an organization is the US military. In addition, while land based warfare has been used here largely because of the ability to compare this over a longer stretch of military history, the issues discussed here are also relevant for naval or aerial warfare.

¹ Llana, Andres JR. (1999). *Convergence of Wireless Technology and Enterprise Networks: Integrating the Internet*, Computer Technology Research Corporation, South Carolina.

The focus of this thesis, therefore, is to review the traditional hierarchical organizational model that has served the military for centuries and consider how the military could best adapt itself in the 21st century. This is not a thesis about how to use information as a means of warfare known as “information operations” which refers to “actions taken to affect adversary information and information systems while defending one's own information and information systems”² but rather how the military can organize itself around information to best fight wars.

Often, the military has associated key decision making capacity in its organization especially during operations with the term “command” or “an order given by a commander; that is, the will of the commander expressed for the purpose of bringing about a particular action”³. For this thesis however, I would like to look at command as one form of decision making capacity possible (albeit the dominant form exercised by militaries to date) and explore other means for which decision making could be undertaken especially with the possibilities enabled by the information revolution.

To achieve this, the thesis starts by reviewing how militaries used to organize themselves to exercise decision making through a quick scan of selected events in military history in Chapter 2. This will provide insights to the role of communications in shaping the evolution of the military organization as we know of today as well as draw lessons as to where the essence of this decision making lie.

² Definition according to the US Department of Defense Dictionary of Military Terms, <http://www.dtic.mil/doctrine/jel/doddict/>

³ Ibid

Chapter 3 then considers how the costs of communications affect decision making structures and the potential that this has to shape the structure of organizations. In this chapter, we look at new organizational structures that have emerged in business organizations that may be indicative of the direction in which the corporate world could transform itself in the 21st century. The chapter also analyses the merits of the different forms of organization and addresses the issue of the extent to which the military is similar to or different from the business world.

Taking into account the military lessons learnt from the past as well as the new structures emerging in corporate organizations, Chapter 4 will consider the new modes of warfare emerging in military thinking and analyze the ways the organization can be structured to fulfill its missions. It will do so with a view to the likely shape of warfare in the 21st century as its backdrop. In particular, the chapter will focus on whether non-traditional structures will replace the current hierarchical organization, or if not, whether they would be relevant in specific situations. It will also compare the new organizational structures appearing in the corporate world and assess their applicability to the military.

Having seen how even the traditional hierarchy of military organization will be better optimized for war if commanders at all levels are empowered to take on greater decision making, Chapter 5 discusses the means to produce soldiers who are capable of doing so effectively. At the management level, the chapter discusses the shifts in leadership orientation and organizational culture necessary to create the environment that

would encourage this. The chapter then considers the competencies at the individual level and how the capabilities highlighted by the Sloan leadership model would become increasingly important in an increasingly decentralized world.

Chapter 6 then draws the discussion to a close by summarizing the key lessons into a design framework that can help the modern military organization in making decisions about what to centralize and the areas to decentralize. It also suggests areas for further research.

CHAPTER 2: COMMUNICATIONS AND MILITARY ORGANIZATIONS – A HISTORICAL PERSPECTIVE

If systematic study of the past is taken away, only personal experience, hearsay, and intuition remain. Military history may be an inadequate tool for commanders to rely on, but a better one has yet to be designed.

- Martin Van Creveld¹

2.1 Introduction

This chapter takes a selective scan of how the organization of militaries in the past has evolved, with a slant toward the impact of technological advances on this evolution, in particular those involved in communicating information. It is not meant to be a detailed analysis of military history or battles but more so an extraction of the lessons over a long period of time necessary for the understanding on the essentials for effective command, the relationship between organization structure and communications as well as the trends for organization structure. Such a study of history is useful to shed light on the fundamental parameters or principles to bear in mind before future alternative organizational structures are considered. The facts described in this chapter with the exception of the review of Operation Desert Storm had been distilled primarily from Martin Van Creveld's "*Command in War*" as I found the book providing the best details and data in the context of what I wanted to analyze. Where necessary, this is supplemented with other readings.

¹ Van Creveld (1985)

2.2 Before the 18th Century

Van Creveld (1985) terms the period up to just prior to 1796 as the “Stone Age of Command” because the command of military forces were limited by inadequate communications and as a result the commander had to be close to his troops to make the important decisions. As a result of the inability of armies to gather, process and transmit information, the size of armies and missions were constrained. Permanent formations rarely exceeded 3000 and field armies were seldom in excess of 80,000, and once assembled, were often unable to be commanded effectively.

Information traveled as fast as couriers on horseback could journey. Faster, long range communications such as optical telegraphs based on fire or smoke signals were available since the time of the Roman Empire but the information that could be transmitted had to be simple and prearranged. In addition, these means of information transmissions could only be deployed easily behind the army and as such were not of much use for offensive warfare. Primarily due to the lack of long range communications², commanders favored keeping their forces together rather than separating them. Strategy was thus limited to operations commanders could keep under their control and this usually meant within their vicinity and conducted in a single force.

The organization of the military force in the battlefield during this period could be assessed to be largely centralized with commanders taking charge of the most important decisions. Primitive means to communicate information was a key reason for this. The

² Other reasons for this included the limited number of good roads and maps as well as the absence of good time keeping devices.

noteworthy exception here was what the Romans implemented some two thousand years ago and which Van Creveld (1985) considers as most successful in dealing with the inadequacy of communication means during that period. He notes that the Roman system was “a command system, not based on any technical superiority, that relied on standardized formations, proper organization at the lowest level, a fixed repertoire of tactical movements, and *the diffusion of authority throughout the army in order to greatly reduce the need for detailed control.*”³ (italics added).

2.3 Napoleon’s Revolution in Military Affairs (RMA)

Napoleon Bonaparte’s system of command in the late 18th to early 19th century was revolutionary not as a result of technological superiority against his opponents but because of its superior doctrine and organization. He established a system that effectively organized an Army of 150,000 through a system of command, control and communications far more advanced than any previous army had used. This was extraordinary because he was able to achieve this in spite of the fact that except for the Chappe telegraph used for long range communications, there were no other technological advances in the state of communications.

While Napoleon had an Imperial Headquarters which supported his command over the *Grande Armée*, a key factor for his success in commanding forces of unprecedented scale was the organization of the *Grande Armée* to eight numbered corps of between 20-30,000 men, with each corps and the divisions under it to function as a

³ Van Creveld (1985), p.56.

fairly independent unit with its own structured general staff – a revolutionary feature at that time – as well as providing the corps a balanced combination of the three military arms (artillery, engineers and infantry). In fact, the corps remained as the primary unit in the organization of ground wars in modern militaries over two centuries later (Owens (2000)). The *Grande Armée* was the “first in history to radically decentralize the conduct of operations in the field and spread them over hundreds, later even thousands, of square miles or territory. Such a method of waging war required a two-way information transmission and processing system larger and more complex than anything previously attempted...”⁴.

Looking at the structure created by Napoleon, it could be said to be a relatively flat organizational hierarchy that comprised aspects of highly centralized command as well as decentralized decision making. To elaborate, the organization was flat at the top in that Napoleon made all strategic decisions and directly communicated them through his chief of staff to the corps. This also implied that he had a very large span of control, having to co-ordinate the strategic moves of eight corps. To do so, Napoleon had to be selective to focus on activities of corps which were considered key to the outcome of the battle i.e. the center of gravity while allowing others to function autonomously based on broad directive. For example, at the final battle of Jena-Auerstädt during the 1806 campaign against Prussia, Napoleon was intimately involved in directing the operations of three of the corps possibly where the fighting was the heaviest, while the remaining five were left largely to manage their fronts by themselves based on orders they received days ago.

⁴ Ibid, p.70.

There was no contradiction that Napoleon's command structure was both highly centralized and decentralized if one differentiated the levels of warfare. By and large, the organization was very centralized (perhaps more so than even his predecessors) in that Napoleon made practically all strategic or 'big picture' decision such as the assessment of the enemy's forces and intent, and the ordering of the corps' movement or change of direction/ mission. By giving his corps and divisions their own general staff, Napoleon departed from earlier commanders in allowing these units to be self sustaining and autonomous in their operations and actual conduct of the battle and as such achieved a fair level of operational and tactical decentralization. Van Creveld (1985) identifies several key factors to be crucial for such decentralization to be possible. First is the organization of the *Grande Armée* into self contained strategic units mentioned earlier. Another factor is the institutionalization of a reporting system for reports to and orders from the Imperial Headquarters together with the establishment of staff to deal with such a reporting system. The other important factor is in creating the ability for the commander (i.e. Napoleon) to use a "directed telescope" to cut through the hierarchy (through the use of selected envoys such as his adjutant generals) to zoom in and look for information he needed at different situations from any part of the organization. I believe that these ingredients are equally valid today. Napoleon's RMA also contrasted sharply with preceding commanders and even his contemporary opponents who were limited by traditional ways of organizing the military. He did not allow the inadequate communications infrastructure to constrain him to keep his forces close to him. Instead

Napoleon broke the norm and used a revolutionary organization to overcome the technological constraints of his time.

2.4 The Prussian General Staff

By mid 19th century, the telegraph proved a breakthrough technology for militaries in replacing the human messenger as a new effective means of transmitting information over long distances. However, being dependent on wire, it was unwieldy and required static stations and as such was more useful for defense rather than offense and was more suited for major headquarter and communication of strategy rather than the tactical battle communications. Other new technologies included weapons like the breech-loading rifles and transportation via the railway. The size of armies had also been steadily increasing. It was in this context which the earliest example of the modern General Staff organization was put in action by the Prussian Army during the 1866 Königgrätz campaign against Austria.

The Prussian General Staff system headed by the chief of staff Helmuth von Moltke was a General Headquarters comprising three departments and one which for the first time consisted of purely military personnel. Through extensive peacetime training, it developed into a highly methodical organization based on written staff work which enabled it to effectively control the large size of troops under it from the rear. In response to the limitations of the telegraph and the deficiencies of the tactical level subordinates, Moltke did not attempt to tighten controls but instead utilized the “General Staff –

together with the telegraph....to monitor the operations of the field armies, which were granted an unprecedented degree of independence.....Indeed, so flexible were Moltke's plans that it proved possible to accommodate his subordinates' moves, and their blunders, to the point that even a battle that was tactically lost – as actually happened in Königgrätz – would result in strategic victory.”⁵.

What we have here is a highly structured military organization which has been modeled by modern militaries but having a leadership which was willing to decentralize decision making to the extent of completely relinquishing tactical control but within confines of the prescribed strategic directive. The organizational structure was built to optimize the technology available, i.e. to communicate strategic intent but decentralized on the tactical battle of units under its command where it had no ability to control.

2.5 Blitzkrieg or “Lightning War”

Advancing close to a century forward from Moltke to World War II, the face of warfare has been transformed significantly. Technological revolutions such as the internal combustion engine gave rise to mobile warfare. The use of gasoline powered motor vehicles offered greatly improved operational flexibility to military forces compared to the constraints imposed by railroads and speed over horses. An armored division could cover in an hour what would take Napoleon's troops a day to traverse. Combat aircraft capable of close air support and battlefield interdiction meant that battles did not take place only at the point where the opposing fronts converged but command

⁵ Ibid, p.145.

posts and logistic bases at the rear were also subject to attacks from the air.

Communications technology had made substantial leaps and with tactical radios, it became the first time in history “which came close to making reliable, instantaneous two-way communication between mobile forces possible, regardless of the relative positions and speed of forces and regardless of the weather, time of day and terrain...”⁶. These have resulted in the increase in the size and physical spread of forces being commanded.

As much as technological breakthroughs shaped the nature of warfare, it was not sufficient to explain how the Germans achieved an astounding victory over the French and British forces at the onset of World War II in 1940 as both sides possessed comparable levels of technology. Rather “new technology wedded to innovative military organization and tactics” by the German military resulted in “... a six week German blitzkrieg (which) led the British Expeditionary Forces to flee from France at Dunkirk in humiliation, and France to surrender.”⁷. However, as noted by Fukuyama and Shulsky (1999), if one was to look at the formal organization of the German army, it would not have differed much structurally from its opponent. It included other factors notably the decentralization of decision making and assumption of initiative by lower echelons in the tradition of the Prussian General Staff described earlier. For example, a key complement to the high speed of advance of the front line Panzer units was the empowerment of these unit commanders to directly request air support. This stood in stark contrast to the many layers of approval required by the French and British command structures. The Germans had developed a principled based doctrine (*Auftragstaktik* or “mission orders”) which

⁶ Ibid, p.193.

⁷ Owens (2000), p.80

afforded wide latitude to the subordinate commanders based on commander's intent. In addition, the validation of the concept of integrating fast moving German armored divisions, close air support and radio communications was achieved through previous successful operations as well as rigorous war games drilled down to a very low level of the Panzar divisions. This prepared the lower level commanders to make the critical decisions during the actual operations (Builder et al (1999)). "Like Napoleon, but in charge of forces whose mobility was far superior and which consequently spread over much larger spaces, the World War II Panzar leader was forced to decentralize the chain of command and rely on intelligent initiative at every rank, beginning with the lowest, in order to seize every fleeting opportunity and exploit it to the hilt."⁸

2.6 Operation Desert Storm

Five decades later in 1991, the world witnessed a remarkable victory of the US led coalition forces to drive out Iraqi forces from Kuwait which it invaded in July 1990 and a massive destruction of Iraqi forces, with 27 out of its 42 divisions destroyed, with another 6 rendered ineffective and the air force almost entirely annihilated. This was in contrast to the less than 300 soldiers and 31 aircraft lost for the coalition forces. Initiated on January 17th 1991, Operation Desert Storm lasted only 42 days, with the ground war lasting for just 100 hours.

⁸ Van Creveld, p. 191.

In terms of technology, much has changed since World War II and included the use of precision guided munitions (PGMs) such as the Tomahawk cruise missiles, the F-117 stealth fighters and Unmanned Aerial Vehicles (UAVs) to name a few. Much more information was available to the commander as well. Satellites enabled global communications, weather support, reconnaissance as well as precision navigation. For the first time, commanders were provided a radically comprehensive ground and air situation picture through the Joint Surveillance and Targeting Radar System (JSTARS) and Airborne Warning and Control Systems (AWACS). In the eyes of many observers, information was highlighted as the most important and most novel aspect of the war as it was the first time in which existing weapons and systems were networked together with such effectiveness (Shapiro (1999)).

Another important factor that was instrumental for the operation's success was the proper working of the US chain of command and in particular how the Commander in Chief of Central Command, General Norman Schwarzkopf executed their roles. The political leaders and the Pentagon kept to providing the strategic policies and objectives while Schwarzkopf was allowed full authority to conduct his mission. Schwarzkopf, in turn sought not to intervene in his subordinate commanders battles unless it was an operationally strategic move such as bringing forward the main attack force approximately 18 hours when he received information that helped him realize that the Iraqis were withdrawing (Builder et al (1999)). In essence, Schwarzkopf acted in similar fashion to the preceding accounts in this chapter even with the ability to "see" the battlefield much more clearly and communicate to his commander at will. It once again

demonstrated the success of empowering commanders to execute their task autonomously, a situation of decentralization amidst a hierarchical structure.

However, there are those who felt that many problems remained for Operational Desert Storm. Retired Admiral Bill Owens, who was the Commander of the US Navy's 6th Fleet during the Gulf War and subsequently Vice Chairman of the US Joint Chiefs of Staff, felt that the flaws were "not from poor performance, but from an ingrained command hierarchy and an outmoded concept of war that had taken root during World War II and then during the Cold War.....Operation Desert Storm was a transitional conflict that contained the seeds of a revolution but did not constitute the transforming event itself. A decade after the Gulf conflict, that revolution has still yet occur."⁹ A key aspect of this revolution Owens was referring to was the organization of the military in the information age, and it is this aspect which would be discussed in detail in Chapter 4.

2.7 Analysis

These snippets of important junctures in military provided key insights for time tested successful military organizations.

2.7.1 Superiority of Decentralization

A recurring observation in the above accounts was that military organizations that performed well had top leadership that did not seek to control every detail of their subordinates' operations but instead sought through organization and other means to provide them the ability to function autonomously. This did not mean that all decisions

⁹ Owens (2000), pp 91, 96.

were decentralized. Rather, the forces under them were designed to be able to continue to function effectively in the absence of higher level instruction. It is thus essential to explore further why this was critical to the success of military operations.

The very dynamic nature of war brings about a high degree of uncertainty and Van Creveld (1985) concludes that it is as good as impossible to attain complete certainty in war and even the modern information systems that existed in his time did not appear to improve this quest for certainty of one's own forces, the enemy and details about the battlefield environment any more significantly than compared to the past. One factor could be the ever increasing scale, speed and complexity of military operations over time. The command systems including the organization's structure were therefore designed with the intention of best coping with such uncertainty and militaries throughout history had to choose between centralization and decentralization in their approach to the problem. The former is predicated upon the feeding of as much information as possible to the central directing body for the reduction of uncertainty of the entire organization. In contrast, the latter is premised that the uncertainty for the entire organization would be reduced by allowing greater freedom of the parts that constitute the organization to reduce the uncertainty for themselves. The very complexity of trying to reduce uncertainty in the fog of war through centralization clearly made decentralization stand out as the superior solution and this was attested by the experience of history. Decentralization enabled the organization to be more responsive and flexible in dealing with the emerging situation as the commanders *in situ* were able to make better decisions.

It should nonetheless be noted that decentralization did not just happen but these successful organizations were prepared in terms of organization, doctrine and training to cope with operating in this mode. To elaborate, in terms of organization, Napoleon equipped each corps with its own structured general staff to allow it to function with a high degree of autonomy while the Romans adopted standardization of procedures and fixed tactical movements. Doctrinally, the Germans operated on the concept of *Auftragstaktik* and that all commanders understood this was a result of years of training on the common doctrine.

2.7.2 Communications and Organization

The state of communications technology available at each point in time played an important role in influencing the shape of how militaries were organized. Inadequate communications up to the 18th century limited the missions and size of military organizations and necessitated the commander to be close to the troops to make the most important moves. This stood in stark contrast with Schwarzkopf who was detached from the main action hundreds of miles away at the war room in Riyadh, Saudi Arabia but able to get a good picture of the battlefield and communicate at will with all his commanders scattered all over the area of operations and with his superiors almost half a globe away. Advances in communications technology allows for a growing size and spread of forces to come under the control of the commander.

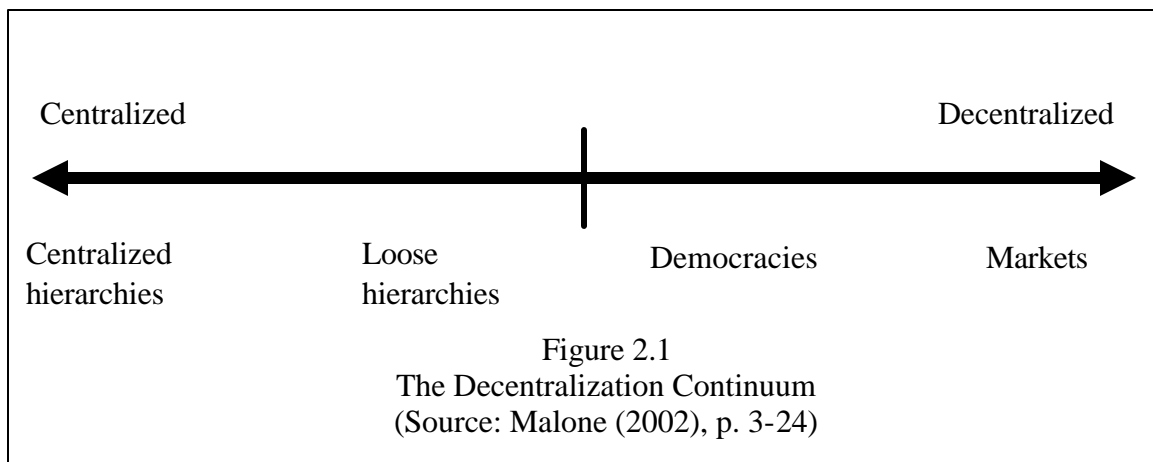
However, the communications capability does not remove the choice that military organizations need to make to handle uncertainty, namely whether to centralize or decentralize decision making. To minimize uncertainty Napoleon's opponents (as well as commanders that preceded him) chose to keep their forces closely concentrated so as to be able to maintain central control of them whereas Napoleon chose to decentralize his army. Napoleon's revolutionary action was one which optimized his organization around the available technology. Similarly, Schwarzkopf with state of the art communications at hand, could have chosen to micro manage his subordinate commanders but he did not. With similar state of technology, the Germans chose to flatten their decision making structure whilst the French and British maintained their bureaucratic approval process.

In sum, the state of communications technology is only part of a larger equation and should not dictate the how the military organization should function. As Van Creveld puts it, "communications and information processing technology merely constitutes one part of the general environment in which command operates.... since any technology is by definition subject to limitations, historical advances in command have often resulted less from any technological superiority that one side had over the other than from the ability to recognize those limitations and to discover ways –improvements in training, doctrine, and organization – of going around them."¹⁰

¹⁰ Van Creveld (1985), p.275.

2.7.3 The Degree of Decentralization

While decentralization had proven to be a successful recipe for military operations regardless of the available communications technology, the degree of decentralization warrants a separate discussion. Thus far, all the decentralization was conducted in the context of hierarchical organizations. Such a decentralized structure could be termed as “loose hierarchies” in Malone’s (2002) decentralization continuum as depicted in Figure 2.1. While it is clear what centralized hierarchies are, loose hierarchies refer to organizations where more and more decision making power is delegated to the subordinates. Going further to the right of this continuum we have “democracies” which are structures whereby the ‘citizens’ or each individual personnel in the organization in principle have the authority to make decisions (although they usually in practice decide on the major issues while delegating all other decision). Free markets are those where local decision makers have the authority to make all important decisions.



Malone noted that “when most people think about decentralization, they stop halfway – at the middle of this continuum.”¹¹ He asserts that in view of the reducing costs of communications in the information revolution, organizations of the future can move beyond loose hierarchies to adopt democracies or even free market structures. Could this hypothesis also prove valid for military organizations as well? This will be discussed in detail in Chapter 4 but before we do so, let us first review the new organizational forms appearing in business organizations today as a result of the decreasing cost of communications.

¹¹ Malone (2002). p.3-24

CHAPTER 3: COMMUNICATIONS AND DECENTRALIZATION

“Sooner or later, something fundamental in your business world will change.”

- Andrew Grove¹

3.1 Introduction

Chapter 2 concluded that the decentralization in military organizations that had been successful can be termed under the category of “loose hierarchies” in the decentralization continuum. This chapter continues the discussion on the decentralization continuum by first looking at the trend of decreasing communications costs and the distribution of decision making power in organizations. The chapter discusses how this trend has affected business corporations, pushing it toward the right of the decentralization continuum. In particular, examples of possible business organizations functioning under the “Democracies” and “Markets” model will be studied as well as the advantages and disadvantages of the different levels of decentralization. Thereafter, analyzing the similarities and differences between the military and corporations, the applicability of such organizational structures to the military organization will be discussed. The findings and assessments from Professor Thomas Malone’s draft book entitled *“After the Corporation: Putting People at the Center of Business”* form the primary basis of review for the chapter.

¹ Grove (1999).

3.2 The Falling Cost of Communications

Changes in the structure of organizations are shaped by a host of complex factors including the available technology, government regulations, the culture of the management running the company to name a few but Malone (2002)'s research has shown that the declining cost of communications has played a key enabling role in these changes and not only for corporations but in societal changes as well. The cost of communications has in almost all situations demonstrated a consistent trend over time i.e. the movement toward a declining cost to communicate information. As such, the relationship between reducing communications costs and the economics of different decision structures can be studied. As an illustration, the cost of sending one page of text to 100 people scattered around the US as well as the time to do so from the 1840's up to today is depicted in Table 3.1 below.

	Pre-railroad 1840s	Railroad 1850s	Telegraph 1850s	E-mail 2000s
1 Destination Delay (Hours)	252	48	0.083	Approx 0
Cost (\$)	\$0.25	\$0.03	\$7.50	Approx 0
100 Destinations Delay (Hours)	260.3	56.3	8.3	Approx 0
Cost (\$)	\$107.17	\$85.17	\$750.00	Approx 0

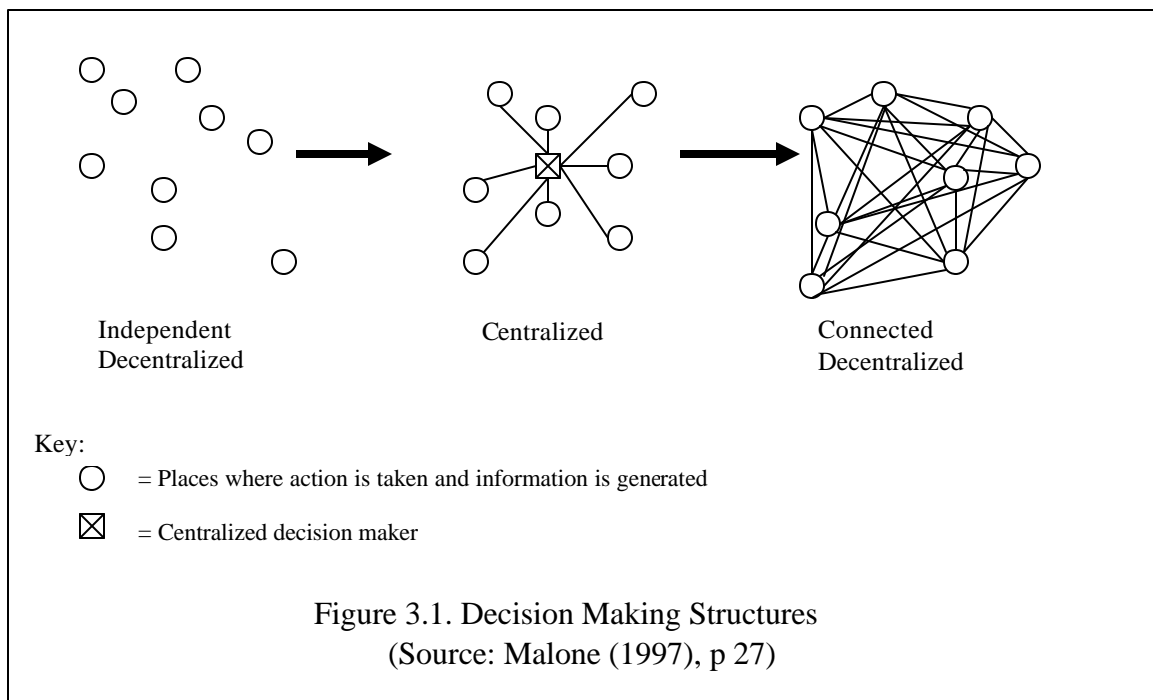
Table 3.1. Delay and Cost for Transmission of 1 Page of Text Using Different Media²

A trend in communications in the 21st century is the increasing movement of larger amounts of data communications such as e-mails and the internet to more mobile devices such as cell-phones and PDAs at higher speeds through long range wireless

² Malone (2003) extracted the data from Yates & Benjamin (1991). *The Past and Present as a Window on the Future*. In Morton S (Ed), *The Corporation of the 1990's*. Oxford University Press. New York.

technologies such as 3rd Generation (or 3G) networks and wireless local area networks like 802.11b³. Meanwhile, in the wired-line world, extremely high bandwidth data transmissions (Gb/s) are being projected through the use of photonics in the coming decades which could enable near instantaneous transmissions of large data streams such as movies or high resolution video images⁴.

Malone (1997) suggests that the most desirable structures for decision making generally moves through three stages as a result of this reduction in the cost of communications technology (see Figure 3.1).



³ For example see *Top Five Mobile and Wireless Technologies for Business, 2002*, by Deloitte Research which provides a good summary of the key mobile technologies, as well as their capabilities and limitations.

⁴ Fairley, P (2000). *The Microphotonics Revolution*, *Technology Review*, July/August 2000 pp. 38-44 and Fine, C.H., & Kimerling, L.C. (1997) *The Biography of a Killer Technology. Optoelectronics Drives Industrial Growth with the Speed of Light*, MIT CTPID Working Paper, provide a sense of the capabilities in the area of microphotonics as well as the projection of the technology's potential.

The first stage occurs when communications costs are high. During this stage, the best way to make decisions is through independent decentralized decision makers.

Decision makers in this stage have relatively low needs for communication. They make decisions based on his perception of his immediate environment. This leads to simplicity in decision making but the decisions taken are relatively uninformed as well.

As communications costs fall, the second stage is reached whereby it is desirable to bring together remote information for centralized decision making. This is because, the communications now allow for a broader perspective to be presented to the central body and thus producing better decisions than the isolated local decision maker. Compared to the first stage, significantly higher communications needs are required to allow informed decisions to be made by the central body and hence become the preferred mode. This would allow managers, for example, to share best practices, capture economies of scale as well as test pricing and promotions on a few stores and subsequently use the results for the others.

This fall in communication costs eventually reaches a point where it becomes more effective in many cases to have connected decentralized decision making structures. Such a structure combines the advantages of having the best information available with local knowledge, energy and creativity. Decisions are made autonomously by local units based on the vast amount of remote information made available through electronic or other networks. Communications requirements are highest in this situation because the

relevant information has to be brought to all decentralized decision makers and not just to one central point.

It should however be noted that whilst the decreasing costs of communications has made certain decision structures more favorable, it does not mean for example that the connected decentralization structure should be universally applied. In fact, “recognizing when to centralize and when to decentralize is one of the most important challenges for managers in this century”⁵. As a guide, the above three stage progression in decision making structures would apply particularly in situations whereby local decision can be significantly improved when remote information is considered as well as when other benefits accrued to decentralization are important. Such benefits include higher commitment and creativity of local decision makers when granted greater autonomy, greater efficiency, creativity and flexibility can be achieved with more people working on the entire problem and when there are aspects of the local information which are hard to communicate to the central body.

Relating this to the decentralization continuum mentioned earlier, the implication is that today and extending into the future, the declining communication costs would allow more organizations to move away from the centralized hierarchies toward the market situations. In some situations it may even be imperative to do so as otherwise it may result in organizations losing their competitive advantage as a result of the inability to match the responsiveness, flexibility and/or creativity of more decentralized competitors.

⁵ Malone (2002), p. 2-46

With this in mind, we move now to consider new organizational structures in the corporate world made possible by today's communications capabilities as well as extending this to the look at future possibilities.

3.3 Linux – A Very Loose Hierarchy

Chapter 2 concluded that even for the military who has often been thought of as highly centralized organizations, history appears to show that some of the most successful ones are those whose leaders adopted a looser hierarchical structure than their opponents and where subordinate commanders have a fair degree of latitude based on a clear commander's intent. In the case of Linux, a more extreme form of the loose hierarchy is exemplified.

The Linux computer operating system is today a well known "open-source" software where the source codes are freely available for anyone who wants to use or modify it. It has been said that the system poses the greatest challenge for Microsoft Windows' dominance of the PC operating system. The group was started in 1991 by Linus Torvalds who made available on the internet his basic software and encouraged others to freely use and modify it. Eventually thousands of volunteer programmers internationally took the software and began fixing bugs, refining it, adding feature as well as writing documentation for the system which became one of the best implementations of Unix.

The Linux organization is made up of a basic hierarchical structure that can be said to be a highly delegated hierarchy and where the delegation of most decisions is to very low levels in the organization. It is also an open hierarchy in the sense that being a volunteer organization, its members can freely enter and leave. Only two types of decisions are centralized. The first is where Torvalds selected the original high level goal for the system. The second is where Torvalds and a few others decide what suggested changes to include in new releases of the system. Every programmer is free to decide what tasks to do, when and how to do them and who (if anyone) to work with. “By delegating so much decision making to the lowest level of an open hierarchy, organizations like the one that created Linux are able to take advantage of a much greater amount of creativity and energy from a much larger pool of people than would ever be possible in most hierarchical organizations.”⁶ While the case of Linux is probably as loose a hierarchy as it can possibly get, similar extreme delegation of decision making within more closed hierarchies have been proven to work in companies like AES, one of the largest supplier of electric power in the world⁷.

3.4 Making Democracies Work

The democratic form of decision making refers more to changing the process rather than the structure of the organization. In this process, decisions are made through voting by the group just in the same way citizens in democratic countries get to vote to choose the leaders of their countries. The issue here is to consider how to use this form of

⁶ Ibid., p.3-8

⁷ Ibid, pp 3-9 – 3-16

decision making much further down in businesses and what possibilities it could lead to⁸. Information technology makes democratic decision making easier by providing the platform for which a large number of views could be quickly polled and aggregated in the decision making process. The case of Mondragon Cooperative Corporation (MCC) provides an example to how such a process is being done today.

MCC is a group of worker-owned cooperatives near the town of Mondragon in Spain and is made up of more than 150 companies and about 60,000 employees. Its companies include a diverse range of manufacturing companies (from auto parts to industrial equipment), a bank, a supermarket chain and a management consulting firm. Together, these companies own the corporation instead of the other way round which we are familiar with. Each company in MCC is a worker owned cooperative in which the employees, as members of the cooperative are the ultimate source of decision making authority. These members usually allow a series of elected representatives (such as the Governing Council) to exercise this authority. To be a member and thus an owner of the cooperative, the employee first needs to make an initial capital contribution which the company uses as a source of investment. This capital sum grows or declines depending on whether the company performs well or not.

Ownership and the ability to participate in the decision making of the company make MCC attractive and serve to help motivate employee performance. MCC is unique compared to other cooperatives in that nearly 80 % of the workers are owners and each member is entitled a single vote in company decisions regardless of the size of one's

⁸ Ibid, pp 5-1 – 5-19

capital account. To make this possible, MCC has devised a complex structure which is hierarchical but with representative democracies at various levels.

Malone (2002) extends MCC's democratic decision structure by postulating a scenario in the future of a radically democratic hierarchy whereby power comes from the bottom. Building from what MCC had done, the scenario is one whereby all rules are decided by the group and every hierarchical level has a democratic representation as opposed to only three levels in MCC. A manager's approval voting is a continuous process whereby if it falls below another person's, the manager could be replaced by the other person. The bottom up approach is also used for the determination of compensation of their direct managers as well as their own. Electronic tools facilitate such voting and communications to make the scenario more feasible. Such a scenario has the advantage of generating motivation of every employee knowing that they help decide the future of the company and also taps on collective thinking to determine the overall good of the group. However, the drawbacks are that such a decision making process could be time consuming and that it assumes that everybody is just as qualified in making every decision when sometimes a few could be more qualified to do so.

3.5 Markets – The Extreme form of Decentralization

Just as publicly listed companies are subject to market forces to set the price of their stocks, the markets decision making structure refer to a situation where power, ownership and initiative come from throughout a system and not just from the top or the managers. The idea here is to tap the advantages of a system of coordination involving

the decentralized decisions of lots of people leading to efficiency in resource utilization and results in a similar fashion for business. Decisions are made by mutual agreement of the involved parties together with the need to take into account competing alternatives available to each party. Malone (2002) proposes two ways that this could be done, namely, through the use of external markets and creating internal markets within companies.

3.5.1 External Markets: The E-Lance Economy

The external markets here refer to the outsourcing of functions of an organization to external parties which comprise of temporary combinations of small companies and independent contractors. Malone and Laubacher (1998) used the term “e-lance” to describe the new way of working by electronically connected freelancers which typifies such a external market arrangement made possible by the internet. Postulating this into the future could result in “the devolution of large, permanent corporations into flexible, temporary networks of individuals”⁹.

In the e-lance economy, individuals form the basic work unit and tasks are autonomously executed by these independent contractors. Temporary networks are formed when freelancers come together to produce a good or service and these networks are dissolved once the task is completed and the individuals become independent agents once again seeking out the next task. Such an arrangement becomes increasingly practical

⁹ Malone and Laubacher (1998), p.146

as a result of declining communications costs where technologies such as the internet simplify the process of organizing people to work on projects in this way.

This highly flexible way of arranging work benefits both the organization and individuals. The organization that has decided to adopt the external market approach can keep their staffing of specialists to a core minimum and be able to quickly assemble teams whenever they need. It is also able to tap on talents from all over the world to undertake the assignment. For the individuals, this provides them with great flexibility to choose when, where and what they would like to work on. However, corporations need to be clear in their analysis what is strategic to them and be careful not to outsource their core competency away which could lead to the loss of competitive advantage¹⁰. Certain situations may also require firms to possess long term stable groups as opposed to freelancers.

3.5.2 Creating Internal Markets

The concept of markets can also be applied to decentralized decision making within the boundaries of a company to allow the people to make decisions along the lines of information flows in market. The possibilities for the organization include using such a system in the formation of project teams, for the collection and analysis of information spread across the company and for the allocation of hard assets such as manufacturing capacity. For the project team formation, the idea is similar to the situation described for

¹⁰ Fine et al (2002). *Rapid-Response Capability in Value-Chain Design*, MIT Sloan Management Review, Winter 2002, 43(2), 69-75 provides a good framework from which companies could use to decide the areas to keep in house and functions to outsource

external markets where either individuals get to bid for projects they are interested in or the project managers bid for individuals to come on the team. Merck and Hewlett Packard (HP) are examples of organizations that have or are experimenting with such processes¹¹.

On information collection and analysis, the concept is to make use of the market mechanism to poll for information such as predictions on future sales. For example, in an experiment conducted by HP, a market-based system involving mainly people from the sales force predicted the actual sales of HP printers with better accuracy than the official HP forecasts¹². The collective intelligence of the ‘market’ appeared to provide better intuitive information about predicting such information. Websites for people to make predictions of future events such as box office receipts of Hollywood films (www.hsx.com), stock market prices (www.biz.uiowa.edu/iem) and future technologies (www.ideosphere.com) have shown that the market system for prediction could be remarkably accurate¹³. For the current conflict with Iraq, websites such as www.Tradesports.com have taken in millions of dollars on bets placed on Saddam Hussein’s fate even before the war started. In early March, Saddam had a 35 percent chance of being ousted by March, 73 percent chance by June and 82 percent chance by July¹⁴. As the war turned out, the US government declared that Saddam was no longer in power by April 11, 2003 and the question remains to date as to whether he is alive. In fact, these schemes have the potential to be such good predictors that according to the Boston

¹¹ See Malone (2002), pp 4-23 – 4-29 for details

¹² Ibid., p 4-31

¹³ Ibid., 4-34

¹⁴ Stockman, F (2003), p. B1

Globe, the Pentagon has inquired about the use of these markets to provide advance warning of future events such as the overturn of some government to some terrorist attacks.

As for letting the internal market decide the manufacturing capacity, this is at present being experimented by Malone's MIT team and a large semiconductor manufacturing company. The idea is to attempt to replace the present hierarchical planning process on how to use this capacity with a more effective market like process by simulating an "internal futures market" within the company where company employees including the plant managers and sales representatives can buy and sell "futures" contract for specific products at specific future periods. Each player trying to maximize his/her profits enables the company to determine the manufacturing capacity for chips that is most efficient¹⁵.

Internal markets motivates individuals when they have the flexibility to choose when, where and what projects to work on. It also has the benefit of drawing many people to work on problems simultaneously and thus tapping their collective wisdom. In addition, it is a system which is able to accommodate much flexibility and individualization. Information technologies help to realize the potential of internal markets to take place in much larger scales by providing the means to share information quickly, build collective knowledge and create a dynamic environment for such trading to take place.

¹⁵ Malone (2002), pp 4-36 – 4-41 provides a more detailed description of the process.

3.6 Discussion

3.6.1 Distribution of Decision Making Power

This chapter highlights the impact of the declining cost of communications on decision making structures and discusses ways in which organizations could be structured along the decentralization continuum. It was also noted that this does not imply that all organizations should switch completely to embrace decentralized structures. Rather, the possible alternatives to the traditional centralized organization implies that more options are available today for organizations to choose from and the key management challenge is making the choice that meets the situation the organization is in best. In this regard, Malone (1997) highlights decision information, trust and motivation as the three factors which are deemed most important in determining the economic desirability of decision making in different places and they are discussed below.

Decision information refers to the information required for making good decisions. While today's information technology removes the barriers of distance by making it possible to bring information to decision makers wherever they are, it is easier to communicate more explicit, quantitative information than those based on experience or more implicit qualitative impressions. The latter class of information which is costly to acquire, transfer and use in a new location has been described by Von Hippel (1994) as "sticky". He observes that when information is sticky, the way the patterns in the distribution of problem solving can be affected in a number of ways. First, if the sticky information needed is held at only one site and other things being equal, the problem

solving will tend to be carried out at that locus. If the sticky information has more than one locus, then the problem solving activity will tend to iterate between these two loci. If iterating among two or more sites of sticky information is costly, task partitioning into sub-problems, with each sub-problem tapping on the sticky information of one locus to avoid the need for or to minimize iterations sometimes occurs. For organizations including the military, this would mean being clear about where the sticky information reside and for management decide where decision making should be task partitioned and hence where to centralize or decentralize the structure accordingly.

With regard to trust, the decreasing cost of communications can either increase or decrease centralization but given that the many existing military organizations are already highly centralized, it is assessed that increasing trust would likely lead to the latter. Increasing trust would be an important factor for central management to be willing to decentralize decisions which are clearly sticky to local decision makers and use information technologies to push more information to them. This does not remove the need for some form of supervision or feedback on the actions of subordinates, but it involves removing the temptation to use advanced communications to micro-manage subordinates.

Increased motivation is one advantage of decentralizing decisions and this in turn leads to higher quality of work and increased creativity. Top management in organizations including the military therefore needs to balance this with the above two factors to try to increase the amount of decentralization where possible throughout the

organization especially as more work becomes knowledge work. As a rule of thumb, centralized hierarchical structures are useful if there is the need to save on communications costs or resolve conflicting interests of different parties is high. On the other hand, one should move more towards decentralization when flexibility, motivation and creativity need to be maximized.

The table below summarizes the relative strengths and weaknesses of the different structures.

Decision making structure	Communications Cost*	Individualization and using many minds simultaneously	Resolving conflicts	Autonomy, motivation and creativity
Centralized Hierarchy	L	L	H	L
Loose Hierarchy	M	M	M	M
Democracy	H	M	M	M
Market	H	H	L	H

Key: L = Low / M = Medium / H = High

*Note that low communications cost (L) is a strength unlike the other columns where “L” is not desirable

Table 3.2. Relative Strengths and Weaknesses of Different Decision Structures¹⁶

3.6.2 Comparing the Corporate World and the Military

Having seen examples of companies in the corporate world who have adopted greater decentralization in their organization, the question one should ask is whether such organizational models are applicable to the military in view that the decreasing cost of

¹⁶ Source: Malone (2002) p 5-24. Note that these are broad generalizations and specific situations may differ.

communications is a phenomenon that is happening in the military as well. Fukuyama and Shulsky (1999) acknowledges that whilst there are lessons to be learned from the business world, “the manifest differences between corporate and military organizations preclude the automatic application of the lessons of the former to the latter.”¹⁷ Therefore, it would be useful to assess what these differences are here before deciding whether to adopt some of the new models described in this chapter.

One area of difference is the operating environments of the two organizations. The military in war functions under high stress and life threatening situations in high levels of uncertainty as a result of the fog of war discussed earlier. In addition, there is the constant threat of the adversary attempting to disrupt or destroy the available means of communications available to the combat forces. This would therefore stand in stark contrast to the much more sanitized environment of say a manufacturing plant where processes can afford to be much more regulated and as such specified to greater details. Perhaps the stock market offers the closest resemblance to such real-time chaos in war although the threat to disruption/destruction of systems would still not be as high. The key here is to note the difference in operating environments while learning lessons from the corporate world. Taking this factor into account, the military needs to design systems and processes with enough robustness including the ability to quickly switch to a degraded mode of operation should the information systems fail. The design of military information systems that is secure and robust is a separate area of study and for simplicity this thesis will assume that means are available to enable systems that are relatively difficult to disrupt or destroy to be put in place. It will instead concentrate on how new

¹⁷ Fukuyama and Shulsky (1999), p. 341.

organizational designs could take into account the rare instances where systems failure do occur and these would be touched upon in Chapter 4.

A shift away from a hierarchical organization down the decentralization continuum is likely to involve the removal of some or all layers of the hierarchy especially those of the middle management. Similar to corporations, issues related to removal of these layers require detailed consideration in the transition to networked organizations. The first is that the intermediate layers serve to provide leadership to the subordinates. The leadership function is perhaps more complicated for the military. Referring to the flattened organization, Fukuyama and Shulsky (1999) opine that the span of control is important for the armed forces because of the assumption that superior commanders are required to provide direction to subordinates as “no matter how much initiative the latter are permitted or encouraged to take and no matter how good the information flow to them, the need for concerted, decisive action will require that, on some occasions at least, superiors actually direct the actions of their subordinates”¹⁸. In addition, they contended that even in peacetime, commanders are expected to provide personal and professional leadership to subordinates including leadership by example. On the need to provide direction, the next chapter will address what types of decisions would have to be taken by the higher echelons and the boundaries for which networked units can function autonomously. As for personal leadership to the subordinates, this will be discussed in Chapter 5 as to how to develop people to function in non-hierarchical situations.

¹⁸ Ibid. p.343

The other issue is that the intermediate levels in hierarchical organizations serves as important training grounds to take on greater responsibilities in future. Without these, it could lead to newly promoted executives being not adequately prepared to take on the increased responsibilities. This is an issue that both business and military organizations need to address. When Wal-Mart, for example, flattened its organization as compared to other retailing operations through the introduction of automated systems, this meant that junior executives went from store manager to being in charge of an entire region. For the armed forces, this problem may be more severe according to Fukuyama and Shulsky (1999) as “the gradual progression through the ranks is the most important mechanism for training top leadership”¹⁹ in the military. Unlike the corporation that can recruit executives from the market to assume the high level posts, the armed forces has to internally “grow” their own senior management. This issue would be addressed in Chapter 4 on training and Chapter 5 on cultivating.

¹⁹ Ibid. p.344

CHAPTER 4: DESIGNING DECENTRALIZATION IN THE MILITARY

“The rapid advancement of information systems and related technologies...are allowing us to explore doing things in fundamentally different ways. We are just beginning to reexamine our operational concepts, doctrine, organization, force structure and training in light of the new possibilities afforded by these to develop a whole new way of doing business.”

- Vice Admiral Arthur Cebrowski¹

4.1 Introduction

This chapter considers the alternative organizational structures for the military made possible by the decreasing cost of communications. This is set in the context of the challenges posed by the security environment in the 21st. The chapter reviews literature on new military concepts and draws upon the conclusions of Chapters 2 and 3 for the new organizational proposals and discusses the situations when they would be useful.

4.2 21st Century Conflicts

To help frame the various situations in which the military may be involved in, military planners classified conflicts into the various levels. In the US for example, five levels of conflict are used (Owens, 2000). The first level is known as *total war* in which all resources of nations are used against each other as witnessed in the World Wars. The second is *unrestricted conventional war* which is similar to the first less the use of nuclear, biological or chemical (NBC) weapons. Major regional or theater conflicts such as the 1991 Gulf War fall under this category. *Limited war* or *contingency operations* mark the third level and this refers to the use of the military in a local crisis area to

¹ Cebrowski and Garstka (1998)

safeguard national interests and protect civilian lives. The 1989 invasion of Panama by the US is one such example. The fourth level is termed *low intensity conflict (LIC)* and it describes military operations conducted in situations bordering between peace and open conflict. For example, the US provided covert support for Afghan rebels fighting the Soviet military occupation of Afghanistan between 1979 and 1988. With the end of the Cold War in 1990, the fifth level of military involvement known as *operations other than war (OOTW)* grew significantly in numbers and frequency. This category spans a broad spectrum of operations from UN peace making and peace keeping, humanitarian as well as disaster relief missions. Terrorism can be said to straddle between LIC and OOTW depending on the nature of terrorism.

What will the shape of warfare look like in the 21st century? With the US as the sole superpower, total wars looks increasingly unlikely although the same cannot be said about the other levels of conflict. At the point of writing, the US has just engaged in a major regional conflict against Iraq and is facing increasing tensions with North Korea. These events show that unrestricted conventional wars are still real and present.

However, according to military analysts such as Van Creveld (1991), such conventional wars are on the way out and in the future LICs waged not by armies but by groups such as terrorists, guerillas, bandits and robbers will be on the rise. Such a trend would eventually erode the ability for nation states to survive. This includes the military establishment as we know it, since it is an institution of the state. Van Creveld believes that the state and its military are ill-suited to deal with conflicts which are increasingly

motivated by religious fanaticism and beliefs rather than territorial ambitions. It is therefore imperative that the military in particular be able to effectively respond to threats such as those of terrorism to stay relevant in the 21st century. Of greatest concern is the capacity of terrorist groups to conduct what Carter et al (1998) termed as “catastrophic terrorism” as witnessed in the attack of America’s World Trade Center in New York and the Pentagon on September 11th 2001. This also includes the use of weapons of mass destruction such as nuclear, chemical or biological weapons against its population. While Van Creveld may not be fully accurate to say that conventional wars are “on the way out”, there is clearly a rising threat of non-state actors in modern conflict. Even today, there is little doubt that terrorist groups such as Al Qaeda pose the greatest threat to US security.

Terrorist organizations such as Al Qaeda that wage LICs/ OOTWs against nation states are a threat that the military organization in its current form may not be adequate to deal with. Arquilla and Ronfeldt (1996) note that such organizations are organized in networks and coined the term “netwar” to denote “an emerging mode of conflict (and crime) at societal levels, involving measures short of war, in which the protagonists use....network forms of organization, doctrine, strategy and communications”². While netwars do not necessarily require advanced communications such as the internet to conduct, the information age favors and strengthens such network forms of organization as a result of the decreasing cost of communications mentioned earlier. The implication is that such non state groups will probably grow in power and hierarchies will find it increasingly difficult to fight such networked groups (Arquilla and Ronfeldt (2001)).

²Arquilla and Ronfeldt (1996), p.5.

Should the military be required to take on such groups, it would be critical for it to be organized to be effective against them.

The information age also has a significant impact on the ways conventional wars such as major regional conflicts would be waged and there has been much debate on the extent to which the information revolution has brought about another revolution in military affairs (RMA). Arquilla and Ronfeldt (1997) used the term “cyberwar” to refer “to a comprehensive, information-oriented approach to battle that may be to the information age what *blitzkrieg* was to the industrial age....Yet cyberwar is not simply a set of measures based on technology...(and) may have broad ramifications for military organization and doctrine.”³ The difference between netwars and cyberwars is that the latter usually involves military forces pitted against each other while the former involves mostly non-military modes of conflict and crime. Another concept used to describe the harnessing of information for warfare is Network-Centric Warfare (NCW) which “denotes a mode of warfare which derives its power from the strong networking of a well-informed but geographically dispersed force. The enabling elements are a high-performance information grid, access to all appropriate information sources, weapons reach and maneuver with precision and speed of response, value-adding command-and-control (C2) processes--to include high-speed automated assignment of resources to need--and integrated sensor grids closely coupled in time to shooters and C2 processes. Network-centric warfare is applicable to all levels of warfare and contributes to the coalescence of strategy, operations, and tactics. It is transparent to mission, force size and

³ Arquilla and Ronfeldt (1997), pp. 6, 30

composition, and geography⁴”. NCW suggests that the victory in the battlefield of the futures lies in who has the best networks and not so much in who possesses the strongest platform.

The implication of the above is that conflicts at all levels in the 21st century will increasingly depend on information and communications. The challenge here for the military organization is to be able to adapt to such an environment to be able to effectively take on the new threats as well as develop revolutionary ways to overwhelm the opponent in conventional threats. It is as much an organizational revolution as it is a technological revolution that is required.

4.3 The Military and Networked Organizations

The considerations such as those highlighted above provided the impetus for both military analysts and practitioners to highlight the need for the military to move towards more networked forms of organization by embracing concepts such as NCW. However, it “is far from clear how forces would actually be organized and deployed under this concept, and what would be the role and shape of network designs that may figure from the command down to the field level.”⁵ This is an issue which many modern militaries and not just the US military have been trying to come to terms with. For example, the Swedish Armed Forces has come up with a network-based defense roadmap to chart the way ahead in the transformation of the Swedish military through four main programs of

⁴ Cebrowski and Garstka (1998)

⁵ Arquilla and Ronfeldt (2000), p. 60

training, doctrine, technology and organization⁶. The US military is also embarking on various programs such as the Fleet Battle Experiment Bravo and Force XXI. However, for example, Owens (2000) notes that while the initiatives by the US Army are encouraging steps in the right direction, the main criticism to these initiatives is that they are “still wedded to the corps and division structure that were invented by Napoleon and took their current form between the two world wars”⁷.

More radical proposals for organizational restructuring are currently still at the academic level. Owens (2000) envisages a movement from the command chain to the command network where the organization would be flatter through the removal of layers of bureaucracy and with the four services (Army, Air Force, Navy and Marines) fully integrated in the form of standing joint forces. Secure and powerful networks would enable such flattening to enable greater flexibility and responsiveness. Delving into greater specificity, Macgregor (1997) proposes the replacement of the division comprising about 30,000 soldiers as the main standing force with smaller self contained combat groups. Each combat group has about 4,000 to 5,000 troops and is made up of between seven to ten platoons depending on the configuration that would enable it to integrate all of the combat arms⁸ of the present division structure. The idea is for the se groups to be accorded with a “C4I overhead”⁹ to ensure that it is provided with a robust communications infrastructure and a high degree of tactical autonomy. These groups are

⁶ Presentation by General Johan Kihl, Chief of Staff and Director Strategic Plans & Policy Directorate of the Swedish Armed Forces on “How to Implement Network Based Defense” to the Island Forum, Singapore, in September 2002.

⁷ Owens (2000). p. 215

⁸ This would include a mix of infantry, armor, artillery, attack helicopters and combat engineers

⁹ C4I refers to command, control, communications, computers and intelligence

also modular in that, depending on the mission, the number and types of groups can be decided to join the Task Force and as such provide flexibility to the organization to configure force as the mission demands especially for OOTW. Adding to this, Grange et al (2002) outline how such groups can be further organized to exploit emerging information-age technologies, as well as integrating with the air components to enhance mobility, firepower and flexibility.

Suggesting the need for even smaller networked units, Arquilla and Ronfeldt (2000) introduce the concept of swarming whereby numerous, small, dispersed networked maneuver units strike the opponent in a seemingly random fashion but in reality is a deliberately structured, coordinated, and strategic way to strike from all directions. These military swarms would consist of basic units called “pods” that mirrors a platoon size force of about 40- 45 soldiers that can be grouped into bigger “clusters” of typically three pods of about a battalion size. Contrary to massing, swarms should be as widely dispersed as possible and as such should not be composed of anything bigger than clusters i.e. it would eliminate the many levels of regiments, brigades, divisions or corps above the battalion that exist in the army today. Swarming can be observed in nature for example the way the body’s defenses attack the invading viruses/bacteria or where bees/ants strike their adversaries from all directions. For military swarms to work, there are two fundamental requirements. First, the large number of small units needs to be tightly inter-netted with the ability to communicate and coordinate with each other at will. Second, the swarm needs to form part of a “sensory organization” where the surveillance

and observations from each unit helps paint the big picture where “topside”¹⁰ could be provided. Arquilla and Ronfeldt (2000) argue that swarming will come to the fore in future conflict as the decreasing cost of communications allows for the high interactive communication flows that such networked units require to be effective.

Similar to Malone’s observation on how decision making structures move from independent decentralized to centralized and then to connected decentralized as communications costs fall, Arquilla and Ronfeldt outlined the progressive development of four fundamental forms of engagement in military history with each stage representing a higher level of organization as a result of more advanced information structuring and processing systems. When communications means were limited, the melee – a chaotic, undirected clash of forces at close quarters – was the primary mode of conflict and this was supported by very simple organization. The second mode of engagement was massing where more controlled linear formations were established as a result of improvements in both weaponry and communications. Massed formations accorded armies better protection and firepower. Further improvements in technology and organizations gave rise to maneuver and as highlighted earlier in the example of *blitzkrieg*, the concept advanced to become the dominant mode of conflict as a result of the mechanization of forces and the spread of the telegraph and radio.

¹⁰Gelenter (1991) used the term to refer to the notion of a command element that “knows” a great deal but intervenes only sparingly, when necessary.

Swarming was predicted to be the fourth form of engagement. Historically, there were few instances of swarming and it could not stand on its own as a major way to conduct warfare because the organizational and communications demands of swarming were high. As a result, it had to wait till the current information revolution before it could be developed to be robust and hence have the potential to be the favored mode to fight future wars. It should be noted that in the progression of the engagement forms, each stage builds upon and incorporates what was before it. As an illustration, even as the modern military today primarily employs maneuver, massing is a crucial part of maneuver and aspects of melee will still be present when it comes to close-in combat. Nonetheless, even when advances in communications provides the necessary connectivity for swarms to be effective, it should be noted that there are other challenges such as logistic supply and medical support that require new paradigms to be developed.

The forms of warfare described above reinforce that the military's decision making structure follows the same pattern observed by Malone for the business world as well as for society in general. Melee corresponds to the independent decentralized mode while mass and maneuver are by and large centralized decision making structures¹¹. Swarming, while still to be seen whether would become the next form of engagement, is in line with the connected decentralized decision making structure and as such agrees with Malone's conclusion that this mode of decision making would play an increasingly important role. It is given this similarity in the progression of decision making structures resulting from decreasing communication costs in both the military and the corporate

¹¹ This simply refers to the hierarchical organizational structure and should not be confused with the decentralization continuum concept in which we had earlier discussed that the loose hierarchy was observed to be most successful in coping with the uncertainty of war for both mass and maneuver.

world that makes the cross-fertilization of ideas between the two compatible. Therefore, examining these developments and trends together can further spur the thinking on the possibilities which military organizations can be structured.

4.4 Toward New Organizational Designs

In Chapter 2, it was observed that the furthest that military organizations had moved along the decentralization continuum thus far is toward being loose hierarchies. The discussion above also suggests that looking ahead, more networked military organizations are needed to capitalize on the communications power accorded by the information age and swarming as a mode of warfare will grow in significance. How could swarms be organized in the modern military organization and should they replace current means of warfare such as mass and maneuver? What forms of decision making structure would be suitable i.e. should the markets or democracies be preferred over loose hierarchies? This section seeks to examine these issues. Before doing so, a couple of important clarifications and assumptions are necessary.

4.4.1. Defining The Military Organization

Firstly there is a need to set the scope on what the term ‘military organization’ entails. This term on its own would mean different things to different people. A common way to view the military organization is in terms of the strategic, operational and tactical

levels of war. The US Department of Defense's military dictionary¹² defines the three levels as follows:

Strategic Level. The level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives. Activities at this level establish national and multinational military objectives; sequence initiatives; define limits and assess risks for the use of military and other instruments of national power; develop global plans or theater war plans to achieve these objectives; and provide military forces and other capabilities in accordance with strategic plans.

Operational Level. The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or other operational areas. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives.

¹² See <http://www.dtic.mil/doctrine/jel/doddict/>

Tactical Level. The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives.

Within the US military establishment, decisions concerning the strategic level of war are made by the Pentagon, the operational level decisions by the regional commands such as Central Command in the current war against Iraq and the tactical decisions by the individuals or units under the regional command. In this thesis, the objective in the use of the three levels of war is to classify the decision making levels of the military and not to analyze whether an effect of a military action falls under a particular level. In the latter, it has been argued that with the enhanced speed and lethality of modern warfare, there would be overlaps in the three levels as the action at every level has the potential of instantaneously affecting each other (Macgregor (1992)).

I would argue that strategic level decisions as defined here would be a centralized one for the foreseeable future given that these decisions are taken together with the approval of the political leaders of the country and it is beyond the scope of this thesis to discuss whether the political establishment would agree to a more decentralized structure. Unlike the times of Napoleon where the commander-in-chief leads the military in conflict, the modern military organization usually operates apart from the commander-in-chief who is usually the political head of state. Another assumption considered in this part of

the thesis is that the strategic decisions are those that set the boundaries for military action, within which the military forces has the autonomy to take the operational and tactical decisions. This would mean that both the political and top military leadership would not attempt to micro-manage and intervene to control the operational and tactical levels of war as witnessed during the Vietnam War. A good example of this was the way the Gulf War in 1991 was conducted, where in the words of General Norman Schwarzkopf, “the President had been presidential; the Secretary of Defense had concentrated on setting military policy; the Chairman of the Joint Chiefs had served as the facilitator between civilian and military leadership; and as theater commander I’d been given full authority to carry out my mission.”¹³

As such, the discussion of the design of military organizations will primarily focus on the decisions within the operational and tactical levels of war. The design considers the operational and tactical levels taken together as well as each level separately to assess the levels of decentralization possible.

4.4.2. Assessing the Technology Available

The other aspect to provide a common understanding is the level of technology available to the military forces given that this differs across modern militaries, the focus of which are communications and sensing technologies needed to effect new organizational designs. In this regard, it is assumed that the NCW ideal of a “high capacity, multimedia networks of sensors, shooters and commanders to achieve the

¹³ Schwarzkopf and Petre (1992). p.467

power of a truly integrated force.. (where the)...networks form a seamless information grid which provides high-speed information transfer¹⁴” will be by and large available through a constellation of reconnaissance satellites, spy planes, ground sensors and other intelligence means. Such an information grid will provide a digital map of the entire battlespace that will enhance the situation awareness of commanders as well as the speed of decision making. We already see a semblance of this in the current war in the Gulf where the US Force’s Central Command’s Joint Information Center receives “latest satellite pictures, data from reports, live images from Predator drones and intelligence reports”¹⁵ twenty four hours a day, providing an unprecedented real time battlefield picture. However, the systems provide the picture from a stand-off distance and could be hampered by the weather or smoke and are also limited in capability in built up areas.

In the area of communications, it is assumed that the ability to exchange large amounts of voice and data communications is available to the military. In addition, promising communications technologies not currently in use by the military are also assumed to be available in a robust form. They include grid computing (and its integration with collaborative peer to peer computing and web services) as well as low powered wireless sensor networks which are networks of wireless battery-powered sensors that could be used to monitor just about everything, including traffic, weather, seismic activity, the movements of troops on battlefields¹⁶.

¹⁴ Cebrowski, and Garstka (1998)

¹⁵ Bamard, A (2003), p. A21

¹⁶ See for example, *10 Emerging Technologies that will Change the World*, *Technology Review*, February 2003, 33-49

While it should be noted that there are significant challenges to be addressed in realizing some of these capabilities especially in making them able to stand up to the harsh military environment, it is beyond the scope of the thesis to go into the discussion of these challenges in depth. They are nonetheless technologies that can realistically be attainable.

4.5 Designing the Military for the Information Age

Having clarified the scope of the military organization and the state of technology available, the next step is to sieve from the lessons learnt to outline cardinal requirements in the design of the military organization optimized for the information age.

Consistent with the analysis thus far, the real world military organization needs a *hybrid* organization that retains some aspects of hierarchy while flattening out as networks in other areas. In other words, “hierarchies are not “goners” because of the information age – but they must adapt”¹⁷. Several reasons point to the continued need for hierarchies to be present in the military and that a purely networked organization is unlikely to work. First, as mentioned earlier, strategic decisions in the foreseeable future will have to be top down and as such certain level of hierarchy is needed to cater to and provide advice to the political leaders. As the strategic objectives percolate down, the hierarchy is needed to translate them into operational objectives and size up the forces required for the operations as a whole. It is difficult at this stage to decentralize much decision making other than receiving feedback from the ground commanders as these

¹⁷ Arquilla, J & Ronfeldt, D (1997), p. 459

decisions may still require political approval, for example, in the call up of reserves. Therefore, from the standpoint of the entire military organization, the best that the military can decentralize to is that of a loose hierarchy whereby strategic directions are issued and from which operational and tactical directions are autonomous.

Second, from a training perspective, the military needs some form of hierarchy to organize itself into specialized units in at least two levels. The first is at the service level i.e. the organization into the armed services such as the army, air force and navy and into specialized units within each armed service such as infantry, armor and artillery for the army. How these units/ armed services are subsequently integrated for information age warfare is the key issue in the organization design.

Another reason for the continued existence of hierarchy in the military is the fact that higher level commanders detached from the tactical battles are not only in a better position to see the “big picture” or topsight of what is going on in the battle, they also tend to possess better operational experience and thereby are in a position to make better decisions in some situations especially the operational level ones.

The fourth reason applies equally to the corporate world as well and that is the layers in a hierarchy serve as rewards to motivate subordinates to strive towards. This is particularly true in the military where the current rank structure epitomizes the visible levels of achievement for the soldier to work towards attainment. As Leavitt (2003) aptly sums it, “hierarchical organizations seduce us with psychological rewards like feelings of

power and status. What's more, multilevel hierarchies remain the best available mechanism for doing complex work. It is unrealistic to expect that we do away with them in the foreseeable future.”¹⁸ The key for military organizations is therefore not to eliminate hierarchies but to analyze clearly the situations where hierarchies are best suited and decentralize the other aspects bearing in mind the virtues of the differing levels in the decentralization continuum as summarized in Table 3.2.

Having said that, it is the areas of application of the other levels of decentralization of the military organization that have traditionally not been used and have been made possible by the decreasing cost of communications that will be the focus of the discussion on organizational design. The real choices for the military, as in the case for the corporate world, is not so much then about what decision-making structure to use but how to choose the right combination of centralized and decentralized decision-making for all the different decisions needed to be made. As discussed in Chapter 3, increasing decentralization is favored in situations where speed, flexibility together with the motivation and creativity of the individual is desired. In the military, this corresponds most to the tactical level of war and to a lesser extent at the operational level. This is because it is at the tactical level that combat units come into contact with the enemy in a highly fluid environment that is plagued with uncertainty and changes to plan. Balancing this with the utility of hierarchies discussed above, it appears that taken together the operational and tactical levels of war should by and large favor a loose hierarchical structure with a shift toward more democratic and market decision making. At the tactical level of war, the military should increasingly be organized on the basis of highly

¹⁸ Leavitt (2003). p.102

decentralized markets and democratic decision making structures and less so as loose hierarchies. They are discussed in greater details below.

4.5.1 Loosening the Operational Level Hierarchy

At the operational level, the military organization could consist of up to several hundred thousand soldiers and hundreds of different weapons and systems from all the armed services participating in a battle in a theater. Removing the hierarchy at this level would be difficult if not impossible due to the high requirement for quick conflict resolution in terms of the overall strategy to adopt, the division of resources amongst the many different parties and the need for an agency to maintain topsight on the developing battle. In a sense, some form of hierarchy here is needed to function as the ‘brain’ of the entire battle, coordinating resources and movements of formations, responding to contingencies and continuously refining the strategy. From the lessons gained in Chapter 2, a loose hierarchy and not a tight centralized hierarchy would be the preferred mode of operations. Nonetheless, there is latitude to consider loosening the hierarchy further. We have earlier discussed the extreme example of the Linux model. The question here is how close the military organization should tend toward this. One way to look at this is to see what aspects of the operational level commander’s decisions should remain and what can be parceled out in the information age military compared to those of the past.

One aspect of decision making which should remain in the domain of the operational command is the commander’s intent which is “a concise expression of the purpose of the operation and the desired end state that serves as the initial impetus for the

planning process...(and).. may also include the commander's assessment of the adversary commander's intent and an assessment of where and how much risk is acceptable during the operation”¹⁹. Going beyond just an expression, Builder et al (1999) suggest that communicating the cognitive process or command concept that underlies this expression is also important where the command concept is defined as a vision of a prospective military operation that informs command decision made during the operation. In addition, they highlighted key elements that the command concept should include and they encompass the structuring of forces consistent with the battle tasks to be accomplished, the provision of adequate resources to the forces carrying out the plan, painting a detailed picture of what the enemy is likely to do and contingency actions if the plans fail. These elements provide a good first cut to the decisions to be taken by the commander at the operational level. The commander therefore not only establishes the clear boundaries (in time, space and resources) within which the forces under him operate but also provides broad guidance on what to expect and how to react. In fact, the need to provide a clear regulatory or operational framework will become greater as greater decentralization occurs in the military given that “rigid standards in the right parts of a system can enable much more flexibility and decentralization in other parts of the system”²⁰. This seeming paradox of decentralized coordination can be seen in the example of the Internet, which falls under the ‘markets’ category of decentralization (Malone (2002). By establishing very rigid standards at the Internet Protocol (IP) level, all the amazing flexibility at the other levels becomes possible “because everyone has this level in common, they can build lots of different capabilities at different levels, and all these different capabilities

¹⁹ <http://www.dtic.mil/doctrine/jel/doddict/data/c/01105.html>

²⁰ Malone (2002), p. 8-11

can all work together.”²¹ Similarly, the operational level commander through a proper articulation of the command concept as the operational framework could play a critical role in enabling decentralization of tactical operations.

However, even within these elements considered essential in the command concept such as how to divide the shared resources among the forces, there is scope to consider moving away from having the commander make all the decisions. As we have seen in Chapter 3, internal futures markets provides an alternative method for resource allocation. The operational commander in this case can set the rules for the internal market. This includes allocating points to his subordinates in charge of various sectors of the battle in terms of the priority of that sector relative to the others and determining the shared resources (e.g. aircraft, cruise missiles) they can bid for. In this way, he still ensures that the command concept is adhered to. He can also retain the prerogative to arbitrate to resolve conflicts if, for example, two parties place equal bids on a single resource. This allows the subordinate commanders, who are more familiar with the peculiarities of their sectors, to better decide what resources they should get. Such an approach may be applied not only in the planning phase of operations but also during operations when, for example, they need additional firepower because of unanticipated encounters with the enemy. There are many issues to work through in deciding whether the centralized or decentralized approach is preferred. Centralized decision making had been favored in the past in such situations as it was faster and also the operational commander had the most information available but the declining communications costs is changing these. To speed up collaborative decision making, future information systems

²¹ Ibid, p. 4-15

can be designed to function like stock markets where the price of resources fluctuates dynamically pending on demand and supply and where bids are decided upon almost instantaneously.

In addition, advanced information systems have the potential to provide the same battlefield picture to both the commander and his subordinates, thereby undoing the notion that the former possessed more information to make better decisions. While there are technical challenges (such as bandwidth) to implement this, the more pressing issue is whether subordinate echelons need the same level of information as the operational commander. The answer to this would depend on the degree of decentralization envisaged and the greater the amount of decentralization the more information should be pushed to the lower levels. Even at the minimum, the digitized battlefield provides enhanced awareness for a unit with regards to its surrounding environment including that of friendly and enemy forces in its vicinity. This is discussed further in the next section on the tactical level of war but even in the situation whereby the subordinates get to see as much information as the commander, the commander should still make decisions in areas where he is able to add value to the units. For example, this might include intervening in aspects where his experience tells him that there is a need to change the command concept or to coordinate movements where the tactical forces are too bogged down to decide. On other aspects however, troops who have a clear understanding on the command concept are empowered by information systems to take on much more decision-making authority. The key here for the operational command is not to micromanage with the enhanced picture of the tactical forces on the ground enabled by

information systems but to use the information systems to more rapidly be able to communicate his command concept and changes to this. Information systems should also help operational commanders get a better sense of the actual situation on the ground in order to see how well the overall strategy is playing and to enable them to make timely changes quickly when events do not appear to fit the initial plan. It is not just using these systems to provide information as a matter of routine but also the ability to fetch the information actively sought by the commander at the time it is needed. This is what Van Creveld (1986) considers as 'directed telescopes' and information technology serves to provide near instantaneous feedback of the ground situation. As such it helps commanders react much more responsively than, say, in the time of Napoleon where the role of directed telescopes were played by humans dispatched to experience the ground situation and provide feedback. The ultimate situation information systems can allow the commander to achieve in this regard may resemble the science fiction story 'Ender's Game'. In the story, Ender, the protagonist Fleet Commander was able to instantaneously choose to experience the environment of any of his individual subordinate commanders and quickly detach himself to view the entire picture of the developing battle²².

4.5.2 Decentralizing the Tactical Level of War

For the purpose of this thesis, this level refers to any unit/ personnel operating below the operational command establishment. Here there is a spectrum of possibilities of how to organize the forces ranging from the traditional echelons (such as corps/ armies /divisions) to flatter combat groups to military swarms as discussed earlier in the chapter.

²² Card, O (1992). *Ender's Game*, Tor Books, New York

There are three main reasons for advocating the move toward greater decentralized modes of operations at the tactical levels of war. First, given that war is a clash of human wills, one can expect the opponent to be highly unpredictable in his actions. Commanders detached from the fighting would not be able to make accurate tactical decisions, and even if they could there would just be too many decisions to make. As such, the initiative, speed and flexibility of the individuals / or fighting units is preferred and the information age allows them to be better informed to be able to make better decisions. Second, even with the digitization of the battlespace, operational commanders would be unable to see the details occurring at the tactical battles and would be particularly limited in urban areas or dense forests where the sensors are unable to detect movements of forces. They would also be unable to experience the less explicit information such as morale of the troops or the emotions of the local civilian population. Tactical commanders should hence be empowered by information to better make decisions which are sticky to their location. Third, in modern warfare, the firepower possessed by tactical units could potentially bring about strategic impact to the battle and this “potential for decisive strategic results on the tactical level suggests that the operational commander must grant his subordinates sufficient freedom of action to achieve decisive results, even as tactical and strategic roles begin to accrue to the operational commander himself.”²³

There are various ways to accord greater decentralization at the tactical levels. Arquilla and Ronfeldt (2002) predict a likely shift to swarming as the future of conflict and that the 1991 Gulf War “may mark the end of an era (for maneuver warfare) more

²³ Macgregor (1992). p. 46.

than the start of a new one”²⁴ in the information age where swarming could replace maneuver as a more responsive and flexible alternative. In their view, swarming would be effective across all levels of military conflict i.e. from major regional conflicts to OOTW and against both conventional and non-conventional (e.g. networked terrorists) adversaries. While it was mentioned that swarms, which are connected independent decision making structures, will play increasingly important roles in modern warfare as communications costs fall further, I would like to suggest not to simply consider swarms alone. Hierarchies in the traditional army corps structure or that of combat groups can also benefit from advanced communications to shift towards greater decentralization in much the same ways discussed above for the operational level of command. For one thing, military swarms are lighter and more dispersed in firepower. Thus, it may be much more difficult for them to come together to serve the multipurpose functions of bigger existing military structures such as a heavy combat group that would comprise of light vehicles, combat engineering mobility equipment, artillery and tanks. It might make more sense for example, in the current US war against Iraq where the military combat power strongly favors the US, not to break up into swarms to take on Iraqi armored division.

Instead, both hierarchical structures and networked swarms can be considered in situations where decentralized decision structures could work. The choice of how to organize the forces will be dependent on the strategy adopted by the operational commander and this has to take into account a host of other factors including the adversaries’ likely tactics and relative combat power. Having said this, however, the traditional army corps introduces too many layers in the system. Therefore, in line with

²⁴ Arquilla and Ronfeldt (2002), p. 1

Macgregor's (1997) argument that it is not suited for information age warfare, combat groups will be the only hierarchical structure considered here. In addition, whilst Arquilla and Ronfeldt envisage swarms as pods and clusters of existing platoon and battalion sized forces respectively, I would like to stretch this thinking to consider the possibility of swarms of individuals as well.

As a very broad generalization, comparing between combat groups and swarms, the former appears more advantageous in situations where a stronger force is meeting head on against a weaker foe or where presence is required as a deterrent. The latter appears more suited in a disadvantaged situation, for example, against a stronger opposing force or against more networked and dispersed opponents. In situations where both sides are equally matched, strategy prevails as to which mode (or a mix of the two) is preferred. Utilizing this guide as well as looking beyond conventional warfare to include OOTW, we shall next consider scenarios of highly decentralized forms of decision making in the military. These scenarios are not meant to cover all operational details but are merely a simplistic illustration of how these new decision making structures can work.

4.5.2.1 Decentralizing Combat Groups

In a combat group set up, the operational level commander has a number of combat groups under his command depending on the mission requirements. As described in section 4.3, each combat group is a self-contained unit comprising of a number of

battalions under it and has all the combat arms integrated in it. It is able to plan and operate in a semi-autonomous manner for a period of time.

Decentralizing decision making for combat groups would mean that from the operational commander's command concept, each combat group would be clear about their areas of operation and the time and space requirements. They will also be in the position to bid for additional resources from the operational HQ (such as the use of precision guided missiles (PGMs) from aircraft or ships to help take out a target or additional specific intelligence information) to supplement their group or operate in an entirely autonomous fashion to achieve the objectives. Near instantaneous data and voice communications including facilities equivalent to instant messaging or internet chat as well as various collaborative tools allow such interactions and information exchange with the operational HQ. These tools also enable combat groups that need to cross into each other's areas of responsibility to coordinate with each other. In addition, high bandwidth information systems utilizing wireless sensor networks provide the combat group commander with sufficient information about his area of operations and activities in the vicinity areas for independent operation. To empower him further, such systems are developed to allow him to pull other information (for example, in the form of a search engine) where required. With both the advanced communications and information systems that make real time coordination possible, combat groups are able to enjoy greater decision making involvement. For example, this makes it possible for a democratic decision process to vote for changes to the original command concept due to new developments in the battlespace noticed by one combat group. Decision making thus

becomes a dynamic decentralized process where the operational commander need only function more as an arbitrator, set the operational framework (including non negotiable 'rules' such as the latest time that an objective needs to be secured or non destruction of civilian property according to Geneva Conventions) or act when some new strategic inputs come in.

Within each combat group decentralization is enabled by a tightly networked system that operates in a collaborative fashion, with the combat group commander providing topsight in much the same way as the operational commander. Instead of having each level of hierarchy making all top down decisions, an internal market is used to encourage bottom up decision making similar to what was described earlier for the operational level hierarchy. The decisions to decentralize are those where it is assumed that troops facing the enemy have better local knowledge. Units within the group receives the command concept from the operational level commander direct unless there is need for the combat group commander to clarify on details or where he needs to communicate changes which had been orchestrated with other combat groups. Units can participate in a democratic way during planning on how to fulfill the mission, for example, by voting on how the objectives should be taken and which unit(s) should be in charge to take them. Once the actual operations begin, these units will continue collaborating in a dynamic way, exchanging information, synchronizing operations and coordinating resources organic to the combat group.

Data and voice communications are tiered to suit the needs of the different levels in the hierarchy. For example, each platoon will be given the battlespace picture of his immediate vicinity with the ability to pull more information as required while at the same time feeding the information that his sensors has picked up to the rest of the combat group. In contrast at the individual foot soldier level, small portable devices attached to their uniforms only allow them to conduct instant messaging and voice calls, vote on decisions requested by superiors or pull limited information such as the coordinates of their location.

To illustrate the above, consider a conventional theater conflict scenario similar to the 1991 Gulf War where the size of forces on both sides are similar but in terms of weapons and systems, the combat groups mirror the US led coalition which possessed far superior technology including precision and firepower. Two of the operational commander's combat groups (alpha and bravo) are tasked by him to dislodge the enemy entrenched in two adjacent hills of strategic value by a given time. Being involved in the planning and having clearly understood the command concept of the operational commander, the two combat groups set out to fulfill their task.

The units within each combat group are linked as a local area network while the combat group commanders are additionally linked in a wide area network together with the operational commander. Combat group alpha conducts the attack by first neutralizing the enemy with artillery followed by an assault of the infantry and armor platoons from three flanks as planned. However, one flanking platoon was ambushed by the enemy and

the platoon commander sends an urgent bid for fire support which is immediately accepted by attack helicopters owned by the combat group. As each friendly troop's location is known, the helicopters are able to join in the fight against the enemy without fratricide. Meanwhile, the other two platoons are informed by the collaborative agents about this situation and the platoon commanders dynamically coordinate among themselves to adjust the plan accordingly to take on the enemy with only two flanks. They encountered stiff opposition as they edged their way to take over the hill.

The situation had been more favorable for combat group bravo and it was able to secure their hill with significantly less resistance. Having completed the mission, the combat group commander scans his battlespace picture and sees the fight that combat group alpha is in. He contacts the forces within his group to poll their ability (in terms of measurable factors like ammunition supply as well as the intangibles such as morale and fatigue level) to go to the support of combat group alpha. Collaborative agents in the network quickly compile the feedback of each individual and reported that 80 percent has voted in favor of the new mission. The system also provides information on the relative strength of each platoon from the results to enable the combat group commander to allocate sectors to the platoon appropriately. The combat group commander then informs the operational commander as well as the commander of combat group alpha of his plan to support alpha's mission. Although this departs from the original command concept, the operational commander accepts the bottom up changes and the two combat group commanders proceed to collaborate on dividing and coordinating the sectors to attack. The combined effort proved instrumental in defeating the enemy.

4.5.2.2 Military Swarms

While swarming on its own suggests a more decentralized way of combat, various possibilities within which such networked units could function. In fact, Arquilla and Ronfeldt (2000) outline three major network types which they believed military swarms could operate in depending on the purpose and particular situations (see Fig 4.1). Of the three, the communications requirements for the all channel network is the most demanding but provides the greatest potential for collaborative undertakings. They assessed that hybrids of the three types and also hybrids between such networks and hierarchies in such swarm networks are likely. The scenario below assumes swarms operating in an all channel network.

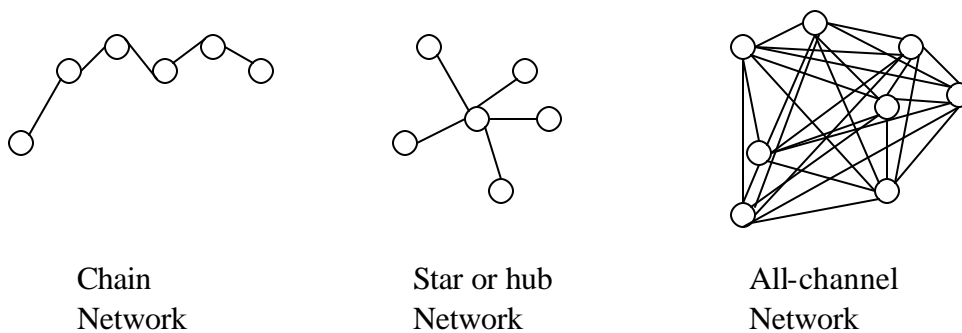


Fig 4.1.Types of Networks for Swarms²⁵

The scenario to illustrate the workings of military swarms is one where the military swarm units are tasked to take on a bigger maneuver force (say an armor division) where the state of weaponry and systems are similar for both forces. Each

²⁵ A chain network refers to the flow of information along a line of separated contacts, and where end-to-end communications travels through the intermediate nodes. The star or hub network is one which the actors are tied to a central, non hierarchical node and must go through that node to communicate or coordinate with one another while the all channel network is one in which everyone is connected to everyone else. (see Arquilla and Ronfeldt (2000), p 58)

swarm pod is a platoon sized force that is a specialized combat component such as infantry, artillery, or armor where the number of troops per pod depends on how many it takes to form what are defined as minimum fighting units, ranging from 40-45 for the infantry swarm as suggested by Arquilla and Ronfeldt to perhaps less than half that to operate a unit of armor.

The communications requirements and interactions between the operational level HQ and a swarm unit is similar to those of the combat group where the operational commander outlines the operational framework in terms of the rules, objectives (including the latest time to complete mission) and number of swarms tasked for the mission. However, each swarm is a much smaller force compared to a combat group, and as such is likely to require more fire support outside its own. Similar to combat groups, internal markets are used to bid for resources held at the operational level. However, coordination amongst swarm units will be more complex than inter-combat group coordination given that the concept of swarming involves highly dispersed units converging on the enemy in a seemingly amorphous manner from all directions to make the larger opponent feel overwhelmed and disoriented.

To achieve such coordination, the communications among swarms take the form of complex peer-to-peer collaborative networks that utilizes wireless sensor networks to detect the presence of each other. In addition, just as insects such as ants secrete chemicals called pheromones to interact and coordinate in their network, virtual

pheromones are used in the swarms' communication agents to find nodes and created connections in a bottom-up process of self-organization²⁶. Such a method of self assembling communications allow swarms which may be arriving on the opponents from multiple directions through a variety of medium to quickly detect one another and establish links in a robust manner. Once connected, these swarms are able to avoid firing on friendly forces while attacking the enemy, quickly form groups to complete a task, dissociate upon task completion and reform with different swarms on a new task. This is in a sense analogous to the e-lance market example in Chapter 3 but occurring in a much faster and more intense pace.

In the scenario, three swarm clusters (each composed of three pods) are tasked to take out an opposing armor division roughly three times larger in force than the total of the swarm units. To simplify the scenario, the only type of swarms considered are utilizing armored vehicles which are lighter, faster and hence more mobile than traditional tanks but with similar lethality. In addition, it is assumed that the air war is still in progress with neither side attaining air superiority yet. This would result in a situation whereby it is difficult for either side to depend on air power to shift the battle to its favor. The terrain for the battle is that of a light tropical forest that permits armor maneuverability but which space or airborne sensors are unable to have a clear picture of the forces continuously.

²⁶ Patch, K(2003). *On the Backs of Ants : New Networks Mimic the Behavior of Insects and Bacteria*, *Technology Review*, March 19, 2003

Based on the last sighting of the enemy armored division's movement, the three swarm units are launched from different axes; one by land to meet the opponent head on, another by air drop to the rear and the third through amphibious landing to attack by the flank. According to plan, a pod approaching the division from the front contacts the enemy first. Although the cluster is quite widely dispersed their communications enable them to maintain as a network of peer to peer units and the sensor information from the pod which contacted the enemy is instantaneously shared throughout the cluster network and an alert broadcasted over the battlespace. The same happens when the other pods subsequently detect the enemy at their locations. This swarm cluster pieces together a picture of the enemy from the various inputs and begins to sort out the target for each pod to engage using dynamic collaboration. In contrast, each individual tank of the opponent only sees the pod it comes in contact with and as the contacts appear spread out over a distance, the opponent assumes the swarm cluster to be a force bigger than actual. Having assessed that its firepower is insufficient to overcome the enemy while the other two swarms have yet to join them, this swarm cluster places high bids to the operational headquarters for artillery support. The artillery resources available accepts the bid and fires with a high level of accuracy as a result of the information broadcasted by the swarm cluster.

After a while, the swarm cluster from the flank comes within range and through sensing the virtual pheromones of the first swarm unit is able to quickly join in the latter's network and collaborate on engaging the enemy while avoiding the targeting of

friendly forces. By this time, the enemy commander feels overwhelmed as he sees units of armor attacking him from multiple directions and orders his forces to retreat. As the individual pods sense this change in the enemy's movement, they conduct an internal "idea futures" to trade assessments on what they collectively think the enemy is doing and where it is likely to head. This predicted direction is in the path that the air dropped swarm cluster is approaching and it is informed accordingly to ambush the retreating forces. Eventually, the three swarm units come within range to link together as a collaborative network, encircle and defeat the opponent.

4.5.2.3 Individual Swarms

In the conventional combat environment, it is difficult for swarms to decentralize its organization down to the individual level because of the need for a minimum combat power to be effective as well as the need for teams to operate certain equipment together, for example, in the construction of portable bridges. However, as one moves down the spectrum of conflict to LIC and OOTW, this becomes an increasing possibility. In this scenario, we consider the case of specialized military forces assigned to hunt down armed terrorist groups. This scenario is similar to the current situation where US forces are attempting to flush out the remaining Al Qaeda networks in Afghanistan after routing out the Taliban regime. The assumption here is that the threat is a networked organization that has global links and exists in fragmented groups. The task of defeating such organizations does not lie solely on the military and requires the resources of an entire nation's security and intelligence agencies. These agencies have to be tightly integrated

and organizing them as a large interconnected decentralized networked organization will be the most effective counter against netwars.

However, in our scenario, the focus is on the military aspect of such operations although aspects of inter-agency coordination will be covered as well. Here, the individuals are equipped with light communication devices that perform similar tasks of peer to peer collaboration, connection and self forming communications networks with other swarms to what has been described for military swarms above. As a practice these individual swarms operate in at least groups of two and they could be patrolling on foot or in vehicles. The area of operations has been defined by the command concept and about 500 soldiers are scattered in the desert/ mountainous region with a small group of artillery and aircraft resources available on call that are held at the operational HQ.

Two individual swarms that have moved slightly ahead of the others discover a cave that may be a terrorist camp. Using their instant messaging devices all the other swarms are alerted by this. As they closed in on the cave, they are detected by the terrorist who fires at them. At this point, the collaborative communication agents use the wireless sensors on each swarm to detect those in their vicinity and sends virtual pheromones to draw them in to form a network against the threat. When reinforcements close up near the cave, the network connection is established among the swarm forces to ensure that each one knows the position of the others to enable them to attack the enemy in a coordinated manner. As all reinforcements within the area arrive and join the network, the swarms assess that this is probably a major camp and their organic

firepower is insufficient to rout the terrorist from the entrenched positions. As such, a bid request is made to the combat air patrol aircraft circling the airspace for support. As the resource is available and the bid amount (representing the threat level) high enough, the aircraft accepts the request, locates the swarm nodes and joins the network to receive information on the enemy's dug in position as well as the friendly forces in the vicinity. GPS guided PGMs designed to take down bunkers are fired to dislodge the enemy sufficiently to allow the swarms to enter and overrun the cave.

Having secured the cave, a search reveals a cache of weapons together with a wealth of classified information in a foreign language stored in the remaining laptops of terrorists that were not destroyed. Determining these as important, the soldiers upload the information to the intelligence collection database that is shared across all the security and intelligence agencies (in the US context this would include the FBI, CIA and DIA) and after a short rest for the replenishment of supplies, they proceed with combing the area. Meanwhile, new intelligent sensemaking software helps enable investigators from these security agencies to collaborate as well as wring meaning from the mountain of information received. This includes connecting the information with others available in the shared database²⁷. Investigators including field agents and intelligence analysts across these communities then conduct an internal "idea futures" market to buy and sell predictions on what they think the likely actions of the terrorists would be. This process helps to sieve through actual signal from noise and narrow down on the intelligence

²⁷ See for example, Waldrop, M (2003). *Can Sensemaking Keep Us Safe?*, *Technology Review*, March 2003, 43-39, which provides a summary on the latest intelligent software and datamining technologies being developed by US security and intelligence agencies.

information. Field agents spread across the country and internationally share access to these leads which the internal markets churn out in real time. As such, they are able to act on the results on time to foil a plot to detonate a dirty bomb in the country's capital and separately collaborate with agents in a friendly country to arrest wanted terrorists in that country.

4.5.3 Designing Modularity

Having seen the options for designing the military organization to have greater decentralization at the operational and tactical levels as well as anecdotal examples to illustrate situations where they work, we now turn to consider the other aspects of organizational requirements for the 21st century military.

The spectrum of modern warfare has a broad scope from regional conflicts all the way to OOTW. As discussed in the beginning of this chapter, the growing frequency and importance LIC and OOTW in particular has necessitated that the military organization considers means to meet this challenge effectively. Rather than create separate establishments for conventional warfare and LIC/OOTW, decentralizing the decision making structures to create smaller semi-autonomous units such as combat groups and military swarms provide the organization with more flexibility to handle both situations. By making multi-service integration at lower levels of the organization possible, combat groups and military swarms create greater modularity into the organization compared to the existing organization.

Combat groups and military swarms are advantageous in different situations. Combat groups which are not only more self contained but are also structurally uniform in terms of C4I, logistics and reconnaissance elements are more suited for peacekeeping missions involving a sizable force and protracted duration. The uniformity allows the modularity required for groups as well as battalion sized elements in the group to be rotated in and out of the theater of operations as necessary. In the current division set up, the peacekeeping force usually would not require such a size and the elements stripped out from the division not required for the mission would be virtually unusable for other operations (Macgregor (1997)). Military swarms with little or no organic logistic elements on the other hand are useful for small, short duration missions such as humanitarian relief as well as in countering dispersed networked LIC/OOTW threats highlighted earlier.

A separate question related to modularity to be addressed is how swarms fit into the military organization structure for example, whether they should form a separate entity alongside combat groups. If a great level of modularity is built into the decentralized military organization, one possibility is for combat groups to be designed with more battalions than required each of which could be detached to form up swarm clusters and pods that could together with other swarms units taken from other combat groups to conduct swarming operations when required. To the extreme, each pod can in turn be dispersed to form individual swarms.

4.5.4 Designing Robustness

It was mentioned in Chapter 3 that compared to the corporations, the military faces an environment with a higher degree of uncertainty and greater threat of disruptions to the communications. We also assumed that the communications devices discussed have been made robust either through a networked design or sufficient redundancies. Having said that, the organizational design of communications intensive decentralized structures (especially military swarms) need to take into account of remote situations of communications failure due to system failure or disruption by the enemy by various means including the use of new weapons such as pulse weapons²⁸.

Various procedural measures can be incorporated into training and doctrine but they are out of the scope of the thesis. However, a noteworthy point here is that understanding how decision making structures develop in relation to declining communications costs discussed earlier can aid the development of contingency procedures. Knowing that decision making structures progressed from independent decentralized through centralized and finally to the connected decentralized structure, a solution to the breakdown of communication is to regress back the decision making structures to the more centralize mode but also bearing in mind not to over control the units. This is a particularly important consideration for swarms where without the communications to coordinate the multi-directional attack, fratricide may become a real possibility.

²⁸ This includes high powered microwave weapons (HPM) and high altitude nuclear detonation (HEMP).

Take the case of communications failure for an individual swarm. The communications systems of adjacent swarms could be designed to track the last known position of the individual to allow the closest swarm to try and group up with him and thereafter for them to function as a single unit. If large numbers of swarms lose the communications, procedures have to be in place for a fall back position for them to group. The concept is to group to the next bigger unit where communications means are available. For military swarms this could imply that pods group with adjacent pods until they form a cluster, and should the communications in clusters fail, for clusters to group up to a level where they have sufficient forces to adopt the alternative forms of warfare such as mass and maneuver where communications demands are lower. As for combat groups, they need not group up in the event of communications failure as they are self sufficient forces operating in more conventional mass/maneuver formations, but to operate in a more independent decentralized manner with respect to the operational level commander but guided by his command concept.

4.5.5 Designing Training

Chapter 3 noted that intermediate hierarchies offer the opportunity to train soldiers to assume higher appointments and that this difficulty is probably more pronounced in the military because of the inability to recruit personnel at mid levels of their careers. Information technology can be used here to help alleviate the issue although it will not completely address this issue on its own and the role of mentors covered in the next chapter will complement this. Take for example the grooming of a subordinate who may be a combat group commander or a swarm leader to assume an operational level

commander appointment. The same information systems used in the operational command HQ can be replicated in a simulated environment using actual operational scenarios as well as fictitious ones even with today's technology and the person can be put into a highly realistic training environment to help him up the learning curve. In addition, tools are available to record and playback his actions to allow for debriefing as well as compare his decisions with the experience and lessons learnt from previous commanders. In a sense, the entire training system would parallel a knowledge management system where it tries to capture both tacit and sticky information. Similar simulated training environment with knowledge capture can also be applied for peer training at the tactical level where multiple players can be linked together. The ability to record and provide feedback would be highly essential especially for the swarm scenario given the highly amorphous way of fighting that may make it hard to make sense when one is in the thick of it.

CHAPTER 5: MAKING DECENTRALIZATION WORK

“The organization is, above all, social. It is people. Its purpose must therefore be to make the strengths of people effective and their weakness irrelevant.”

-Peter Drucker¹

5.1 Introduction

In Chapter 4, we discussed the conceptual designs in which decentralized decision making could be applied to various levels and modes of organization in the military. However, it would be almost impossible for such designs to work by simply fitting them for example into a traditional centralized military institution without an accompanying change in the organizational environment and culture. These factors would ultimately shape the competencies of the people the organization produces which are the quintessential determinants of the success of these new decision making designs. We saw earlier that in order for the Germans to successfully conduct Blitzkrieg in World War II, German commanders were trained in the doctrine of *Auftragstaktik* which allowed lower level commanders to exercise a high degree of autonomy based on commander's intent. This operational methodology did not happen overnight but one which was deeply embedded in the German military culture from the time of the Prussian General Staff in the late 19th century.

In addition, when discussing about these organizational factors, it should be noted that a unique aspect of most military organizations as compared to the corporate world is that while the ability to conduct operations across the conflict spectrum is the military's

¹ Hesselbein, F, Goldsmith, M and Beckhard, R (Eds) (1997). *The Organization of the Future*. Jossey-Bass Publishers, San Francisco.

raison d'être, such activities usually account for only a fraction of the organization's time and the organization in most part function in a non conflict environment. As such, the organization culture and environment has to permeate into the plethora of peacetime activities as well including training, the relationship between soldiers and commanders on a daily basis and maintenance activities.

This chapter considers the more intangible organizational ingredients that are required for the military to cope with the increasing decentralization made possible by decreasing cost of communications. The chapter is divided into two parts. The first part looks at issues at the management level by considering what environment and culture would be most suitable in the military and what are some actions management can do to bring about these conditions. The second part focuses on issues at the individual level and the attributes desired from each soldier in the age of decentralization.

5.2 Management Actions

Critical adjustments are needed by the top leadership in the 21st century military as advancement in communications opens up the choices in the way operations could be structured and decisions could be taken. Two important inter-related areas that need to be addressed by the military leadership are the new leadership orientation and the organization culture required. This is not an attempt to detail a comprehensive discussion on each of these areas which on its own could be a separate study but to draw out the essence.

5.2.1 Leadership Orientation

Management will need to rethink the leadership paradigm in view of the information revolution. Malone (2002) suggests that the classic model of management/ leadership through the philosophy of “command and control” will be replaced by a new mental model that will encompass the broader range of organizational possibilities available including command and control. He calls this a shift to “coordinate and cultivate”.

Contrasted with controlling, which is essential for the successful hierarchical organizations, coordinating opens up many more options including the many decentralized possibilities which are becoming increasingly important. Coordinating simply refers to organizing work in a manner that produces the desired outcomes. Three conditions necessary for good results are the need for people who are capable to get the things done, a set of coherent incentives and good connections as to how the goal is set and the information flows. These conditions vary with each different decision making structure. For example, the critical connections are vertical in centralized hierarchies, while horizontal information flows become more important in loose hierarchies and even more so in democracies and markets.

Cultivation of organizations and the people in them involves understanding how to effectively harness their people’s true intelligence and creativity by encouraging the ir positive potentials and limiting the ir negative aspects, shaping these tendencies in ways the organization values. This includes knowing how to balance the right kinds of control

with the right kinds of letting go. Instead of just seeking to impose plans from the top, effective cultivation of the organization requires a conscious effort to seek out and nurture the goals, ideas and opportunities emerging from throughout the organization.

Another form of cultivation important in the military context is that of mentoring. While this should be emphasized more in face of growing decentralization and the issue experience gap mentioned in Chapter 3, the concept of mentoring has to evolve too. It used to be the superior in rank or appointment providing mentorship, but in future the superior (for example, in the case of the operational commander and military swarms) could have too wide a span of command to mentor each immediate subordinate and is only able to do so for those identified to succeed him. For the rest, management will need to look at providing the environment and incentives for mentoring at the peer level. This could take the form of more senior peers mentoring the freshmen and/or to form a buddy system among equals to share experience and mutually cultivate each other's potential.

A shift to a coordinate and cultivate outlook will entail new approaches to leadership which include new attributes of leadership that were not emphasized in traditional organizations. Senge (1996) believes that traditional leadership thinking would have to shift to one where “leaders are those who “walk ahead,” people who are genuinely committed to developing new skills and capabilities, and understandings. And they come from many places within an organization.²” Leadership will also shift from a more direct form towards an indirect one that encourages more room for leadership opportunities to arise from throughout the organization. Direct intervention by leaders

² Senge (1996), p 45

will be replaced by leadership that focuses on communicating inspiring visions and values, listening to and caring for followers and leading by example (Pinchot (1996)). Related to this is the notion of grass-roots leadership, a principle that empowers every individual to share the responsibility of achieving excellence³. It does so by replacing command and control with commitment and cohesion, through engaging the hearts, minds, and loyalties of workers, and such a principle has been envisaged to be a radical transformation of the nature of leadership in the future when knowledge redefines the nature and purpose of organizations (Helgesen (1996)). In similar vein, the concept of “servant leadership” has been advocated for today’s military to adopt in order to encourage better information flow and learning (Sim (1998)) and to create the loyalty required in today’s soldiers (who question more and are less willing to follow leaders blindly) to trust commanders with their lives in battle (Braye (2002)). The idea of servant leadership was first articulated by Robert Greenleaf in the early 1970s which highlighted that true leadership needs to be borne from the desire to first serve others and that the “best test is: Do those served grow as persons; do they, while being served, become healthier, wiser, freer, more autonomous, more likely themselves to become servants?”⁴ These ideas of leadership point toward the acknowledgement of the increasingly important role each individual plays in the information age and the corresponding need for the empowerment of the individual. This would be discussed in greater detail in section 5.3.

³ The concept of grassroots leadership originated from US Navy Captain Mike Abrashoff who used this principle to cause a remarkable transformation of the demoralized crew of the USS Benfold into a high performing one which won the best ship in the Pacific Fleet after he assumed command. Details about grassroots leadership can be found at <http://www.grassrootsleadership.com>

⁴ Greenleaf (1991),p.4

5.2.2 Organizational Culture

For the military to adopt increasingly decentralized decision making structures, not only is there a need to redraw organizational charts, management also needs to ensure that the informal culture supports this.

An important imperative is that the military organization be transformed to a learning organization that emphasizes the motivation, creativity and empowerment of the individual as its *modus operandi*. Otherwise, the shift to the various decentralized designed would be doomed to failure. A learning organization can be said to be one which “adopts a willingness to identify and challenge its existing paradigms, valuing output and the skills necessary to yield that output, rewarding the thinking, not just the doing, eliciting inputs and commitment to the vision, values, and performance expectations from employees at all levels within the organization, providing opportunities for growth, accepting and encouraging mistakes.”⁵ Senge (1990) lists five learning disciplines critical for the success of building a learning organization. They are personal mastery, mental models, building team learning, shared vision and systems thinking. The disciplines have to be internalized at the individual level given that “organizations learn only through individual who learn”⁶ and subsequently building up into a more collective level that results in learning as an organization. The five disciplines need also to work together in an integrated manner for the organization to develop the collective learning capacity which the knowledge of the whole is worth more than the sum of the parts and Senge (1990) identified systems thinking as the fifth discipline that serves as the glue for

⁵ Rolls, J (1995), p. 103

⁶ Senge (1990), p. 139

the other four to come together. Learning organizations will thus be able to discern system wide effects, collectively appreciate the changing environment and adapt accordingly, traits that are crucial for the military organization to possess in concert with the more decentralized structures discussed.

To spur the military towards becoming a learning organization, to quote the words of Harley-Davidson's CEO Rich Teerlink, "top management is responsible for the operating environment that can allow continual learning"⁷. Adopting the new leadership paradigm mentioned above helps foster the learning culture in the organization because when executives lead as "teachers, stewards, and designers, they fill roles that are much more subtle, contextual and long term than the traditional model of the power-wielding hierarchical leader suggests"⁸. This firstly involves the management articulating guiding ideas which unlike management buzzwords or slogans, are derived from extended reflection on the organization's history and traditions alongside its long-term growth and opportunities. Such ideas have the potential to unleash the energy from the imagination and aspiration that will be more deeply and widely embedded in the organization as compared to traditional authoritarian organizations. Second, management needs to pay conscious attention to creating a learning infrastructure, for example, in ensuring how the entire organization could adopt the learning disciplines and not to leave learning to occur by chance. This includes issues related to peacetime and wartime organization structures, formal and informal communication patterns to be encouraged as well as the review of current performance appraisal and incentive norms. Third, the executive team has to take

⁷ Senge (1996), p.51

⁸ Ibid, p. 51

actions to change the many skills that enabled them to be successful in the past but that could inhibit learning. These could include the toning down of the forcefulness and articulate advocacy that most executives are good at and developing greater ability at inquiring into one's own thinking or exposing the areas where one's thinking is weak.

While there are senior commanders in the military who still believe that authoritarian leadership is what the military needs⁹, more enlightened leaders are taking steps for the military to transform itself into learning organizations. This journey towards the ideal learning organization is not limited to bigger militaries like those of the US but also in smaller modern militaries like the Singapore Armed Forces (SAF) who has embarked on initiatives such as “The Learning Army” (Tan (2002)).

Perhaps unique for the military in relation to the field of learning is that the organization cannot wait till war to test out new structures such as those described in Chapter 4. In view of this, military organizations in countries including Australia, US, Sweden and Singapore have embarked on the process of “experimentation” in a big way where resources are set apart to assess the impact of technology on doctrine, training and organization including the utilization of live units to test out these experiments. For example, in the US, the Atlantic Command was re-designated as the Joint Forces Command in 1999 after being charged with the mandate to lead the transformation of U.S. military joint warfighting into the 21st Century with the “commitment to experimentation

⁹ For example, retired US Navy Captain Robert Masten concluded that it was “highly unlikely and mission defeating for the Navy to ever become a learning organizations” and that it was still necessary for the Navy to breed the authoritarian leader in the interest of speed of decision making in the battlefield (Masten (1995))

with new warfighting concepts and technologies that answer the call in the Joint Chiefs vision”¹⁰. In a similar vein, the Singapore Armed Forces intends to open a Centre for Military Experimentation to “promote innovation in the armed forces and challenge established military concepts in order to better meet future requirements”¹¹. The learning environment is particularly important for experimentation so that such organizations are empowered to test out radically new concepts without fear of failure. One way to extend this experimental learning is not to be confined to only looking inward for ideas. New concepts like swarming in the information age may not have precedents in the military, but the military can draw on experience from other “lead users” such as the gaming industry. For example, for the US Department of Defense, it was noted that “the attractive features of gaming must be brought to bear on improving our understanding command and control structures – and making those C2 structures more distributed, more self-organizing, and more self-synchronizing.. This model is completely foreign to defense information systems. So are the 24/7 paradigm and the notion of iterative processes that are both inherent in MMOGs¹². At the same time, the Internet clearly has huge potential benefits for the military. MMOGs run on thousands of servers simultaneously, again in stark contrast to the centralized DoD information systems models. Insights from the gaming industry also demonstrate that information can be handled only once (the "OHIO" principle) and without being processed, and still be extremely useful, in addition to being more timely.”¹³ In addition, MMOGs could serve

¹⁰ See <http://www.jfcom.mil/about/History/abthist1.htm>

¹¹ Karniol, R (2003), p. 19

¹² Massively Multi-player Online Gaming

¹³ Highland forum XX conference proceedings, www.hlforum.com. The Highlands Forum is an informal, cross-disciplinary group sponsored by the US Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) with a common interest in the information revolution and its impact on global and societal activities.

as platforms for which realistic simulation training can be provided for new concepts such as swarming to be worked out over a range of scenarios, for example, where individuals are linked up to fight the simulated enemy.

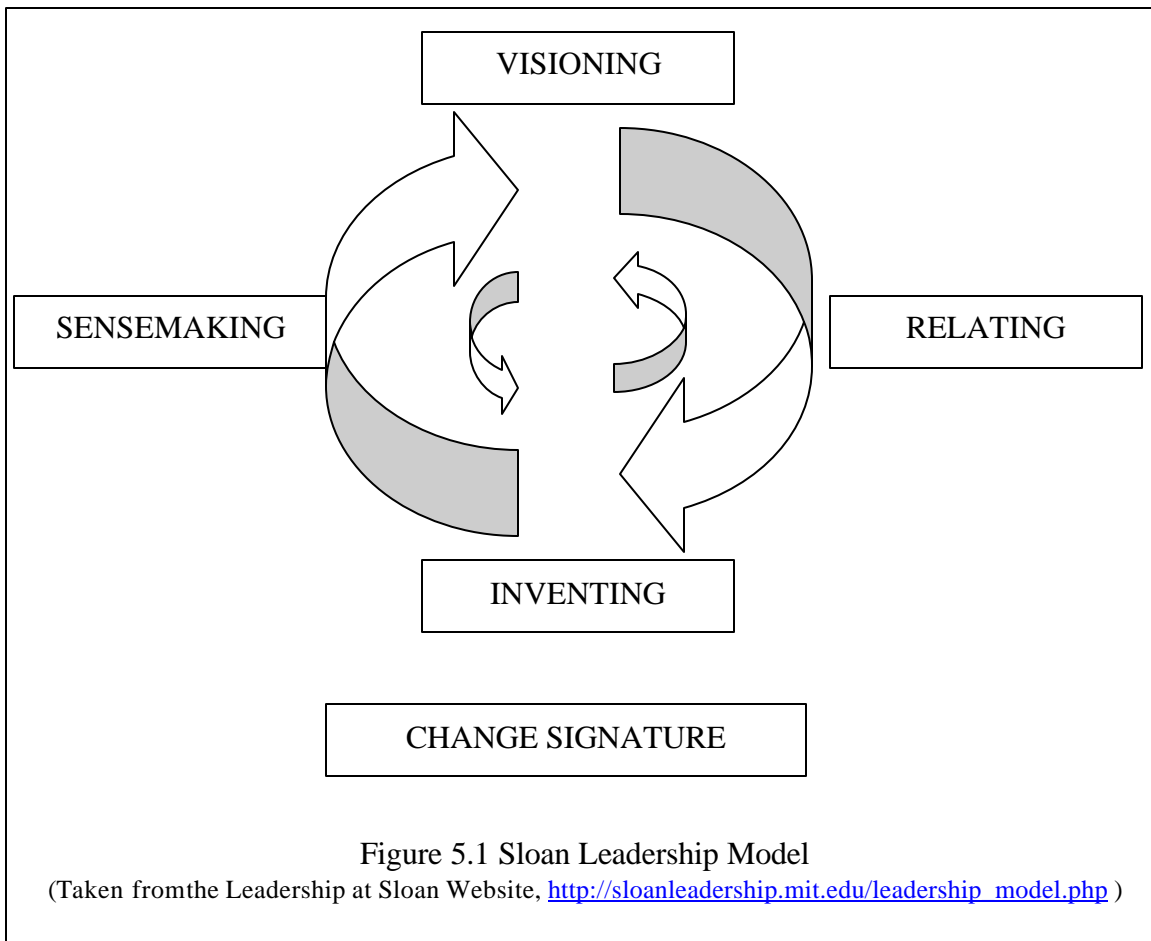
5.3 Competencies for the Empowered Individual

As the above suggests, the responsibility of each individual will increase as the management seeks to create leadership forms and organizational environment that supports the increasing importance of decentralized decision structures made possible by the information revolution. This is not only true for the business world but also recognized to be critical in military organizations as well. For instance, the commander in chief of the US Special Operations Command, General Peter Schoomaker notes that the top down hierarchical organization is “an outmoded, inaccurate, and dangerous model for leadership” and that to “win in the future, everybody’s got to know how to be a leader”¹⁴. This is particularly true as decentralized decision gets pushed further down the line. The extreme case is the scenario of the individual swarm described earlier where each individual is equipped with both the information and firepower to make many critical decisions and the success of the battle depends on everyone making good decisions.

What then are the competencies of the individual necessary for him/her to be a leader? Malone (2002) predicts that many personal attributes such as hard work, intelligence, creativity and good interpersonal skills would remain important while others like being good at following orders or engaging in office politics would diminish in

¹⁴ Braye (2002), p. 296

importance. In place of these, Malone and his colleagues at MIT identified four core capabilities would become especially important for this new environment for the individual regardless of his/her position in the organization and that leadership would be “a distributed process in which a community is energized to get separate people working together interdependently”¹⁵. The four capabilities of visioning, sensemaking, inventing and relating interacting together are collectively known as the MIT’s Sloan Leadership Model which is depicted in Fig 5.1.



¹⁵ Quoted from Leadership at Sloan Website, http://sloanleadership.mit.edu/leadership_model.php

5.3.1 Visioning

For the individual, a good vision is “a concrete image of some outcome that you are deeply committed to achieving”¹⁶. Just as CEOs need to develop visions for their business, each person as the CEO of his career (Grove (1999)), also similarly needs a vision to enable personal clarity in terms of what he wants for himself and the organization. This is important in decentralized organizations because increasingly individuals will be required to not just take initiatives but also define the vision of what the organization can achieve. Being deeply committed to the vision that connects with one’s values and things that really matter to him energizes and motivates the individual to accomplish things as well as influence others to the cause. Influencing others here in a decentralized environment cannot be done in an imposing manner but rather the vision connects with the needs and values of others. Collectively the entire establishment becomes aligned to a shared vision which is a key tenet for creating a learning organization.

5.3.2 Sensemaking

Sensemaking refers to the ability to “make sense of what the current reality is – even when it is confusing and ambiguous”¹⁷. While this used to be one key role of centralized managers, it will become the job of nearly everyone as organizations become more and more decentralized. The ability to make sense of the deluge of information around that appears ambiguous and recognize trends ahead of others becomes an

¹⁶ Malone (2002), p. 7-3

¹⁷ Ibid, p. 7-4

important advantage for the individual. This involves the accurate interpretation of the perceived information both at the level of interpersonal interactions as well as at higher levels such as those affecting the entire organization and not be biased by mental models. For example, Bill Gates was able to make sense of the impact of the internet ahead of other organizations and his memo on the “Internet tidal wave” led to a “remarkable turning point in Microsoft’s entire product strategy that, in turn, probably helped catalyzed the economy-wide Internet enthusiasm that followed”¹⁸. This quality has particular significance for military personnel in conflict situations as it enables them to quickly develop new mental maps to the changing situations and accurately discern the combat environment in order to take the correct actions. As one moves from combat groups to individual swarms, the more important it is for each individual and not just the commander to do so.

5.3.3 Inventing

In the fast paced world of the information age, changes to technology and competition are occurring faster making it impossible for the top management alone to fully comprehend the changes required. Instead the individuals in the organization will need to continually be inventing. This includes the invention of new ways of doing things, encouraging experimentation and risk, coordinating change processes, monitoring results and creating an atmosphere that helps other to produce¹⁹. In the increasingly decentralized designs discussed in the previous chapters, it becomes important to have

¹⁸ Ibid, p.7-8

¹⁹ Paraphrased from the Sloan Leadership Website, http://sloanleadership.mit.edu/leadership_model.php

individuals possess such a capability as it enables them to better react in the dynamic battlefield situation especially if the threat is a less predictable networked actor.

5.3.4 Relating

Relating involves listening to others, encouraging expression of diverse viewpoints, advocating own point of view to others, valuing and developing others, as well as building networks of collaborative relationships with others²⁰. This becomes more important in decentralized organizations because of the need to relate to many more people at many different levels. This is not limited to relating within one's organization but also includes relating to those of other organizations and for the military, the example of the need to more closely interact with other security and intelligence agencies in combating terror discussed previously illustrates this importance. Extensive communications is required and learning to be able to effectively balance the skills of inquiry and advocacy. This means developing the ability to state "clearly and confidently what one thinks and why one thinks it, while at the same time being open to being wrong."²¹

Putting the four competencies together would result in a change signature of the individual, that is, the ability for him/ her to act "in accordance with personal values, builds credibility, wins respect and trust of others, and leads in a way that others recognize as authentic"²². While the capabilities outlined above are nothing radically new, the difference is that in the decentralized world these are skills which individuals

²⁰ Ibid

²¹ Malone (2002), p 7-14, a quote from Bill Isaacs

²² Quote from Leadership at Sloan Website, http://sloanleadership.mit.edu/leadership_model.php

throughout the organization require and not just confined to those in the top management. Distributing leadership to the individual enables organizations to develop the competitive advantage in a knowledge based economy “not from developing the most predictable organization....but from being the best at engaging incompetitions where the winners are those who figure out fastest how to take advantage on new situations”²³. Developing these skills also enables the individual to attain personal mastery, an important discipline for the organization to be transformed into a learning one.

²³ Malone (2002), p. 7-21

CHAPTER 6: PUTTING IT TOGETHER – A DECENTRALIZATION DESIGN FRAMEWORK FOR THE 21ST CENTURY MILITARY

“What we do face are a set of capabilities and technologies and weapons of mass destruction that can cause enormous carnage in our country and deployed forces and friends and allies around the world. But to deal with that you really have to organize, train and equip to address those kinds of capabilities as opposed to just continuing what we were doing in the 20th Century.”

- Donald Rumsfeld¹

6.1 Introduction

This concluding chapter summarizes the discussion in the thesis by synthesizing the key lessons into a framework. It serves as a useful guide for choosing among the many more organizational and decision making possibilities arising in the 21st century as communications costs continue to decline. In addition, this chapter will discuss the further work that can be followed up from here.

6.2 Decentralization Design Framework

At the broad level, the thesis have shown that the decreasing cost of communications have given rise to the feasibility of more decentralized decision making structures before which was impractical or almost impossible to carry out. It was also highlighted that this does not mean that all organizations necessarily need to blindly re-structure into these decentralized forms. Rather, the key challenge for management is being able to effectively make these strategic choices as to what to centralize and what to

¹ The US Defense Secretary was speaking to journalists on the US military transformation. See DoD transcript entitled *Secretary Rumsfeld Interview With The National Journalists Roundtable*, 5 August 2002, http://www.defenselink.mil/news/Aug2002/t08072002_t0805sd.html

decentralize. This is what the design framework shown in Fig 6.1 hopes to help military commanders do. Before moving to explain the framework, I would like to mention two considerations that shaped the design. The first is that the framework was developed essentially to consider the effects of the information revolution on the way the military can be organized for war. As such, it has left out the consideration of the effects other military technological breakthroughs (such as weapon systems (e.g. faster, more precise and lethal bombs) or delivery platforms (for e.g. unmanned combat aircraft)) may have on the organization of the military. They are important and should certainly be kept in mind. However, not only are discussions of these other technologies beyond the scope of the thesis, it should also be noted that the effects of the information revolution are much wider and hence the interest of this thesis. Unlike other military RMAs, the information revolution is unique in that it is “dramatically altering the power relationships between the state and society, not just in America or even in the developed world but throughout the globe. And it is from the state that the military draws its mandate”².

On a different note, the second consideration is that this framework is scalable in that it could be used at both the macro level as well as the micro level. The thesis has mainly covered the former i.e. mainly from the view of shaping the entire organization, but the same design considerations can equally apply to, say, a special forces unit that wants to decentralize its organization more.

With that in mind, the following sections will describe the design framework starting from the environment and working inward.

² Builder (1999), p.24

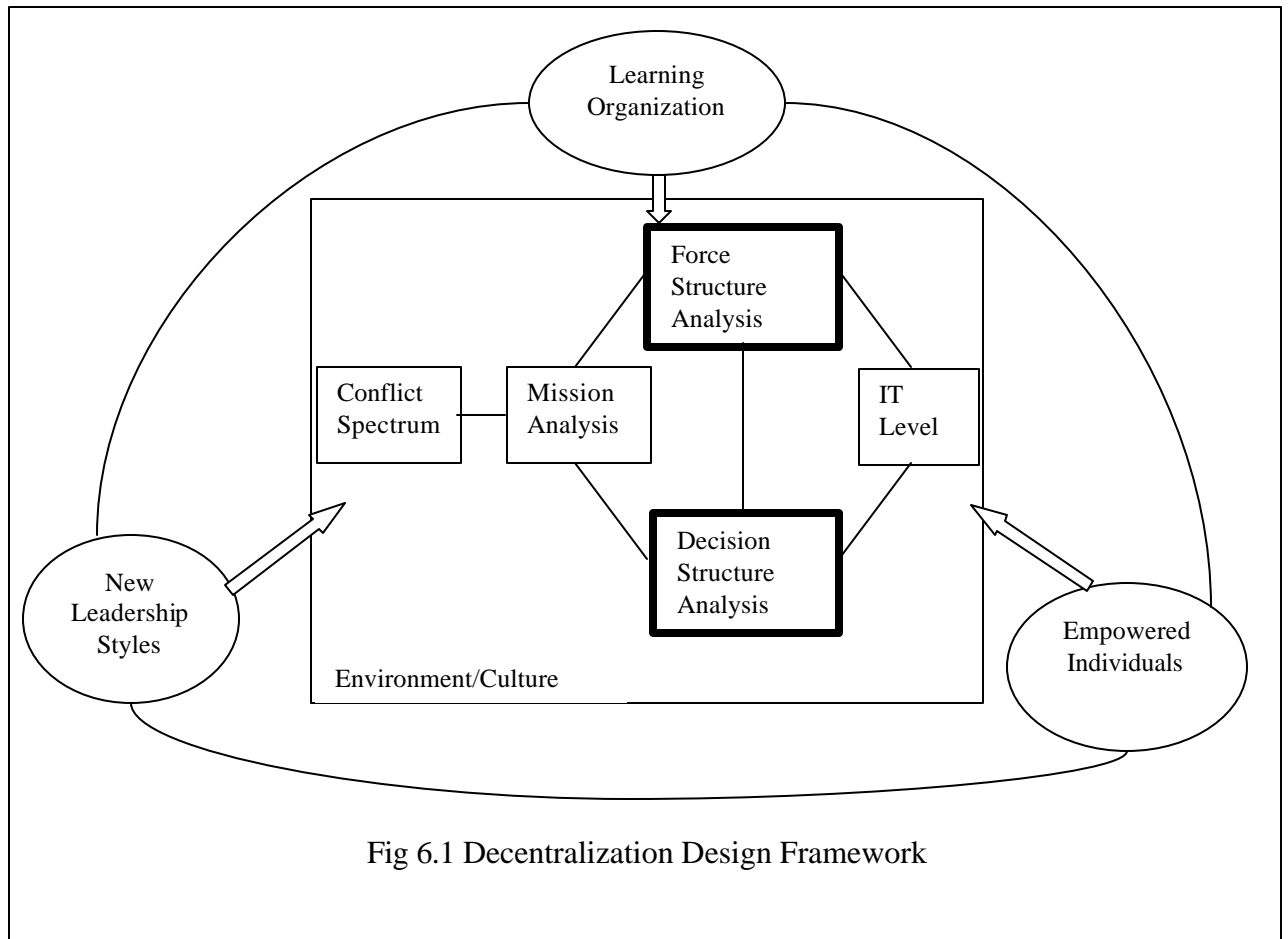


Fig 6.1 Decentralization Design Framework

6.2.1 Creating the Environment

As discussed in Chapter 5, to ensure that decentralization of decision making can be successful in the military, shifts will be required in the leadership orientation, the organizational culture has to embrace learning and individuals have to be empowered with new capabilities. These factors interact to mutually reinforce one another while at the same time independently contributing to creating the environment favorable for decentralization. For example, adopting a more grassroots form of leadership encourages distributed leadership with individuals empowered to create visions that resonate strongly within them. Collectively this helps create a shared vision which is central to building a

learning organization. As management sees the success of the transformation towards learning, they in turn will be motivated to divest even more authority to the individuals.

6.2.2 Conflict Spectrum/ Mission Analysis

Having framed the requisites for creating an environment suitable for decentralization, the next step in the design is to conduct a mission analysis on each type of the five levels of conflict mentioned in Chapter 4, ranging from unrestricted conventional war to OOTW. The mission analysis here includes making planning assumptions on the likely objectives of the mission, the likely enemy to be encountered in terms of its structure (e.g. hierarchical or networked) as well as its forces and hence the relative combat power in relation to the friendly forces and the likely duration of operations (e.g. days/months or years).

6.2.3 IT Level

At the same time, planners need to consider the IT infrastructure of the military in terms of the communications means as well as the information systems available. For the latter, this includes other C4I related infrastructure such as sensors (satellites, airborne and ground) and the level of integration of these into the information systems including whether the picture provided is real time or delayed, the resolution and the fidelity of the battlespace picture.

Together, the mission analysis of each conflict spectrum and the IT level will drive the options available for the modes of warfare and decision structures possible. The assessment is that it will likely take a longer time for the military to develop the requisite IT to effectively execute some of the more extreme forms of decentralization as compared to the corporate world because of the greater demands on robustness and the need for a highly mobile communications infrastructure. Nonetheless, it should be a goal to strive towards, and in the absence of this capability to figure out ways to best optimize the available communication means to maximize the power of decentralization as what Napoleon did during his time.

6.2.4 Force Structure Analysis

For each conflict level, there is a need to assess which mode of warfare will be dominant, whether this will be mass/maneuver or swarming and having assessed the requirements from all the conflict levels, the military will be in the position to determine how to structure the forces. In Chapter 4, it was suggested that perhaps having combat groups and swarms (pod/cluster and/or individuals) which are modular in structure may be the best option as it then enables the operational commander the ability to choose the mode to suit his strategy. However, even if this is the case, the mission analysis helps to determine to a better granularity the likely configuration in terms of the number of combat groups and swarms to structure. Arquilla and Ronfeldt's suggestion that swarming will become the dominant mode of warfare is likely to be true only if the IT level is much better than the present and/or when all militaries no longer fight in mass/maneuver.

6.2.5 Decision Structure Analysis

The analysis here involves being clear about what decisions to centralize and what to decentralize and consequently the decision making structures along the decentralization continuum to choose for each conflict and IT level. As mentioned in Chapter 4 this can be looked at by categorizing according to the levels of war (strategic, operational or tactical) and then making an assessment as to what information is sticky at which level. The considerations provided in Sections 3.6.1 and 4.5 as well as the lessons from military history discussed in Chapter 2 on decentralization and communications costs have to be taken into account here. Having determined this, clear boundaries and rules can be set for decisions to be taken at each level to clearly define who makes what decisions when and how.

It should also be noted that the decision structures and force structure arising from the warfare modes are inter-related and the choice of one affects the decision of the other.

6.3 Areas for Further Study

There are two main areas that can follow from the discussions of the thesis. As alluded to earlier in this chapter, the first is to consider the impact of new military technologies of the 21st century and how they influence the choices on force and decision making structures to complement the study of this thesis. In addition, the thesis has primarily addressed the wartime structures. Further study could be conducted to determine how structures especially those of swarming should be organized in peace.

6.4 Conclusion

Many reasons were attributed to the collapse of the Soviet Union over a decade ago but clearly this was facilitated by changes in information technology as the “Soviet style of communism and command economy failed in part because it was not compatible with the requirements of the information age. These changes in information technology have helped strengthen free markets and democratic forces around the world”³. The military organization in the 21st century could similarly be in peril of becoming irrelevant in the information age. It is therefore imperative that the military understands the forces of decentralization stirred up by the decreasing cost of communications and knows how best to adapt the organization to it.

³ Khalizad and White (1999), p.8

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