

# Organizational Fitness of a Proposed Network Centric Organization

**LCDR R. Alistair Borchert**

**Professor Carl R. Jones**

Naval Postgraduate School [codeIS\JS]

Monterey, California, 93943

831.656.2995

[Alistair@Borchert.net](mailto:Alistair@Borchert.net)

[crjones@nps.navy.mil](mailto:crjones@nps.navy.mil)

## Abstract

Network Centric Warfare (NCW) has emerged as a new concept for the U.S. Navy. NCW capitalizes on technology to obtain and maintain an enhanced situational awareness and uses the distributed offensive firepower of the collective force to fight the battle. Speed of Command and Self-Synchronization are key tenets of NCW. The authors propose an organization designed to operate in the NCW environment. It consists of the Force Commander and Commanders of Situational Awareness, Resources, Effects, and Operations. The research question is whether or not the proposed organization's is fit in the NCW environment. The organization is studied using two "snapshots": one is the planning process and the other is the execution process. The expert system Organizational Consultant is used to analyze the organization and determine its organizational fitness. The results indicate that the proposed organization is fit if changes are made to make the planning process highly centralized and the execution process decentralized. Formalization will also need to be lowered in the organization.

## 1. Introduction

Recently the Navy has been studying and experimenting with Network Centric Warfare (NCW) as a warfighting concept for Conflict in the Information Age. An important aspect of understanding Network Centric Warfare is the impact on the configuration and decision processes of command and control by the information technology now available and anticipated over the next decades. The history of military organizations suggests that technology provides the commander with a rich menu of alternative means to implement command and control. Success in the battlespace is then used to focus on a best way to accomplish command and control. Currently information technology innovation has created another point in history where there is a search for a battlespace effective command and control configuration and decision processes. The focus of this paper is using the current state-of-the-art of organizational science to understand the characteristics of the Navy combat organization needed for combat success – fitness in the combat landscape.

Basically there are three categories of organizational analysis useful for the purpose at hand. The first type is called organizational ecology. Here individual organizations are treated as "blackboxes" with goal(s) and a transformation of inputs into outputs. The interaction of the organizations in the ecology leads to some organizations being successful and others dying out of the population. The second type of analysis assumes the characteristics of the organization's

environment and studies the characteristics of the organization needed for fitness in that environment. The last mode of analysis assumes the characteristics needed for environmental fitness and seeks the configuration and decision processes needed to diagnosis and solve the organization's problems. This "moves" the organization to fitness. This study uses the second type of analysis.

## **2. The Proposed Organization**

The proposed organization has its origin in a proposal by LCDR Alistair Bochert and Captain Michael LeFever, developed during the Chief of Naval Operations Strategic Studies Group (SSG) XVII (SSG XVII, 1998). Although this organization was developed and thought about during the SSG, many of the ideas presented here are different from those presented in the SSG report. This work was continued as a thesis project at the Naval Postgraduate School where LCDR Alistair Borchert was Joint C4I Systems student. The ideas presented here are those of the authors and not necessarily of the SSG or the Naval Postgraduate School.

This organization is designed to operate in a NCW environment. It is not designed for one specific mission, rather it is flexible and adaptable so it can be changed to suit the mission in both objectives and scale, while still retaining the same basic functional elements and decision processes.

It has been said that "the challenge for the U.S. military is to develop new organizational structures that achieve the efficiencies and creativity businesses have gained in the virtual and reengineered environments, while at the same time retaining the elements of the traditional, hierarchical, command and control system essential for operations in the combat arena." (Huber, 1996, p xiii) The authors believe the approach to such an organization has been captured in the following proposal.

The core of the organization is focused on the functions and processes that the force will need to self-synchronize. There are still commanders of platforms (e.g. ship commanding officers) however there will be a fundamental change in their roles and responsibilities. They will become, similar to the Chief of Naval Operations today, responsible for "manning, training, and equipping" the platform. The fighting of platforms will be done by a different organization. It is important to note that a ship commanding officer could, and likely would, be "dual hatted" as both the platform commanding officer and one of the functional (warfighting) commanders presented below.

All of the weapons brought to the fight by a platform will be available for the entire force to use, not just for the one platform. We will no longer "fight the platform" (except in self-defense), we will take advantage of the distributed offensive firepower of the entire force and the combined effects the weapons bring to the fight.

To carry out the advantages of using the distributed offensive firepower of the entire force, the basic organization is composed of the Force Commander, a Situational Awareness function, a Logistics function, an Effects function, and Operations function. This organization, with the commander of each function, is shown in Figure 1.

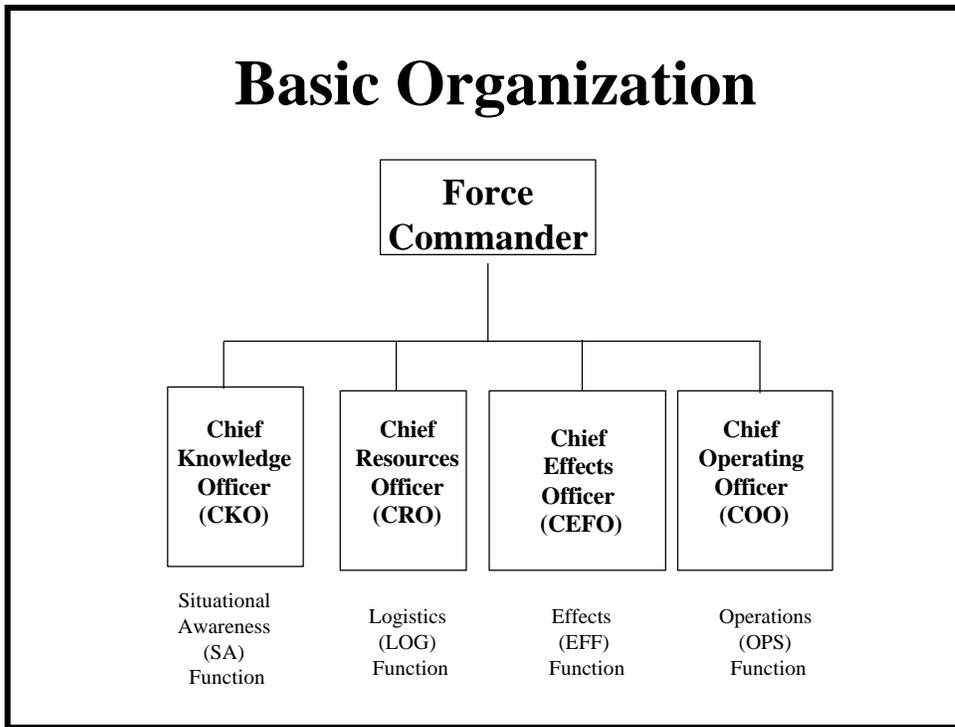


Figure 1. The Basic Organization.

In certain situations (described later), a Mission Commander role may also be activated.

#### Force Commander

The most obvious role of the force commander is to command the force. The Commander is, and should always be, responsible for the actions of the forces assigned. The commander has several specific roles, each a part of command: resource allocation, promulgation of intent, decide on courses of action, develop and maintain situational awareness, and perform a meta-cognitive function.

When there is a requirement to perform any task the commander must allocate resources to complete the task. Resource allocation is not an easy chore because many times assets are scarce and they must be distributed across many tasks, all competing for resources. Some assets may have multiple capabilities (e.g. sensors and shooting). This further complicates the resource allocation function.

There are numerous ways to accomplish a mission, but there may only be a few feasible or satisfying solutions. Generally, the staff will generate several courses of action (COAs) for the commander using decision support systems and modeling and simulation tools. The commander, using these aids, will select a particular COA or a combination of COAs and then direct it to be carried out. This becomes the commanders intent.

The commander must promulgate his/her intent so the forces know what end state they are striving to achieve. Without knowing the intent, there is no way for self-synchronization to

occur. It is the understanding of the desired end state, not necessarily how to get there that matters, although collaborative planning and, in certain situations, being told how to achieve the end state, can help.

Events on the battlefield will occur too fast for the commander to dictate every action - centralized control will not work. The intent enables subordinates to anticipate the commander's desired and take actions to implement them.

It is imperative that the commander has the "big picture". Overall situational awareness must be maintained to effectively integrate and utilize the force elements. It is of utmost importance that the commander's staff, and the other command functions, provide the right information to the commander at the right time and in the right form.

Information management is the key in providing situational awareness. To prevent overload or fixation on extraneous data a common integrated picture (CIP) must be developed and maintained on the net so everyone has access to consistent information. The Chief Knowledge Officer (CKO) of the organization is responsible for building and presenting this common integrated picture to the commander and the rest of the force.

In an organization there has to be someone who can step back from the current situation and assess how the organization is performing. Meta-cognition means "thinking about thinking". There is no one better than the commander (possibly with the Chief of Staff) to do this function. Self-critique is invaluable for improvement and adaptation to occur. The recognition of limitations, either your own, the staff's, or the organization's is the trigger for adaptation. Correcting or mitigating them is central to adaptation. Meta-cognition should be addressed at two levels in the force: the staff (is the commander being supported effectively by the staff?) and the organization of the entire force (is the force organized for efficient performance or is there a better way to do things?)

#### Chief Knowledge Officer (CKO)/Situational Awareness (SA)

The Situational Awareness (SA) function is a combination of the intelligence (the "2") and communications (the "6") functions of today and is commanded by the Chief Knowledge Officer (CKO). It is the CKO's job to manage all information in the force. Information will be managed as a pooled resource, with direct access controlled according to security control and access privileges. But the CKO is not merely a manager of information; the CKO is a commander. The CKO has direct command over all dedicated sensor systems which may reside on multi-mission platforms, like a radar on a ship, or may be solely dedicated to gathering situational awareness information, like unmanned aerial vehicles (UAV). The CKO will control these assets to effectively gather knowledge and build the enhanced situational awareness upon which the force will rely. To coordinate these assets on each platform, the CKO will have Knowledge Officers (KO) under his command. KO are working for the CKO to build the situational awareness for the force.

The CKO also maintains the CIP showing positions of friendly, enemy, and neutral platform and assets, as well as, any unresolved contacts. The CIP must show where ambiguities in contact

information exist. CKO coordinates all national assets and brings the right information to the force from national sources. CKO identifies gaps in sensor and intelligence coverage and takes action with his dedicated assets to maximize the coverage. CKO must also be able to display where these gaps in sensor and intelligence coverage exist. It is the CKO's job to maintain all communications assets, as well as ensure the security of those communications. CKO must protect our physical systems from exploitation by the adversary (defensive information warfare). CKO also attempts to predict the enemy intent. During offensive attacks, the CKO performs all battle damage assessment.

#### Chief Resources Officer (CRO)/Logistics (LOG)

The Chief Resources Officer (CRO) is responsible for the logistics support of the entire force. The CRO ensures re-supply and delivery, from the source to the user, of all food, munitions, parts, POL (petroleum, oil and lubricants) and personnel. This re-supply is based on anticipated usage and actual consumption rates. If required, the CRO is responsible for any salvage activities or contracting actions which may need to be done in theater. The CRO also maintains the logistics database.

The CRO is a commander of the logistics platforms and resources which will carry out re-supply of the force. On each platform is a Resource Officer (RO) who will carry out the direction of the CRO.

#### Chief Effects Officer (CEFO)/Effects (EF)

Effects is where decisions are made concerning fighting the battle which enables leveraging of the distributed offensive firepower of the force. The Chief Effects Officer (CEFO) is responsible for this process. The CEFO commands all the weapons and weapons systems in the force. These assets are the CEFOs to use in the most effective way to carry out the intent of the commander.

The CEFO relies heavily upon decision support systems to help carry out effects tasks. The CEFO ensures all targets are prioritized and duly targeted, coordinates all fire support requests, and matches the target with the most appropriate weapon. In some cases, CEFO will have to hold back some weapons, husband assets, to prevent too many weapons from being fired at one target or weapons usage rate from being too high. CEFO must ensure the deconfliction system is running properly and resolve any problems the decision support system can not handle. Besides the kinetic weapons, CEFO is responsible for non-lethal weapons, to include offensive IW. The CEFO commands all platforms that are solely dedicated to the effects process (such as Unmanned Combat Aerial Vehicles (UCAVs)) and has control over the weapons on multi-mission platforms. Working on each platform for the CEFO is an Effects Officer (EFO).

It is important to note that the effects function is arguably the most centralized process. Almost all the engagement deconfliction decisions, as well as, determining what platform will fire, will need to be made by an automated decision support system (as programmed by the CEFO, based on the intent of the commander), and then broadcast on the network. This becomes a centralized process, with decentralized execution. Firing of weapons can be done remotely by the CEFO or by any EFO.

Effects is separate from OPS, as the effects process is focused on the weapons and their effects and the employment of these weapons. OPS, as described below, focuses on the total force and the proper balance between the CKO, CRO, and CEFO.

#### Chief Operating Officer (COO)/Operations (OPS)

Operations (OPS), commanded by the Chief Operating Officer (COO), is where the day to day execution of the force is carried out. The COO directs the tactical execution of the force, to include stationing of units which are not under the command of the CKO, CRO or CEFO. These include multi-mission platforms performing several competing functions at once. In the case of one platform performing several functions, the COO takes the potentially competing recommendations of the CKO, CRO, and CEFO and decides the positioning of the force's platforms for the effective positioning of sensor, weapons, and logistics assets.

Other functions of the COO include future force employment, the near real time planning and execution functions, force protection, simulation and event reconstruction analysis. On each platform is an Operations Officer (OPS) who works for the COO.

#### Relationships in the Organization

In a platform centric view, each platform brought its weapons to the battle and each platform was considered as a whole. Under NCW, this changes. Now each individual sensor and weapon (not platform) will be considered individually and how it (not the platform) can contribute to the force. Weapons, and the control of each weapon, can be distributed throughout the force. This new perspective changes the relationships in the organization, and allows for capability tasking vice unit tasking.

The commanders (CKO, CRO, CEFO, COO) must work closely together and keep the success of the force, not just their respective functions, at the forefront when carrying out a mission. A commander who is not concerned about the entire force, will do more harm than good. We are trying to fight the force as a whole and effectively use the capabilities brought to the battle in a distributed fashion.

While each command function has its own unique responsibilities, it is working for the force commander and towards the commander's overall goal. CKO and COO have the most responsibility, while the CRO and CEFO functions are clearer and have less ambiguous solutions. COO makes many decisions on behalf of the commander (i.e. force positioning of multi-mission assets), however, if one of the other functions has very strong objections to the decision of the COO, they may take their case directly to the force commander for arbitration.

In the case of a multi-mission platform, such as a ship, where the CKO is commanding the radar systems, the CEFO is commanding the weapons, the CRO is commanding the resources, and the COO is carrying out the mission, there will likely be instances where not everyone can agree. Hopefully, due to the commanders self-synchronizing their efforts, these instances will be rare, but when they do occur, the force commander will need to step in and allocate the asset's

resources. Allocation of assets is one of the roles of the commander, so if the CKO, CRO, CEFO, and COO can not agree, the force commander will make the ultimate decision.

### Platform Commanders

So if the force commander, CKO, CRO, CEFO, and COO are commanding the force, where does this leave the traditional platform commander? The platform commander is concerned about “manning, training, and equipping” the platform. The platform commander (e.g. a ship’s commanding officer) still has command of the platform and is still responsible for safe navigation and safety of the crew, but now the platform commander brings the platform to the battle, then enables other people, either on board or remotely, to use all the assets on the ship. The platform commander must make sure all systems are operating properly so they can be used in the most effective manner across the force.

On each platform the KO, RO, EFO, and OPS are working for the chief of each function (the CKO, CRO, CEFO, COO), see Figure 4-2, but the platform commander will still be involved in each process to ensure the most effective employment of the platform in each functional area.

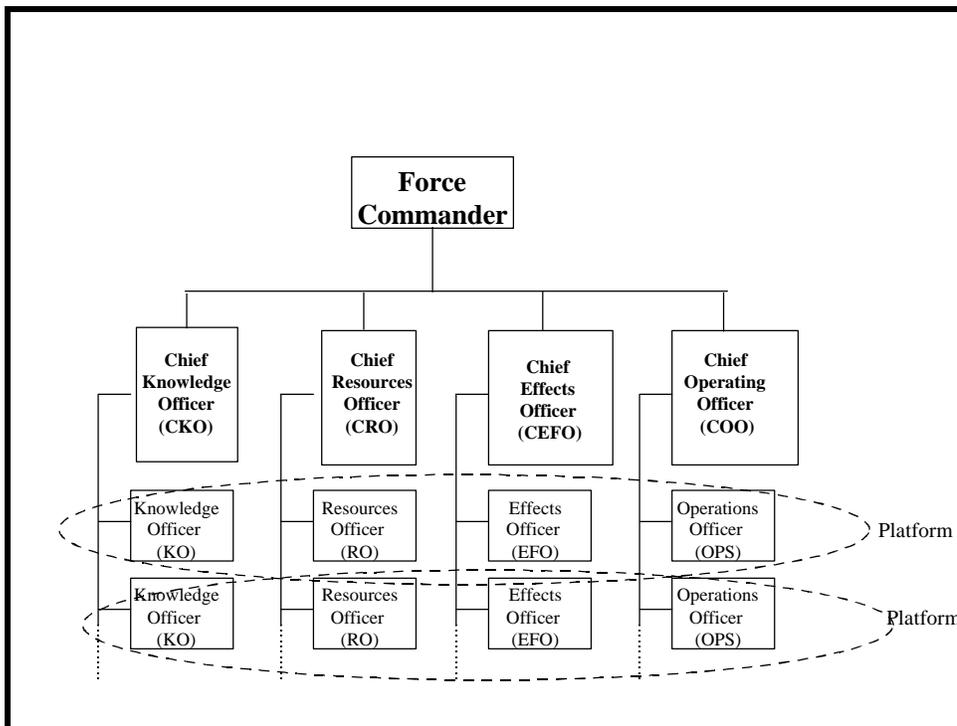


Figure 2. Organizational Relationships.

It is important to point out the one situation where the platform centric view still holds true: self-defense of the platform. The platform commander (ship’s commanding officer) can override the CKO, CRO, CEFO, or COO if the platform must respond immediately to ensure its survivability. An exception to this may be when the force commander decides that a platform may have to take a hit to protect another more important asset.

## Mission Commanders (MC)

The addition of mission commanders (MC), see Figure 3, makes the proposed organization flexible, scalable, and adaptable.

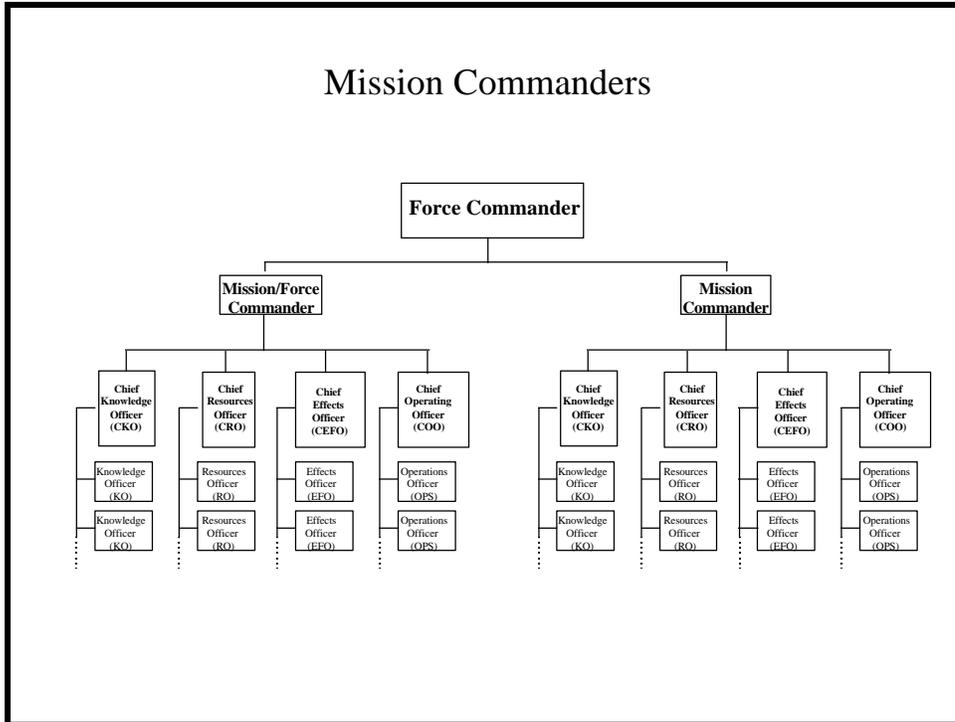


Figure 3. Mission Commanders.

In Figure 3, the new MC is a section of the old force which has been “spun off” for a specific mission. In a sense, the force commander moves up a level and also functions as a MC for the original force (reporting to him/herself), while the new MC reports to the force commander.

Mission commanders can be activated in several situations. A mission commander can be activated when: the complexity of a mission is high and requires special focus, the mission requires a unique capability, to prevent overload of the functional commanders (i.e. span of control is too large to handle), or forces are required to leave the protection afforded by mutual protection of forces close together.

The assets, both platforms, sensors, and weapons, assigned to the mission are organized around the mission they are assigned. Any asset can be assigned to a mission commander. It all depends on the mission and the best solution to the problem. The assets assigned are dedicated to the mission commander and for accomplishing the mission.

The Mission Commander concept is designed to give the MC the forces needed to complete the sub task or mission, let the MC organize these forces, plan and execute the mission, and then

return main force where the MC and the assigned forces revert to their previous roles (or new roles).

While being adaptable to any situation, standing up a mission commander will not generate unfamiliar command relationships. The newly formed mission commander will also have a CKO, a CRO, a CEFO, and a COO, and each platform will have a KO, a RO, a EFO, and an OPS. Ideally, the people carrying out these roles on the platforms will not change, only the focus of their efforts (the new mission) will change.

The mission commander's organization may be comprised of forces that are not familiar with each other, although it is best if they have worked and trained together. However, the functions (SA, EFF, LOG and OPS) are still the same as before the activation of the mission commander and relationships between force assets assigned to the mission commander are the same as when they were working for the force commander.

Experiments carried out under the Adaptive Architectures for Command and Control (A2C2) program support the idea of an organization focused on a specific task. Previous research found that organizations had a higher level of performance if there was a match between the task, the environment, and the organizational design (Kemple, 1998, p. 5). Also, in highly uncertain and highly dynamic environments, an organization that can adapt is favorable (Bowditch, 1997, p. 280).

#### The Process of Self-Synchronization

The following helps to examine the process of self-synchronization which an organization might use. Five KOs, on different platforms, are working to build the enhanced situational awareness upon which the force is relying. They are updating the CIP, monitoring systems that update the CIP, and monitoring the sensor assets which they control. The CKO is monitoring the KOs compliance with the CKO intent, which is itself based on the force commander's intent. All the KOs are communicating with each other using the information grid. The KOs are equal in authority as there is no hierarchy amongst the KOs. As one KO sees an opportunity which can be exploited, he/she either takes action, using assets under the KO's control, or alerts another KO of the opportunity. If there are disagreements amongst the KOs, or the CKO sees an opportunity which has not been seen, the CKO will direct one of the KOs to take action.

While the CKO and the KOs are working on building the situational awareness, the CEFO and the EFOs are working on having the right assets (weapons) ready for any action which may be pending. The EFOs ensure that the weapons and weapons systems under their control are ready for combat and disposed so the offensive capabilities of the force are in the most effective position. In the same way there is no hierarchy amongst the KOs, there is none for the EFOs. Any disagreements amongst the EFOs, of which should be few as decision support systems should tell the EFOs where to position the weapons for maximum coverage and effects, will be resolved by the CEFO.

If there are disagreements between the KO and EFO of a particular multi-mission capable platform and both missions are being performed simultaneously (e.g. providing both sensor

coverage and weapons coverage), then the OPS on each platform, working with the COO, will resolve the conflict. The CKO and CEFO must remember that the “big” picture is what matters. Some give and take between all individuals is vital as resources will always be in short supply. If the issue cannot be resolved locally, and the CKO, CEFO, and COO can not work together to solve the problem, the force commander must make the ultimate decision regarding asset allocation and utilization.

In matters regarding the logistics function, the RO and CRO function in the same manner as the other functions.

### Planning and execution processes

Although this organization is designed to function as one cohesive unit, there are two distinct processes occurring within the NCW organization at the same time; one is the planning process and the other is the execution process.

The planning process is highly centralized. The force commander and his staff will generate the commander’s intent and decide how to allocate resources. The individual KO, RO, EFO, and OPS have little, if any, input into this process. It is very centralized.

On the other hand, the execution process is very de-centralized. It is capitalizing on forces self-synchronizing their efforts to carry out the commanders intent. The force commander is not heavily involved in this process, except to monitor events, ensure that they meet the intent, and resolve any disputes. This is a very de-centralized process.

Obviously there are not two distinct NCW organizations. Unity of command as well as unity of effort are required to carry out the mission. However, the two processes (planning and execution) are so distinct that they are analyzed as different processes.

## **3. The Organizational Analysis**

### Contingency Theory

Organizational theory focuses on the understanding of organizations. It is a multidisciplinary science with distinct viewpoints. Contingency theory is a dominant theme in organization theory. Contingency theory suggests that the effectiveness, efficiency, profitability, and viability of an organizational design is contingent or dependent upon such factors as size, strategy, technology, environment, and managerial preferences (Baligh *et al*, 1996, p. 1650). Figure 4 presents the contingency theory-organizational design model pictorially (Burton and Obel, 1998, p. 16).

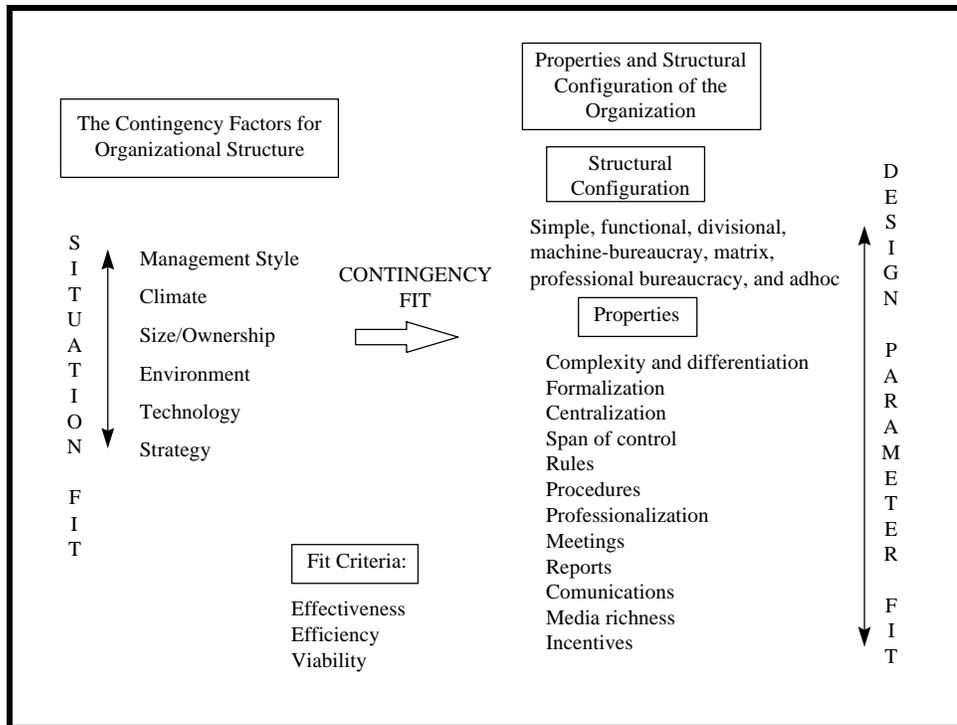


Figure 4. Contingency Theory - Organizational Design Model

This model is the basis for the knowledge base in the Organizational Consultant expert system. The knowledge base is derived from the vast contingency theory literature. It is used in a series of “if-then” rules to ensure proper fit Between the contingency factors (the “if” part) and the properties and structural configuration of the organization (the “then” part). Organizational Consultant uses these “if-then” rules according to a particular logical process to produce recommendations on the design of an organization. The designed structure is examined for the fit between its parts and its environment and also the fit between it and the existing structure.

The organizational structure must be appropriate for the situation (or situations) it will operate in and the organization must also function well as a whole. The term used for describe these two conditions is “fit” (Baligh *et al*, 1996, p. 1653). Fit must be achieved in the environment and also within the organization.

An effective and efficient organizational design needs to have a proper fit simultaneously throughout all the dimensions of Figure 4. There has to be a fit among the contingency factors themselves (Management style, Climate, Size/Ownership, Environment, technology, and strategy). This is called situational fit. There has to be a fit between the contingency factors, listed on the left side of Figure 4, and the design parameters on the right side of the figure. This is called contingency fit. There also has to be a fit among the design parameters - called design parameter fit (Baligh *et al*, 1996, p. 1650). The final type of fit, total design, is the most demanding of all. It assumes that the contingency fit, situational fit, and the design parameter fit criteria have all been met (Burton and Obel, 1998, p. 18). All four fit criteria are necessary to obtain a useable system.

Situation fit is based on the contingency factors for organizational structure: management style, climate, size/ownership, environment, technology, and strategy. To change any of these contingency factors requires a change to take place in either the environment or the organization. It is difficult to alter the situation fit. For example, one of the contingency factors is technology. For an organization to transition from a situation where few technology systems being used to where many advanced technology systems are being used requires a great deal of effort and can change the way an organization functions.

Situation fit requires that the design situation be internally consistent. Situational facts, which give answers to the “if” questions, must make sense. For example, an equivocal environment and a routine technology do not fit. There is a recommended design for this situation, and, since it is not being met, it is a situational misfit (Burton and Obel, 1998, p 17).

Control of situational misfits (and ensuring they continue to fit in the environment) is key to organizational success. Only those organizations that manage to identify the proper misfits and resolve them will be successful (Burton and Obel, 1998, p. 17).

For each design parameter listed on the right hand side of Figure 4, the set of if-then propositions that lead to a design recommendation must fit and be in balance. For example, a design recommendation that the organization should be decentralized can be driven by a number of contingencies. Management style, climate, size, environment, technology, and strategy may all strongly suggest decentralization. However, the more likely situation is that there are also design propositions that suggest more centralization. Here the design propositions must be in proper relative balance to obtain a good fit. Certainty factors, discussed below, help obtain proper design parameter fit (Burton and Obel, 1998, p. 17).

Contingency fit is the underlying organizing concept that joins together situation fit and design parameter fit. It explains how situation fit and design parameter fit are based on contingency theory and work together. Contingency fit is labeled as such in Figure 4.

Each if-then contingency proposition must be consistent with contingency theory. A rule that states “If the organization is large, then the structure should be centralized” does not fit with what contingency theory tells us and should not be a part of the knowledge base (Burton and Obel, 1998, p. 16).

Contingency fit criterion can largely be achieved by adhering to the contingency theory literature and translating this into appropriate if-then statements for the organization (Burton and Obel, 1998, p. 17).

Total fit assumes that situation fit, design parameter fit, and contingency fit are all in balance. Total design fit requires that the design recommendations fit together internally and fit the actual situation (Burton and Obel, 1998, p. 18). Total design fit is the reality check - it asks “can the recommendations be used in real life?”

Even with a situational fit and a contingency fit, design parameter fit may not be present. This is due to the fact that each contingency relationship may lead to more than one design

recommendation. The right set or combination has to be chosen to obtain total design fit. Total design fit may be impossible to obtain if a serious situational misfit exists (Burton and Obel, 1998, p. 18).

### Organizational Consultant Expert System

Organizational Consultant is an expert system which relies on a knowledge base derived from a combined large body of literature on organizational theory and a body of expertise on organizational design. Its purpose is to help design organizations. Its underlying assumption is that an organization's primary role is an information processing one.

Contingency theory and the "fit" criteria are the organizing concepts for the creation and development of the knowledge base used by Organizational Consultant. The knowledge base appears as a system of decision rules, or rules that generally apply under specific sets of circumstances.

The knowledge base has over 450 rules. An example of a rule is proposition 5.12: "If the organization is large, then formalization should be high (cf 20)." The cf stands for certainty factor and can range from -100 to 100. The certainty factor measures the degree of belief (or disbelief for negative certainty factors) one has in the rule statement. These certainty factors are set in Organizational Consultant by the developers as default values based on their experience and cumulative research. These certainty factors were not modified by the author. Certainty factors are also used in the input by the user to answer the questions posed by Organizational Consultant and in the recommendations provided after the system has analyzed the organization.

The problem of organizational design is difficult when one considers the many different variables and combinations possible. For example, an organization can be defined as to whether it is centralized or not, formalized or not, and whether it has a simple, divisional, functional, or ad hoc configuration. In this situation, there are  $2 \times 2 \times 4 = 16$  different possible designs from which to choose. The number of choices grows non-linearly as the number of organizational dimensions grows (Burton and Obel, 1995, p. 321). To consider all the possibilities, without the aid of a computer, would be monumental at best. The Organizational Consultant expert system allows the user to examine many different variables and possibilities in a short period of time.

Organizational Consultant analyzes the current organizational structure using many facts related to the functioning of the organization. The structure is then described in terms of configuration and its properties. Based on the input, the system, using the rule set in the knowledge base, recommends the configuration and structural properties that give the best fit for the specified situation. The situation itself is analyzed and possible situational or organizational misfits are given. Finally, the current and prescribed organizational structures are compared, and possible changes are recommended. The system allows the user to change input values and rerun the consultation. This is a way to perform sensitivity analyses (Burton and Obel, 1998, p. 31).

More information on Contingency Theory and the Organizational Consultant expert system can be found in the Burton and Obel text, *Strategic Organizational Diagnosis and Design* (1998).

## Inputs to Organizational Consultant

Based on user input, Organizational Consultant recommends the structure and its structural properties that give the best result within the specified situation. The situation itself is analyzed and possible situational or organizational misfits are given.

Inputs to Organizational Consultant are separated into twelve sections: current configuration, current complexity, current formalization, current centralization, size, age/ownership, diversity, technology, environment, management profile, strategy factors, and climate factors.

Some of the answers to the questions posed by Organizational Consultant can be very subjective. For example, in the current centralization section, the question, "How much discretion does the typical middle manager have over hiring and firing personnel?", has as possible answers "no answer, very great, great, some, little, or none." What is the difference between some and little? The answer is very subjective. Given the same situation, one person may answer differently than another. "No answer" is always an answer if the question is not applicable.

Confidence factors (0 to 100) are included as an input for each question to measure how sure the user of Organizational Consultant is in the answers to each question. A high confidence factor (i.e. 100) means that the user is positive in the value of the answer and Organizational Consultant will fully weigh the propositions associated with that question. A lower confidence factor will not weigh the associated propositions as strongly.

When answering the questions for the proposed organization, several assumptions were made by the author. There was a realistic progression of the Navy as it moved into the proposed structure. There were no real radical changes in the basic Navy way of life: there are still Officers and Enlisted personnel, salary is set on a chart as it is today, bonuses are paid to some people and not to others, promotions are determined by a selection board (for officers) and a multiple score primarily determines advancement for enlisted personnel, fitness reports and evaluations were still used. Forces are still commanded by a commander responsible overall for the operation and accountable for the forces actions. The Chief Executive of the organization is the Force Commander. Top Management consists of the Force Commander and the other commanders (CKO, CRO, CEFO, COO). Middle management are the KO, RO, EFO, OPS and platform commanders.

Organizational Consultant expert system is designed to look at the entire organization. It can not consider adaptation of the organization or different processes within the organization. NCW has two distinct processes, planning and execution. The planning process is highly centralized, where the force commander is deciding on the intent and the overall strategy for the forces. In the execution process, the commander has delivered the intent and has stepped back to allow the forces to self-synchronize their actions. Here centralization is very low.

These two different "snapshots" of NCW organization, planning and execution, were used to answer the questions posed by Organization Consultant. Each of the two snapshots had a slightly different output from Organizational Consultant.

The authors will briefly review each input category and discuss the rationale behind the input of each section, both from a planning and execution point of view. Answers to each question are available from the authors along with the reasoning for each question.

## Current Configuration

Configuration specifies the way an organization divides work, breaks tasks into subtasks, and coordinates these activities. An organization can be described as simple, functional, divisional, a machine bureaucracy, professional bureaucracy, adhocracy, or matrix configuration.

This organization has elements of the following four configurations: functional, divisional, simple, and ad hoc.

The functional configuration has unit grouping by functional specialization (production, marketing, finance, human resources, and so on) (ORGCON, 1998). The NCW organization is broken down into functional groups: Situational Awareness (SA), Operations (OPS), Logistics (LOG), and Effects (EFF). Each of these groups, which cross all platforms (divisional configuration), allows the organization to interact within each functional area.

A divisional configuration has self-contained, somewhat autonomous units, coordinated by a headquarters unit (product, customer, or geographical grouping including multinational) (ORGCON, 1998). In this configuration each platform is clearly a separate division, operating very autonomously (yet synchronizing with other divisions).

The simple configuration has a flat hierarchy and a singular head for control and decision making. This is a "one man show." (ORGCON, 1998) For the NCW organization the force commander clearly is in charge of the planning process. On the execution side, the "chiefs" of each functional division are in charge of their own simple (flat) organization, as they are in charge of the officers on each platform within their functional area.

The ad hoc configuration is characterized by high horizontal differentiation, low vertical differentiation, low formalization, decentralization, and great flexibility and responsiveness. (ORGCON, 1998) Under this configuration, forces are self-synchronizing. Forces come together with a common purpose (a mission which is clarified by the commander's intent), yet they are not directed how to carry it out. The ad hoc body must decide among themselves how to proceed. This is the heart of self-synchronization accomplished during the execution of a mission.

Although there are elements of each of the four configurations in the organization, a simple configuration captures the essence of the NCW organization during the planning process while an ad hoc configuration describes the execution process.

Complexity is a measure of horizontal (specialization within the organization), vertical (depth of the organization hierarchy), and spatial (amount of geographic dispersion of the organization) differentiation. As the degree of complexity increases, the need for coordination and the requirement for organizational information processing increases (Burton and Obel, 1998, p. 69).

Complexity for the NCW organization is characterized by 2 levels, 16 to 30 geographic locations and a moderate number of job titles.

Formalization is the degree to which jobs and procedures within the organization are standardized, rule based, and in writing (Burton and Oel, 1998, p. 73). The greater the number of written rules and procedures the higher the formalization. In most studies, the measurement of formalization has been related to written rules (Burton and Obel, 1998, p. 73). For the NCW organization (being a military organization) written job descriptions are available for all employees. The planning process has loose compliance with standards as the process is carried out higher in the organization (closer to the force commander who can easily change the standards). The execution process demands more compliance with standards and is supervised closer.

Centralization is the degree to which formal authority to make discretionary choices is concentrated in an individual, unit, or level (usually high in the organization). Centralization is measured by how much direct involvement top managers have in gathering and interpreting the information used in decision making and the degree to which top management directly controls the execution of a decision (Burton and Obel, 1998, p. 75). For the NCW organization, top management is greatly involved with the gathering and interpreting of information during the planning process and not directly involved in execution of these decisions. The typical middle manager has little control over establishing budget (usually set by outside authority), little discretion over how his or her unit will be evaluated, some discretion over hiring and firing personnel, and little discretion over rewards (salary and promotions).

Size is one of the variables that influences the choice of an organizational structure. Size is used here as a measure of the information processing capacity. A larger organization requires greater information processing capacity (Burton and Obel, 1998, p. 153). An organization of over 2,000 is considered large by Organizational Consultant. Here the author assumes a large organization with 3,000 people.

Age of the NCW organization can be young, mature or old. The age of the NCW organization is young due to the relatively short tour lengths of military personnel, constant turnover, as well as the dynamic nature of individual units rotating within Joint Task Forces of today. Ownership of the NCW organization is public/state owned.

Diversity is a measurement of the number of different products that the organization produces, the number of markets the organization competes in and the number of markets overseas. The NCW organization is considered to have “many” different products (products are considered to be different weapons types and different kinds of forces) and compete in “some” different markets. The question concerning overseas markets was not answered as naval forces always operate overseas during conflicts.

Technology is the information, equipment, techniques, and processes required to transform inputs into outputs (Burton and Obel, 1998, p 213). The technology required to carry out the NCW organization is considered to be highly advanced. The major activity of the NCW organization is production - providing energy (via a weapon’s effect), at a given location, at a

given time. The planning process has both routine (easy to analyze problems and few exceptions) and non-routine (difficult to resolve problems and many exceptions) technology. The execution process has primarily non-routine technology.

The environment can be described as simple or complex, by the amount of uncertainty in the environment, the amount of equivocality in the environment, and rating the toughness of the competition. For the NCW organization (both planning and execution) the environment is complex, uncertainty is high, and the competition is extreme. The equivocality of the planning process is higher than the execution process, as the force commander is trying to determine what course of action to follow, often without knowing specific adversary or engagement locations and intentions.

Management profile is concerned with the question of whether management or leadership style affect the choice and fit of the organizational structure. The Organizational Consultant questions in this section concern types of decisions made by top management, the level of information used to make these decisions, a proactive or reactive approach to taking action, and the top management's attitude towards risk. The NCW organization is characterized by top management making policy and general decisions, long term decisions, being risk neutral, and taking proactive actions. During the planning process top management will use very detailed information to make decisions, while during the execution process only aggregate information as they will not be heavily involved in the execution process.

Strategy is the determination of the basic long term goals of an organization, the adoption of courses of action and the allocation of resources necessary for carrying out these goals (Burton and Obel, 1998, p. 248). The NCW organization was characterized as having a high capital requirement, medium product innovation, medium process innovation, and high concern for quality.

The organizational climate refers to the beliefs and attitudes held by individuals about their organization. The climate is a relatively enduring quality of an organization that is experienced by employees and also influences their behavior (Burton and Obel, 1998, p. 113). Climate questions were answered in the best possible, yet still realistic, manner, indicating high trust, medium conflict within the organization, high morale, a moderately equitable rewards system, high leadership credibility and low scapegoating.

## Results

Organizational Consultant uses the knowledge base of over 450 "if-then" statements to analyze the organization. Organizational Consultant also provides written comments about why a particular conclusion was reached.

Recommendations are made with a certainty factor associated with them. In the conclusion, certainty factors may take any value between -100 and +100. The higher the numerical value of the certainty factor, the stronger the conclusion. In general, certainty factors between 0 and 30 indicate a low certainty, 30 to 60 indicate medium certainty, and 60 or above indicates high certainty. Above 80, the recommendation is almost certain.

Sensitivity analysis can also be performed to analyze a questionable result more closely. Changing the answers to one or two questions can change the results and conclusions of Organizational Consultant. This can provide valuable insights into the organization.

Table 1 is a summary of results from Organizational Consultant.

Table 1. Results from Organizational Consultant.

	NCW Organization (Planning)		NCW Organization (Execution)	
SIZE	Large (80)		Large (80)	
CLIMATE	Developmental (76)		Developmental (76)	
MICROINVOLVEMENT	Low (73)		Low (80)	
STRATEGY	Analyzer with innovation (72) Prospector (65)		Prospector (76)	
	Current	Recommended	Current	Recommended
COMPLEXITY	Medium (82)	Low (55) Medium (54)	Medium (82)	Medium (54) High (54) Low (51)
HORIZONTAL DIFF.	Medium (80)	Low (55)	Medium (80)	Low (51) High (51)
VERTICAL DIFF.	Low (80)	Low (79)	Low (80)	Low (59) High (51)
SPATIAL DIFF.	High (80)		High (80)	

CENTRALIZATION	Medium (81)	High (50)	Medium (85)	Low (48)
FORMALIZATION	Medium (76)	Low (71)	High (76)	Low (77)
SPAN OF CONTROL		Moderate (60)		Narrow (58)
MEDIA RICHNESS	High (85) Providing a large amount of information (85)		High (85) Providing a large amount of information (95)	
INCENTIVES	Results (85)		Results (95)	
COORDINATION AND CONTROL	Meetings (86)		Professionalization (100)	
CONFIGURATION	Divisional (69) Matrix (62) Adhocracy (60)		Adhocracy (73) Simple (65)	
SITUATIONAL MISFITS	None		None	
ORGANIZATIONAL MISFITS	Complexity Centralization Formalization Configuration do not match		Complexity Centralization Formalization  do not match	
MORE DETAILED RECOMMENDATIONS	<p>1) You may consider decreasing the number of positions for which job descriptions are available.</p> <p>2) You may give supervisors and middle manager fewer rules and procedures.</p> <p>3) Managerial employees may be asked to pay less attention to written instructions and procedures.</p> <p>4) You may consider fewer written job descriptions.</p> <p>5) Top management may control the execution of decisions more actively.</p> <p>6) The typical middle manager may be given less discretion over how work exceptions are to be handled.</p>		<p>1) You may consider decreasing the number of positions for which job descriptions are available.</p> <p>2) You may give supervisors and middle manager fewer rules and procedures.</p> <p>3) Managerial employees may be asked to pay less attention to written instructions and procedures.</p> <p>4) You may consider fewer written job descriptions.</p> <p>5) Middle managers maybe given more discretion over evaluations.</p> <p>6) The typical middle manager may be given more discretion over personnel rewards.</p> <p>7) Middle managers may be given more discretion over establishing budgets.</p> <p>8) The typical middle manager may be given more discretion over establishing a new program or project.</p>	

Detailed results for the planning and execution processes from Organizational Consultant are available from the authors. Below, each result and the recommendation from Organizational Consultant are discussed. Remarks are taken from the Organizational Consultant results.

The NCW Organization, for both the planning and execution process, is considered a large organization.

Based on the answers you provided, it is most likely that your organization's size is large (confidence factor [cf] 80). Between 51 and 75 % of the people employed by NCW Organization have a high level of education. Adjustments are made to this effect. The adjusted number of employees is greater than 2,000 and NCW Organization is categorized as large.

The organizational climate is the summary measure of people and behavior. Both the planning and execution processes of the NCW organization have a developmental climate.

Based on the answers you provided, it is most likely that the organizational climate is a developmental climate (cf 76).

The developmental climate is characterized as a dynamic, entrepreneurial and creative place to work. People stick their necks out and take risks. The leaders are considered to be innovators and risk takers. The glue that holds organizations together is commitment to experimentation and innovation. The emphasis is on being on the leading edge. Readiness for change and meeting new challenges are important. The organization's long-term emphasis is on growth and acquiring new resources. Success means having unique and new products or services and being a product or service leader is important. The organization encourages individual initiative and freedom.

The rationale behind the recommendation is:

When the organization has a high to medium level of trust it is likely that the organization has a developmental climate. Employees with a high morale is frequently one element of a developmental climate. Moderately to high equitable rewards in the organization drives the climate towards a developmental climate. Medium to high leader credibility characterizes an organization with a developmental climate. An organization with a medium level of scapegoating may have a developmental climate.

## Micro-involvement

Micro-involvement is a leadership characteristic, not an organizational characteristic. The level of management's micro-involvement in decision making is the summary measure of management style. Leaders have a low preference for micro-involvement; managers have a high preference for micro-involvement (ORGCON, 1998)

The NCW Organization management profile, during the planning process, has a low preference for micro-involvement (cf 73). The execution process also has a low preference for micro-involvement, but with a higher confidence factor (cf 80).

Organizational Consultant's reasoning for low micro-involvement by the NCW organization was:

The management of NCW Organization has a preference for delegating decisions. This will lead toward a low preference for micro-involvement. Management has a long-term horizon when making decisions, which characterizes a preference for a low micro-involvement.

The management of NCW Organization has a preference for taking actions when making decisions. This will lead toward a low preference for micro-involvement because meeting the problems before they arise allow you to work on the general level and not being consumed with the very detailed decisions that can best be made at lower level in the organization.

Management has a preference for motivating people and not using control which will lead toward a low preference for micro-involvement.

The execution process had an additional reason for a low level of micro-involvement:

Since the management has a preference for making decisions on the basis of very aggregate information a low preference for micro-involvement characterization is appropriate.

## Strategy

The organization's strategy is categorized, following Miles and Snow's (1978) typology, as one of either prospector, analyzer with innovation, analyzer without innovation, defender, or reactor. This is a statement of the current strategy; it is not an analysis of what is the best or preferred strategy for the organization. (ORGCON, 1998)

Organizational Consultant concluded that for the planning process the current strategy is likely an analyzer with innovation strategy (cf 72), however, it could also be a prospector strategy (cf 65). Based on the answers provided for the execution process, the NCW organization's current strategy is likely a prospector strategy (cf 76).

An analyzer with innovation strategy is for an organization that combines the strategy of the prospector and the defender. It moves into the production of a new product or enters a new market after viability has been shown. But in contrast to an analyzer without innovation, it has innovations that run concurrently with the regular production. (ORGCON, 1998)

The prospector strategy is for an organization that continually searches for market opportunities and regularly experiments with potential responses to emerging environmental trends. Thus, the organization is often the creator of change and uncertainty to which its competitors must respond.

However, because of its strong concern for product and market innovation, a prospector is usually not completely efficient. (ORGCON, 1998)

A defender strategy is for an organization that has a narrow product market domain. Top managers in this type of organization are experts in their organization's limited area of operation but do not tend to search outside their domains for new opportunities. As a result of this narrow focus, these organizations seldom need to make major adjustments in their technology, structure, or methods of operation. Instead they devote primary attention to improving the efficiency of their existing operations. (ORGCON, 1998)

Organizational Consultant's reasoning behind an analyzer with innovation strategy for the planning process is:

For a medium routine technology, NCW Organization has some flexibility. It is consistent with an analyzer with innovation strategy. With a concern for high quality an analyzer with innovation strategy is a likely strategy for NCW Organization.

Organizational Consultant's reasoning for a prospector strategy, for both the planning and execution process is:

For a prospector strategy to be aggressive in product development or market opportunities exploitation, it requires a high capital investment. NCW Organization has numerous products. A prospector is constantly seeking new product opportunities to serve the existing and potentially new customers. With a concern for high quality a prospector strategy is a likely strategy for NCW Organization. With top management preferring a relatively low level of micro-involvement, the strategy is likely to be prospector.

There was an additional statement for the reasoning behind the conclusion for the execution process:

A non-routine technology is likely to be costly for NCW Organization, and a prospector strategy of new product development where margins are likely to be high is very reasonable.

The authors agree with the strategy types assigned by Organizational Consultant. The planning process has experts in their respective areas and is concerned with efficiencies (defender strategy). It also searches for new opportunities and wants to be the creator of change, creating uncertainty for the enemy. Also, the planning process will most likely not try out new products until their viability has been shown (analyzer with innovation strategy).

The execution process is looking for new opportunities to exploit, is the creator of change, and desires to create uncertainty for the enemy (prospector strategy).

## Complexity

Organizational complexity is the combined degree of horizontal, vertical, and spatial differentiation.

The current horizontal differentiation, in both planning and execution, is medium (cf 80). It is recommended to be low (cf 55) for the planning process and either low (cf 51) or high (cf 51) for the execution process.

The current vertical differentiation, in both planning and execution, is low (cf 80) and matches the recommended low level (cf 79 for planning and cf 59 for execution). The execution process could also have a high level of vertical differentiation (cf 51).

Spatial differentiation is high (cf 80) for the NCW organization.

Organizational Consultant concluded that the current organizational complexity is medium for both the planning and execution processes (cf 82). Organizational consultant is split, with very close confidence factors, for the recommended level of organizational complexity. For the planning process the recommended degree of organizational complexity is low (cf 55), however, it could also be medium (cf 54). For the execution process the recommended degree of organizational complexity is medium (cf 54), high (cf 54) or low (cf 51).

The reasoning behind a low level of complexity is:

Not much is known about the environment since both the environmental uncertainty and the environmental equivocality of NCW Organization are high. In this situation, the organizational complexity should be low. This allows the organization to adapt quickly. When the environmental hostility of NCW Organization is high, organizational complexity should be low.

The reasoning behind a medium level of complexity is:

Large public organizations should have medium to high organizational complexity. NCW Organization has a technology that is somewhat routine, which implies that the organizational complexity should be medium. Because NCW Organization has an advanced information system, organizational complexity can be greater than it could otherwise. A developmental climate in the organization requires a medium level of complexity.

Finally, the reasoning behind a high level of complexity, only for the execution process, is:

NCW Organization has a prospector strategy. Then, the organizational complexity should be either low or high. NCW Organization has a non-routine technology, which implies that the organizational complexity should be high. Top management of NCW Organization has a preference for a low level of micro-involvement, which allows for a higher organizational complexity. Because NCW Organization has an advanced information system, organizational complexity can be greater than it could otherwise. Since the size of NCW Organization is large and NCW Organization has a non-routine technology, the complexity should be high - particularly the vertical differentiation.

With such close confidence factors, low (55) and medium (54) for the planning process, and medium (54), high (54) and low (51) for the execution process, the author concludes that a medium level of complexity is probably the best level for the NCW organization. The

organization was not designed to be complex, rather it was designed to minimize the number of interactions, and repeat the basic functions (SA, LOG, EFF, OPS) on each platform.

### Centralization

Centralization is measured on two main factors: 1) how much involvement top managers have in gathering and interpreting the information they use to make decisions; and 2) the degree to which top management directly controls the execution of the decision.

For both the planning (cf 81) and execution (cf 85) process the current centralization is medium. The recommended levels of centralization are, as expected, high (cf 50) for the planning process and low (cf 48) for execution.

Organizational Consultant's reasoning behind high centralization for the planning process is:

When there is a high capital requirement and the product innovation is medium, as is the case for NCW Organization, centralization should be rather high to obtain efficiency. When the environment is extremely hostile, top management must take prompt action and centralization must be high. Because NCW Organization has an advanced information system, centralization can be greater than it could otherwise.

Organizational Consultant's reasoning behind low centralization for the execution process is:

NCW Organization has a prospector strategy. A low centralization is required so that the organization can react and innovate quickly. Large organizations should have low centralization. Since NCW Organization operates in a complex environment and knows only some of the factors that affect the organization and when the values of the factors are relatively unstable, centralization should be low. Low centralization can be allowed when top management has no desire for micro-involvement. A developmental climate in the organization requires a medium to low level of centralization.

These results are expected as the planning process is highly centralized, with the force commander deciding upon the intent. On the other hand, the execution process is very decentralized with forces self-synchronizing their efforts, based on the commander's intent.

### Formalization

Formalization is the degree to which jobs and procedures within the organization are standardized, rule based, and in writing

The current formalization is medium (cf 76) for the planning process and high (cf 76) for the execution process in the NCW organization.

Organization consultant recommends a low degree of formalization (cf 71) for the planning process:

Since the set of variables in the environment that will be important is not known and since it is not possible to predict what will happen, no efficient rules and

procedures can be developed, which implies that NCW Organization's formalization should be low. When environmental hostility is high formalization should be low. Low formalization is consistent with top management having a low preference for micro-involvement. A developmental climate in the organization requires a low level of formalization.

Organization consultant also recommends a low degree of formalization (cf 77) for the execution process, but for different reasons:

NCW Organization has a prospector strategy. A low formalization is required so that the organization can react quickly. Low formalization is also required because of the need for innovations. Organizations with non-routine technology should have low formalization. When environmental hostility is high formalization should be low. Low formalization is consistent with top management having a low preference for micro-involvement. A developmental climate in the organization requires a low level of formalization.

The authors agree that formalization will need to be lowered in the NCW organization. There will still need to be some formalization, to keep reports and interactions standard, however overall formalization in the NCW organization should be low.

#### Span of Control

Due to information networking and force self-synchronization, the author believes that a large (high) span of control could be obtained in the NCW organization.

However, Organizational Consultant recommends that the span of control should be moderate (cf 60) during planning and narrow (cf 58) during execution:

Since NCW Organization (planning process) has some technology routineness, it should have a moderate span of control.

and

Since NCW Organization (execution process) has a non-routine technology, it should have a narrow span of control.

The underlying factor in determining span of control is the routineness of the technology. Recall that the planning process had "some" technology routiness - both easy to analyze problems and few exceptions (a routine technology) and difficult to resolve problems and many exceptions (non-routine technology) - while the execution process had non-routine technology. Clearly, the level of technology routineness does not capture the concept of self-synchronization.

This may indicate that the large span of control, envisioned by the author, is too difficult. The NCW organization may need more "middle managers" in the organization or more Mission Commanders when the span of control is too great for the force commander. It may also indicate that the CKO, CRO, CEFO, COO will need to do more to allow the force commander a wider span of control.

## Media Richness

The NCW organization should use media with high media richness (cf 85). The information media that NCW organization uses should provide a large amount of information (planning - cf 85, execution - cf 95).

Large amounts of information will need to be processed in the NCW organization. The right information, with the desired level of detail, must be available to the right person, at the right time, and in the right format for ease of understanding and decision making.

## Incentives

Incentives should be based on results (planning - cf 85, execution - cf 95).

Results are what matter in warfare. However, it is the results of the entire force, not just one individual or unit grouping, that matter. The needs of the force and its effective utilization must be the driving factor for everyone in the organization.

## Coordination and Control

Organizational Consultant recommends meetings as the means for coordination and control (cf 86) during the planning process.

When the environment of NCW Organization has high equivocality, high uncertainty, and high complexity, coordination and control should be obtained through integrators and group meetings. Coordination within each division is very important. Coordination between (among) divisions is usually relegated to top management, which is also concerned about strategic direction and allocation of funds between (among) the divisions. Technology efficiencies can be obtained by sharing technology, information and new developments across divisions. Liaison managers and technology committees are possible coordination mechanisms. Conferences among technical professionals can be very effective. When the organization has a developmental climate, coordination should be obtained using planning, integrators and meetings.

During execution, however, professionalization (cf 100) should be used for coordination and control.

With a non-routine technology NCW Organization should obtain coordination and control via group meetings. When NCW Organization's environment has medium equivocality, high uncertainty, and high complexity, coordination and control should be obtained through integrators and group meetings. An open organizational climate and team spirit must be fostered. Information must be shared among all levels. Constructive conflict on 'what to do' will be usual. Individual tolerance of ambiguity and uncertainty will be necessary. Individual performance evaluation will be problematic and largely subjective. Mutual adjustments of 'give and take' will be the norm. Frequent informal meetings and temporary task forces will be the primary coordinating devices. When the

organization has a developmental climate, coordination should be obtained using planning, integrators and meetings.

These supportive comments for professionalization are what one would expect for a self-synchronizing force. Professionals are trained to behave in a standardized way. From an information-processing point of view, professionals with skills can process more information than less skilled employees (Burton, 1998, p. 158).

## Configuration

The most likely configuration for the planning process is be divisional (cf 69), matrix (cf 62) or an adhocracy (cf 60) configuration. For the execution process, the configuration is likely either an adhocracy (cf 73) or simple (cf 65) configuration.

The following is a description of each of the four possible configurations:

A divisional organization is an organization with self-contained unit grouping into relatively autonomous units coordinated by a headquarters, (product, customer, or geographical grouping).

A matrix structure is a structure that assigns specialists from functional departments to work on one or more interdisciplinary teams that are led by project leaders. Permanent product teams are also possible. A dual hierarchy manages the same activities and individuals at the same time.

An adhocracy organization is normally an organization with high horizontal differentiation, low vertical differentiation, low formalization, decentralization, and great flexibility and responsiveness.

A simple organization has a flat hierarchy and a singular head for control and decision making.

Organizational Consultant's reasoning behind recommending a divisional configuration for the planning process is:

When the organization is large, the configuration can be a divisional configuration. Because the organization has many products, the configuration should be divisional. The divisionalization of NCW Organization may be based on products or product groups. Because the technology is not fully divisible, care should be taken in recommending a divisional configuration.

Organizational Consultant's reasoning behind recommending a matrix configuration for the planning process is:

When NCW Organization has many products or markets, a matrix configuration is a likely configuration. When NCW Organization's environment has neither low equivocality nor low complexity, the configuration should be matrix. When NCW Organization is large, the configuration can be a matrix configuration. An organization with a developmental climate could have a matrix configuration.

Organizational Consultant's reasoning behind recommending an adhocracy configuration for the planning and execution process is:

An adhocracy configuration is appropriate when neither the environmental equivocality of NCW Organization nor the environmental uncertainty is low. NCW Organization has many products or many markets which indicates that an adhocracy is an appropriate configuration. When the organization is also young, the conclusion that it should be an adhocracy is further strengthened. Since top management has a low preference for micro-involvement, the ad hoc configuration is feasible. However, the size of the organization is not very important for the choice of an adhocracy configuration.

Finally, Organizational Consultant's reasoning behind recommending a simple configuration for the execution process is:

The primary reason for recommending a simple configuration is that the organization has extreme environmental hostility. Extreme environmental hostility requires that the organization can respond consistently and rapidly to unforeseen challenges. Therefore, it must have a simple configuration. A prospector like NCW Organization can be configured as a simple organization.

Interesting to note is that the anticipated configuration, adhocracy, was recommended for the execution process. An adhocracy is the heart of the self-synchronization process. Forces mutually adjust to each other.

On the other hand, the anticipated configuration for the planning process, a simple configuration, was not recommended. This is due to the fact that there are many products in the planning process of the NCW organization and a divisional configuration is best suited for a production process.

As discussed at the end of Chapter IV, even though there are two distinct processes occurring within the organization, there is still only one NCW organization. Changing between configurations (divisional in the planning process and an adhocracy in the execution process) will be difficult. A mix of both divisional and adhocracy configurations will be required.

#### Misfits

Organizational Consultant describes two types of misfits - situational and organizational (design parameter). Situational misfits occur when the design situations are not internally consistent, e.g. Organizational Consultant's recommendations for a highly equivocal environment are not consistent with those for a routine technology. Organizational misfits exist whenever the level of an organization design parameter differs significantly from the level recommended by Organizational Consultant. (Burton, 1998, p 392)

## Situational Misfits

A situation misfit is an unbalanced situation among the contingency factors of management style, size, environment, technology, climate, and strategy. There are no situation misfits (cf 100).

This indicates that a high level of internal consistency exists, both in the planning and execution processes of the proposed NCW organization, between the contingency factors for organizational structure (strategy, size, ownership, technology, environment, and management preferences). There is a fit between the NCW organization, both in planning and execution, and the multiple contingency factors.

## Organizational Misfits

While there were no situational misfits, there were organizational misfits in both the planning and execution processes of the NCW organization in the categories complexity, centralization, and formalization. Configuration was also an organizational misfit for the planning process of the NCW organization.

The current organizational complexity was medium for both the planning and execution process. The recommended configurations all had very close confidence factors (low (cf 55) and medium (cf 54) for planning and medium (cf 54), high (cf 54), and low (cf 51) for execution) indicating that any one may be the best configuration. As discussed earlier, it is the authors opinion that a medium level of organizational complexity is best for the NCW organization.

Centralization was recommended to be high during the planning process or low during execution. These results were expected for the NCW organization. What was not expected was centralization to be characterized as medium for the current situation. Centralization was expected to be high during planning and low during execution for the current situation (as Organizational Consultant recommended). This difference, between current and recommended centralization, caused centralization to be identified as an organizational misfit.

Formalization was recommended to be low in the NCW organization but characterized as either medium (planning) or high (execution) in the current organization. This is an area where the Navy will need to change. Formalization should be low. Due to the anticipated environmental hostility (high), the Navy will need to change the formality of the organization and allow more independent actions, rather than rigid following of procedures and rules. Procedures and rules have their place, but creativity and looking at situations in new ways will become paramount.

The configuration was an organizational misfit only for the planning process. The author characterized the best configuration to be a simple one during the planning process. Organizational Consultant recommended either a divisional, matrix, or adhocracy configuration, hence the misfit.

## More Detailed Recommendations

Organizational Consultant had a number of additional recommendations for the NCW organization.

Common to both the planning and execution process were four recommendations:

- “You may consider decreasing the number of positions for which job descriptions are available.”
- “You may give supervisors and middle managers fewer rules and procedures.”
- “Managerial employees may be asked to pay less attention to written instructions and procedures.”
- “You may consider fewer written job descriptions.”

These recommendations call for less formalization within the NCW organization. This agrees with previous discussions concerning lowering the level of formalization in the NCW organization and the Navy.

There were two additional recommendations for the planning process:

- “Top management may control the execution of decisions more actively.”
- “The typical middle manager may be given less discretion over how work exceptions are to be handled.”

These recommendations call for more centralization during the planning process, clearly desired in the NCW organization.

There were four more recommendations for the execution process of the NCW organization:

- “Middle managers may be given more discretion over evaluations.”
- “The typical middle manager may be given more discretion over personnel rewards.”
- “Middle managers may be given more discretion over establishing budgets.”
- “The typical middle manager may be given more discretion over establishing a new program or project.”

Each of these recommendations calls for empowering the lower levels of the NCW organization during execution.

## Overall Assessment

Is the proposed Command and Control structure fit in a NCW environment? Does the organization have a total design fit, where the situation fit, design parameter fit, and contingency fit are all in balance?

The NCW organization fits situationally and with several changes, can fit organizationally as well, thereby obtaining total design fit. There were no situational misfits and each of the organizational misfits can be resolved for the NCW organization. The NCW organization will need to change in several categories and each change will be good for the NCW organization. The NCW organization will need to have a medium level of organizational complexity, high centralization during the planning process and low centralization during execution, low formalization throughout the NCW organization, and adopt a different configuration during the planning process.

#### 4. Issues

When adopting a new organization there are major issues to confront. Change is never easy and there is always the inertia of the status quo to overcome. But if one does not think about the impacts and experiment with proposed solutions, total success of the organization will never be achieved. In adopting this new organization there are some major issues to confront.

##### Cultural

Cultural barriers are debatably the hardest ones to overcome. Adopting this new organization will require significant shifts in organizational culture. It calls for new commanders with new responsibilities. This will mean that the traditional roles of a ship's commanding officer will change. Convincing the navy traditionalist that this change is for the better and will result in a stronger, more robust force, will be difficult. A strong case, based on results of experiments and war games, will be required to prove that this organization is effective and efficient in the NCW environment.

##### Trust

Trust is an important issue to consider. Both trust by the force commander in the lower level commanders and sailors, but also trust by the lower level commanders and sailors in the force commander. Forces will not self-synchronize if their actions are being excessively questioned by the commander. Platform commanders will also have to trust that their protective safety and the effective use of their assets (sensors and weapons) is being accomplished by the functional commanders.

##### Training

Training forces as a whole, planning operations together, and fighting as one entity, not separate platforms, will be key to the NCW organization's success. Teamwork and understanding the commander's intent will greatly enhance the forces' performance.

Grooming a cadre of personnel capable of performing the overarching functions is necessary. They need to be tracked from the very beginning of their careers with a detailed career path of schools and sequential job assignments. It is the only way that the force will be experienced enough within each functional area to exercise a large span of control.

##### Joint

This organization is designed for the Navy. What about the Marine Corps, Army, and Air Force? Will the other services be able to operate with the Navy in this structure or will they need to adopt a similar structure to allow coordination amongst the services? Experimentation, both by the Navy and other services, will be required to see if this organization is compatible with the evolving structures of other services.

## Coalition

Can we operate with coalition partners in a NCW environment? Will we need to provide them equipment (and money for the capital requirements) so they can be part of the network? Will our speed of command be so fast that we will leave our coalition partners out of the fight? These are major questions which need to be addressed by the Navy's senior leadership, as NCW is developed, regardless of whether or not the proposed organization is adopted.

## 5. Recommendations

### Organizational Consultant

The Organizational Consultant expert system, while a useful tool for analyzing organizations, could be improved.

Organizational Consultant is based on research conducted in the civilian world. The military environment is unique. While many of the lessons learned from the civilian world do apply in military situations, there may be some that do not. A military version of Organizational Consultant would be useful.

It was hard for Organizational Consultant to capture the total organization and the adaptability that is envisioned. The flexibility that Mission Commanders provide to the organization and how it can adapt was not fully captured by Organizational Consultant. Organizational Consultant only provides a static snapshot of the organization. The adaptive process and structure of the NCW organization was not fully captured in Organizational Consultant.

Finally, it can be difficult to understand how a change in one input changes the output of Organizational Consultant. The capability to understand, perhaps visualize in a flowchart, the complex interactions analyzed by Organizational Consultant would be helpful.

### Experiments and War Games

Experiments and war games are the first step to validating this, or any other, new organizational structure. The Navy's new Maritime Battle Center in Newport, Rhode Island, is the place where this organization could be analyzed and explored in depth.

Toward the end of the experimental stage, actual implementation in a Fleet Battle Experiment would either verify the organization's concepts or prove them unfeasible. New organizational structures need to be experimented with by fleet participants.

### Future Research

There is still much research to be conducted in exploring organizations for the network centric environment. Some possible topics include:

- Are there better organizational structures for NCW?
- What are the details of the process of self-synchronization? How is self-synchronization executed?

- What is the maximum span of control in a network centric environment?
- Which processes can have low formalization and which ones need to remain high?
- What effect does NCW have on coalition partners? Can we operate with them in a network centric world?

## 6. Conclusion

Regardless of whether this organization is adopted for further exploration or not, a fresh look at organizational structures for the NCW environment is useful. This thesis, and the conclusion that the proposed organization can be made to fit organizationally, is one step in that direction. Brigadier General J.P. Kiszely has stated that “without originality, let alone genius, the new technologies will merely be grafted onto existing organizations and doctrines in a way designed to cause the least inconvenience and least unpleasantness in peacetime. The risks of having operated on this principle in the past are as nothing to the dangers of doing so in the future.” (Roman, 1998, p. 2) The United States Navy must find, and adopt, an organizational structure which is efficient and effective for the network centric warfare environment.

## REFERENCES

- Baligh, H.H., Burton, R.M., and Obel, B., “Organizational Consultant: Creating a Useable Theory for Organizational Design,” *Management Science*, v. 42, December 1996.
- Bowditch, J.L., and Buono, A.F., *A Primer on Organizational Behavior*, 4<sup>th</sup> ed, Wiley, 1997.
- Burton, R.M., and Obel B., *Strategic Organizational Diagnosis and Design: Developing Theory for Application*, Kluwer Academic Publisher, 1995.
- Burton, R.M., and Obel B., *Strategic Organizational Diagnosis and Design: Developing Theory for Application*, Kluwer Academic Publisher, 1998.
- Huber, A.F., and others, *The Virtual Combat Air Staff: the Promise of Information Technologies*, 1<sup>st</sup> ed, RAND, 1996.
- Kemple, W.G., “Adaptive Architectures for Command and Control (A2C2),” *NPS Research*, p. 5, February 1998.
- Miles, R.E., and Snow, C.C., *Organizational Strategy, Structure and Process*, McGraw-Hill, 1978.
- ORGCON v7.0, computer program in: Burton, R.M., and Obel B., *Strategic Organizational Diagnosis and Design: Developing Theory for Application*, Kluwer Academic Publisher, 1998.