

INVOLVING USERS IN THE
DESIGN PROCESS

by

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ABSTRACT

This thesis argues that designing solutions can't just be left to experts and leadership; it needs to incorporate the creativity, ideas and expertise of the entire workforce. This thesis specifically looks at the U. S. Coast Guard and how it can involve users in designing technology for the complex problems facing our service. As we are asked to do more and more with less, making the tools we use more effective and usable becomes increasingly important to mission effectiveness. This thesis will outline one possible method for how to obtain ideas and consensus from such a large, geographically dispersed organization.

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CHAPTER 1

OVERVIEW

United States Coast Guard

The United States Coast Guard (USCG) is the smallest of the five branches of the United States Armed Forces with approximately 40,000 members (United States Coast Guard, 2008a). The USCG, a self-described “military, multi-mission, maritime service,” is tasked with five fundamental roles: maritime security, maritime safety, protection of natural resources, maritime mobility, and national defense. These roles incorporate a wide range of missions including: search and rescue, migrant interdiction, drug interdiction, fisheries enforcement, aids to navigation, icebreaking, marine inspection, marine accident investigation, pollution response and prevention, licensing of mariners, and counterterrorism. The personnel, boats, cutters, and aircraft of the USCG perform these missions daily along the nearly 95,000 miles of U. S. shoreline (United States Coast Guard, 2002).

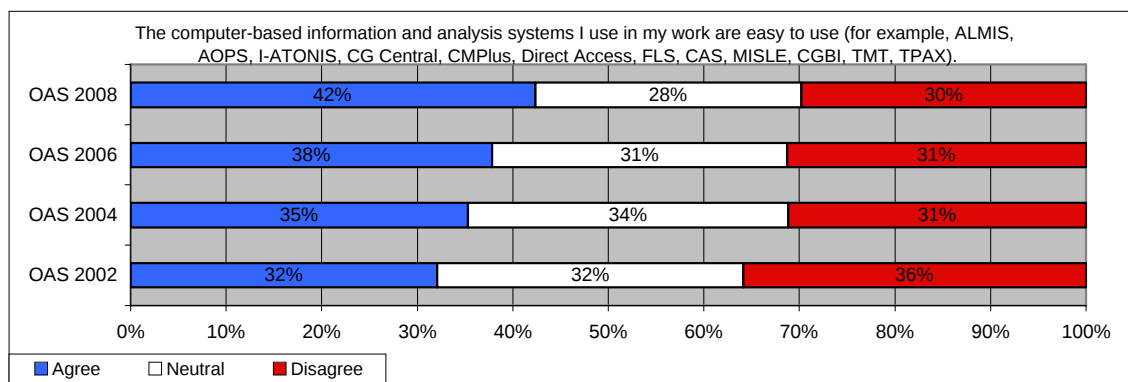
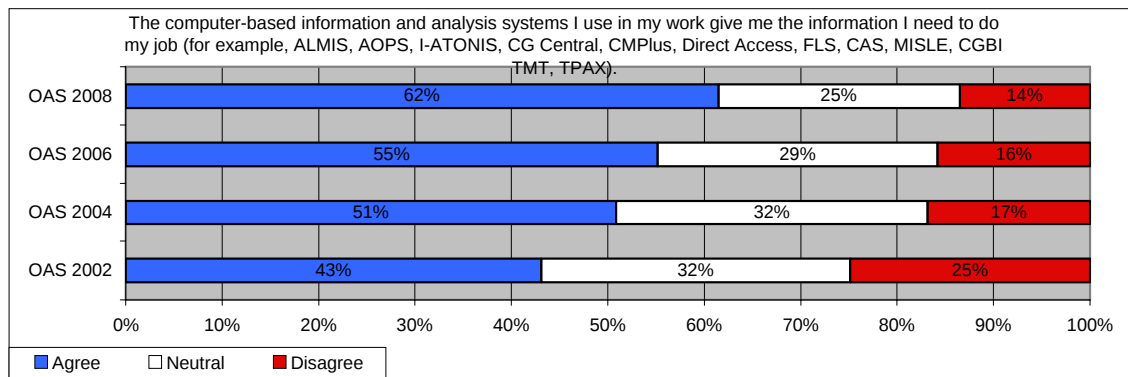
The Coast Guard’s role as a military service, with largely peacetime duties, makes it unique and flexible. Because of its law enforcement missions, the USCG is the only military service not housed in the Department of Defense. The *Posse Comitatus* Act of 1878 (18 U.S.C. § 1385) restricts military services from acting as law enforcement agents on U. S. soil or in U.S. territorial waters. As the only military service not legally bound by this doctrine, the Coast Guard has proven vital in the United States’ response to non-traditional threats such as migrant smuggling, drug smuggling, and terrorism. (United States Coast Guard, 2002). Following the attacks of September 11, 2001, the Coast Guard’s maritime homeland security role saw a dramatic increase, largely due to its

ability to respond to these non-traditional threats. In 2003, the service was moved from the Department of Transportation to the newly created Department of Homeland Security. The Coast Guard has an identical rank structure to the U. S. Navy and is commanded by the Commandant, a four-star admiral (United States Coast Guard, 2008a).

Organizational Assessment Survey

Throughout its 218-year history, the Coast Guard has expanded its roles and missions dramatically. The increased responsibilities on such a small service as well as the challenges of aging equipment and budgetary constraints have made efforts in efficiency, effectiveness, and innovation vital to achieving mission success. Over the last seven years, the Coast Guard has worked to computerize many of its logistics, supply, administrative and maintenance systems. In 2002, the USCG added two questions to its Organizational Assessment Survey (OAS) to measure the success of these technologies. The OAS is sent to all Coast Guard members every two years to assess the current state of the organization. One question was “The computer-based information and analysis systems I use in my work give me the information I need to do my job.” The second was “The computer-based information and analysis systems I use in my own work are easy to use.” Both used a response scale of Agree, Neutral, or Disagree. Table 1 shows the OAS results for technology from 2002 to 2008:

Table 1. USCG Organizational Assessment Survey Data 2002 – 2008



Although the percentage of “Agree” responses has increased over the 6-year period, 58% of the organization still disagrees or is neutral about the ease of use of the tools provided to them, and 39% still disagrees or is neutral about whether these systems provide the information they need. Also, there is no way to tell if increases are due to prolonged exposure to the tools, or if the increase was due to actual improvements made to the systems.

The OAS data lumps all the technology initiatives together and doesn’t give a good assessment of satisfaction with the provided tools or which specific tools could use improvement. Technology and innovation still remain a high priority in the Coast Guard. In September 2008, the Commandant of the Coast Guard, Admiral Thad Allen, released

an All Coast Guard message outlining the need to expand our capabilities in the social media realm. In that message he said:

As we modernize the Coast Guard we must learn how to effectively use social media tools to enhance our ability to perform as a more transparent, change-centric organization prepared to meet increasingly complex mission demands. (United States Coast Guard, 2008b)

As the Coast Guard moves into more advanced and complex technology initiatives, I argue that a concerted effort needs to be made to make this technology not only useful, but useable. As the former Army Chief Technology Officer, Colonel Coxe, stated “in a geographically dispersed organization, you’ve got to get the word out and do it without irritating the heck out of people” (Callaghan, 2001).

Purpose of Thesis

Through my studies of problem solving, systems thinking and complexity, I became increasingly interested in the concepts of design. Specifically, I was curious why the technology initiatives introduced in my organization, designed by experts, resulted in low levels of appreciation by the people who actually had to use them. Why did things that were designed to make our jobs easier not show higher scores on the OAS surveys? We were given training, job aids, and help desks to do tasks we were somehow able to accomplish on our own before these technologies were introduced. It seemed too simplistic to say people were just resistant to technology. As a helicopter pilot, I operated extremely complex and sophisticated equipment each day, yet my own perceptions mirrored the OAS survey results. For example, I often found it difficult to navigate my organization’s web portal to find a simple publication. I began to wonder if what was

often characterized as a “training problem” or a “user problem” was actually fundamentally a design problem. I, therefore, decided to test this hypothesis.

This Capstone describes a design project centered on one technology initiative, the Coast Guard’s intranet web portal, referred to as CG Central. Introduced in 2003, CG Central was designed by web experts and won “10 best intranets” from the Nielsen Norman Group, a leading judge of web usability and design (Michael, 2003). Its purpose was to replace individual intranets, developed piecemeal by various Coast Guard units, and eliminate inconsistencies in amount and timeliness of information (Hardy, 2004). Despite the use of experts and the awards, CG Central and other technology initiatives continue to receive high percentages of disagreement or neutrality on the OAS on whether these programs give users the information they need and are easy to use. Although the OAS does not specifically separate CG Central from other programs, it is the main program which connects users to all other programs.

This thesis argues that with an increasingly complex and diverse workforce, the Coast Guard must develop modern technology that is useful, engaging, and reduces workload rather than increasing it. I argue that the Coast Guard would benefit from a user-centered approach to technology design, which involves a broad range of users from the beginning of the process to the end.

The importance of user-centered design is not new to government agencies. In response to the E-Government Act of 2002 and the President’s Management Initiative, government agencies have been working to make their public-facing web sites more user-friendly and accessible to citizens. A government usability website run by the U. S.

Department of Health and Human Services, summarized the reason for this large scale initiative:

Given its large presence in citizens' daily lives, it is essential that government agencies not only involve citizens in developing online Web sites, but also measure and report how a Web site is meeting users needs. Resources are diminishing. We're being asked to do more with less. Designing Web sites the right way the first time sets a foundation for more efficient improvements long-term (U. S. Department of Health and Human Services, 2008).

What the government has mandated and deemed important for our public-facing Web sites may be applied to internal Web sites. For this thesis, I argue that the problem with CG Central is a complex interactive design problem and further argue that to address it requires a systemic redesign methodology. I ran a small pilot test of this methodology; one which seeks to incorporate the input of a wide variety of users rather than just a core team of experts. This project is not focused on an end product, but a process. It pilots a process for obtaining user input, across the organization, with little cost and minimal effort. It will attempt to show that through process improvement and group communication techniques, the Coast Guard can solicit group consensus on desired qualities of its many users. The pilot project used a small sample group, so specific data does not necessarily reflect the feelings and desires of the entire organization.

The format is as follows: Chapter 2 reviews the literature on systems thinking, interactive planning and the idealized design approach. Chapter 3 outlines the methodology for the design project. Chapter 4 presents the results of this project and Chapter 5 offers a summary and conclusion.

CHAPTER 2

LITERATURE REVIEW

Holistic Approach to Design

Natural systems can be understood and examined by considering three components: the inner environment, the outer environment, and the goal or purpose. Natural science is generally concerned with the interaction between the inner and outer environment. If a natural system's inner environment is adapted well to its outer environment, it can generally achieve its goal or purpose. Similarly, if a system's goals and outer environment are understood, predicting how it will behave can be accurate without knowledge about its inner environment (Simon, 1969.)

One example of this is the biological concept of homeostasis. Homeostasis is how a living organism regulates or controls its inner environment in relation to unpredictable changes in the outer environment. Human body temperature regulation works on the principles of homeostasis. As outer environment conditions change, the body sends signals to control the internal temperature by shivering to increase physical activity or sweating to cool the skin. The body does not need to predict all the possibilities of the outer environment, it simply needs to sense then act on what it senses (Langley, 1965). Homeostasis is an example of a well-designed biological system. In general, a good design is one that allows the inner system to adapt to the unpredictability of the outer environment (Simon, 1969).

Designers of artificial systems can benefit from understanding the adaptation techniques of natural systems because there is concern with the same three elements of inner environment, outer environment and goals or purposes (Simon, 1969). However,

while artificial systems, like computers, have a purpose they are not themselves purposeful as are people. It is only when artificial systems work together with living systems (human beings) that they become purposeful (Jackson, 2003).

Although the biological model serves as a good argument for a holistic or systems approach, it is incomplete when applied to complex purposeful systems such as organizations. In the biological model, the parts of an organism adapt to ensure the survival of the whole, but the internal organs do not make decisions themselves. In contrast, an organization's parts are human beings who do make their own decisions and have their own purposes. The purposes of the parts aren't always the purposes of the whole, but they affect the whole. This interrelationship of multiple purposes is what is described as purposeful, and what makes social systems' problems so complex (Jackson, 2003)

Studying complex purposeful systems with the typical problem-solving techniques of reductionism championed in the fields of science is inadequate and ineffective (Jackson, 2003). Reductionism seeks to understand whole systems by studying their parts, a strategical thinking method referred to as analysis. Analysis breaks problems into their parts and attempts to find the optimum solution. This process of breaking apart the whole, however, neglects the interrelationship between the parts which is often the root cause of the problem. Systems thinking argues that in complex systems, the parts don't always provide an understanding of the whole. Rather, in a purposeful system, the whole gives meaning to the parts (Jackson, 2003). In a biological model, it would be like trying to diagnose a liver problem independent of how it interacts with the rest of the body. Peter Senge (2006) described this interrelationship in organizations:

Leaders who appreciate living systems approach design work differently. They realize that they can create organizational artifacts like new metrics, or formal roles and processes, or intranet Web sites, or innovative meetings – but it is what happens when people use the artifacts or processes or participate in the meetings that matter. (p. 321).

The alternative to analysis is synthesis, a thinking strategy that balances conflicting views, assumptions, and purposes (Jackson, 2003). Problems are often a matter of perception, and many times in a purposeful system, perceptions are different. Synthesis is a way of taking conflicting ideas and coming up with a joint solution. The most important part of synthesis is not necessarily the solution it provides, but the learning that takes place in the process. Because it is the learning in the process that is important, participation is one of the most important aspects of the synthesis process. The more people involved, the more divergent viewpoints, the better the process.

This is the argument for a holistic approach to design planning. Ackoff (1981) describes four basic approaches to planning: inactivism, reactivism, preactivism, and interactivism. The inactivist approach is one that tries to prevent change by trying to hold steady in an ever-changing environment. Inactivist organizations approach planning from a very present-oriented focus and often delay action until a crisis has emerged. The focus is more on fixing emerging problems rather than finding a cause and eliminating it. The problem with the inactivist approach is often in what they are not doing, rather than what they are doing. Most organizations fail not because of things they did do and shouldn't have, errors of commission. Most organizations fail because of the things they should have done but didn't, errors of omission (Ackoff, 2004).

The reactivist approach is past focused in that there is preference to return to the way things were. Because of its focus on the past, reactivist planning tends to approach

problems from a mechanistic and reductionist thinking. Complex problems are reduced into parts and dealt with separately. Reactivist organizations are generally stable, traditional, and hierarchical. The limitation of the reactivist approach is that solving all the problems in an organization doesn't necessarily give you the organization you want, and past solutions often don't handle new realities effectively (Ackoff, 1981).

The preactivist approach is future-focused. Preactive planning involves trying to predict the future and prepare for it. Preactivist organizations are primarily focused on contingency planning, trying to predict all possibilities and prepare for them. The problem with this approach is that often the biggest changes to a system cannot be predicted. If the system is built only to handle the things predicted, it is ill equipped to handle those things which were not anticipated (Ackoff, 1981).

The fourth approach to planning is interactivism which uses a holistic approach to planning. Interactivist organizations believe that the future is our own creation and use interactive planning for "the design of a desirable future and the invention of ways to bring it about." (Ackoff, 1981, p. 62). Ackoff (1981) uses the analogy of a boat fighting the tide to describe the difference in approach. Inactivist planning throws down an anchor and tries to hold position, reactivist planning attempts to swim against the tide, and preactivist planning tries to ride ahead of it. The interactivist approach finds a way to control the tide. Interactivist planning posits that it is not our inability to solve problems that causes failure, but our inability to solve the right problems. This failure to solve the right problems is due to our focus on human beings as ends-seeking animals rather than ideal-seeking animals. Ackoff (1981) presents three type of ends that people pursue:

1. Goals – ends we expect to attain within the period covered by a plan
2. Objectives – ends we do not expect to obtain within the period covered by the plan, but hope to obtain later
3. Ideals – ends that are believed to be unattainable but towards which we believe progress is possible

He argues that planning should involve all three types of ends. This is the goal of interactive planning. The benefit of interactive planning is that it allows flexibility to be designed into the system to allow it to respond rapidly and effectively to unforecasted contingencies (Ackoff, 1981).

Interactive Planning and Idealized Design

Ackoff (1981) describes three principles of Interactive planning. The holistic principle argues for the systemic nature of an enterprise in that planning for one part of an organization can have adverse effects on other parts of the organization. One unit's "perfect" solution can become another unit's nightmare. Indeed, the corollary of this is that if units could act independently of each other without having an adverse effect on the other, they would not be part of the same organizational system. Since organizations exist to bring these parts together towards a common purpose, the planning process should incorporate all parts of the organization that could possibly be affected. Another important aspect to the holistic principle is that many times a problem that appears in one part of the organization is better solved in another part of the organization. Only by coordinated planning can one take into account the interactions between the parts (Ackoff, 1981).

The principle of continuity argues that in an ever-changing environment all planning should be continuous. Most organizations have designated times during which

they conduct their planning. When completed all planning stops until the next scheduled cycle. In a dynamic environment, however, plans often don't work as expected.

Assumptions and forecasts must constantly be checked to see if the plan needs to be modified. This has to be done on a continuous basis to ensure the organization can adapt to an unpredicted reality (Ackoff, 1981).

The participative principle posits that anyone who interacts with a system should be involved in its design. By participating in the design, the members of an organization develop a greater understanding of the organization and are able to accomplish the organization's mission and purpose more effectively. Additionally, participative planning promotes development, or "an increase in one's desire and ability to satisfy one's own desires and those of others." (Ackoff, 1981, p. 66). People cannot develop by being planned for; they can only develop by being involved in the process themselves.

The interactive design process appears to take a great deal more resources including time and effort to carry out than traditional linear "plan – act" planning approaches. The benefits of this approach, however, outweigh the apparent upfront costs. Interactive design is similar to an architect building a house. The architect does not build the house he wants, and then ask the clients if it meets their needs; the costs involved with redesigning an existing structure would be enormous and might require him to tear it down and start over. An architect first finds out his clients' desires and builds those into the design. In addition, an architect would never design a house for a husband and wife by asking only the husband's desires; he must consider the desires of everyone who will live in the house (participative principle). He checks with his clients continuously throughout the process of the design to ensure the product that is built meets their desires

(principle of continuity). Lastly, an architect always starts with the whole and fits the parts inside. He does not draw a house around the rooms; he draws the house and fits the rooms inside (holistic principle). The architect is always concerned with building the right thing the first time, because it is the least expensive way to design.

Traditional contingency planning involves constant reaction to unforeseen events, or prediction of all possible events. By designing its own future, an organization has a single focus, and much of the trial and error is eliminated. A designer should be constantly working to find a product users' desire. Just like the architect designing a house, finding out what users desire first and then building it, is far cheaper and less time consuming than guessing and trying out several different models. The same is true for organizations. Eliminating or preventing problems is far less costly than solving them. Peter Drucker emphasized this as the difference between doing things right and doing the right thing (Ackoff, 2004). Traditional planning has focused too much on trying to do things right (efficiency), but interactive planning allows an organization to do the right thing (effectiveness). There is also an opportunity cost to ineffective planning. The time we spend on fixing the wrong things, is time wasted that could be used designing the right things. Focusing on what is desired simplifies the design process and takes out much of the trial and error (Ackoff, Magidson & Addison, 2006).

Idealized Design Steps

Idealized Design is an interactive design process involving six steps: (1) Formulating the Mess, (2) Ends Planning, (3) Means Planning, (4) Resource Planning, (5) Design of Implementation, and (6) Design of controls (Ackoff, Magidson & Addison,

2006). Formulating the Mess is the process of evaluating the current state of the organization. The “mess” is the complex and complicated sets of interacting threats and opportunities in an organization (Ackoff, Magidson & Addison, 2006). Completing this step permits all to see what the organization is doing wrong presently, in order to avoid their incorporation in the same ways into a new desired state of the organization.

Ends Planning is where the organization as a whole designs its desired state. This is the heart of Idealized Design and provides focus for the rest of the design process. Participants are asked to pretend that the current system was completely destroyed. This keeps the planners focused on what is desired, rather than what already exists. The constraints to this are technological feasibility and capability of surviving in the current environment. The requirement is that the process must be capable of being improved over time (Ackoff, Magidson & Addison, 2006).

The remaining four steps are concerned with narrowing the gap between the current and desired state. Means Planning compares the defined desired state from the ends planning with the current state defined in the formulation of the mess, and identifies the gaps between the two states. Means are defined as the processes, procedures, practices, programs, and policies that bring the current system closer to the ideal (Ackoff, 1981). This is where the designers take the ideal qualities and translate them into a working design.

Resource Planning is where the necessary resources to accomplish the means are identified and gathered. Resources not only involve people, money and equipment, but also the knowledge, information, and understanding that is necessary to realize the

design. This step in the process identifies what is available and what is needed (Ackoff, Magidson & Addison, 2006).

Design of Implementation and Design of Controls are the final steps in the process. Implementation involves the schedules, deadlines, and outline of who is responsible for implementation of each part of the process. Designing controls ensures oversight of the project. This includes monitoring progress, planning for necessary changes during the design process, and monitoring if the planned process is producing the desired results. The last four steps do not necessarily have to be completed in order, and ideally should be worked on simultaneously (Ackoff, Magidson & Addison, 2006).

Idealized Design carries several benefits including: promoting understanding of what is designed, transforming designers' concept of feasibility, simplification of the planning process, enhanced creativity, and easier implementation (Ackoff, Magidson & Addison, 2006). One of the limitations of Idealized Design is that it is itself an idealized process and, when carried out as exactly as designed, can be extremely difficult. For example, it requires a great deal of facilitation and its mindset is so different from traditional planning that it can be difficult for participants to break free from the traditional focus on "fixing what's broken." Although an organization may not be able to conduct Idealized Design exactly as it is outlined, the principles of Idealized Design and Interactive Planning can serve as a focus for a new way of thinking about design planning. By starting with what is desired, instead of what exists designers/planners create the right product instead of trying to make the "wrong thing right." (Ackoff, 2004).

Interactive Design and Technology

We are surrounded by good and bad design. We encounter new things every day, things for which we have no training or experience, and we're able to use without difficulty. This is primarily due to design. When things are designed well, we don't have to think about them; we know instinctively what to do. Donald Norman (1988), in *The Psychology of Everyday Things*, describes how a task as simple as walking through a door can often leave us feeling stupid and incompetent. Most doors are designed to give us visual clues as to whether to push or pull and on which side. Vertical handles are for pulling; horizontal bars are for pushing. Poorly designed doors, which don't provide these visual clues, or misleading visual clues, have to rely on nameplates labeled "PUSH" and "PULL." More often than not we attempt to go through the door the wrong way and, when impeded, finally look at the placard and realize our ignorance. Except that it isn't our ignorance. It is poor design. As Norman (1988) summarized, "when simple things need pictures, labels, or instructions, the design has failed" (p. 9). Complexity adds to the problem. Users of a door all have the same general goal, to get through the door. Users of a complex system have many goals. This is one of the challenges of Web site designers. How do you build something to meet multiple needs? But even with complexity, basic design principles hold true. We use complicated Web sites everyday without tutorials, help desks, or training programs. Good design requires an understanding of those who must interact with the product. It is through this understanding that complexity can be made to appear simple or intuitive.

There are two general reasons design should not only be left to the experts. The first is that design is principally concerned with how things should be, not with how they

are. For this reason, design experts are limited. Only the members of the organization can design what should be (Ackoff, 1981). Design experts contain detailed knowledge on building tools; users are experts on tasks (Norman, 1988). Designers often build tools without completely understanding the task it must perform. Often organizations will assemble a small group of their own experts to aid the designers in the process, but this is still not adequate to cover the needs of all users. Only the organization as a whole knows what it needs. Good design requires synthesis. Synthesis requires a balance of many conflicting ideas, not narrowly conceived ideas limited by a small team of experts. Also, experts are often very bad at examining their own behavior. It is because they are so good at what they do that they are unable to see why anyone else could have a problem with it. It is because of their expertise that they cannot predict problems users will have with the technology they develop (Argyris, 1991; Norman, 1988).

A second reason design can go wrong is that designers are often rewarded for aesthetics over function (Norman, 1988). For example, CG Central, a web portal designed for use by members of the U. S. Coast Guard was described as “surprisingly good looking for a government intranet” and “very clean” by Nielson Norman, who gave it an award for design and usability (Michael, 2003). However, users want function; they don’t want things to get in the way of them performing their task. This is one of the core design principles of Internet giant, Google. Tools need to be designed to be both useful and usable. Being usable is not enough if the tool is not first useful. Marissa Mayers, Product Manager at Google explained,

I like to say that Google should be "what you want, when you want it." As opposed to "everything you could ever want, even when you don't." I think Google should be like a Swiss Army knife: clean, simple, the tool you want to

take everywhere. When you need a certain tool, you can pull these lovely doodads out of it and get what you want. So on Google, rather than showing you upfront that we can do all these things, we give you tips to encourage you to do things these ways. We get you to put your query in the search field, rather than have all these links up front. That's worked well for us. Like when you see a knife with all 681 functions opened up, you're terrified. That's how other sites are - you're scared to use them. Google has that same level of complexity, but we have a simple and functional interface on it, like the Swiss Army knife closed (Interview: Marissa Mayer, 2002).-

These are the challenges of good design: to make the complex appear simple; to give the user the power without needing to think. Aesthetics can be important, but they must not interfere or replace function.

Peter Drucker (1970) noted that we cannot understand technology until we understand work. Technology, therefore, cannot be designed independent of the people who must use it. A more holistic approach must be taken, one which acknowledges and accounts for the interactions between the parts, both worker and tool. Ackoff (1981) emphasizes that the process of interactive design should be approached cautiously and iteratively. It should be tested out in one part of the organization and lessons should be learned and applied in subsequent processes.

CHAPTER 3

METHODOLOGY

Involving Users

The challenge for this project was to find a way to get users involved in the design process without actually getting them in one room. One of the principles of the idealized design process is that all the stakeholders should be represented (Ackoff, Magidson & Addison, 2006). However, in an organization as geographically dispersed and multi-mission as the Coast Guard, this would be impossible. I wanted to use the model of the customer focus group, but conduct it in a way that could reach a wide range of users with minimal disruption. A Delphi survey seemed to be a reasonable option.

The Delphi Method was first used by the RAND Corporation and the U. S. military in the 1950s to facilitate group communication and gain consensus among geographically dispersed experts on defense strategies. The method consists of sending out several rounds of surveys to the same group. The number of rounds depends on the complexity of the project. The first round is used to generate ideas or brainstorm. These ideas are then synthesized and a second round of surveys are sent to the same group for them to see the other ideas generated and either generate more ideas or reach consensus on the ideas already generated. Rounds continue until the desired consensus is reached (Linstone & Turoff, 1975). Because of the small size of my sample group and my goal of simply demonstrating a process, I chose to only conduct two rounds of surveys.

Participants

To ensure a representative sample, I wanted diversity in age, gender, rank, experience and specialty. One of the complaints often heard about the current system is that it was designed for Headquarters people, by Headquarters people and that the operational units were left out of the process. Though this information was anecdotal and most likely speculation, I wanted to make sure my survey incorporated as many different types of users as possible. I decided to use two already existing groups in the Coast Guard, each containing all the diversity elements I was looking for. These groups were the Leadership Advisory Council and the Diversity Advisory Council. Both groups are composed of hand-selected Coast Guard members from all across the organization who meet twice a year to advise the Commandant on leadership and diversity issues. The total of 32 people comprised these two groups.

I had two goals to accomplish with my first round survey. The first was to get a snapshot of the current state of satisfaction with CG Central. My second goal was to solicit the ideas of a small group of users in how they would design their ideal intranet web portal if given the opportunity. This would involve soliciting qualitative data through open-ended questions. I initially wanted to accomplish my second goal, generating ideas, through a survey that simulated idealized design. Unfortunately adhering strictly to the principles of idealized design would not let me accomplish my first goal of assessing the current state. One of the key principles of idealized design is to keep the group focused on what they desire, not the problems they have with the current system (Ackoff, Magidson & Addison, 2006). In order to accomplish both my goals and still test the feasibility of idealized design, I decided to design two different surveys. The first simply

asked users what they would design if they could design their perfect intranet web portal. The second was a more traditional customer satisfaction survey asking users to rate their satisfaction with the current system and give ideas on how they would make it better. I randomly assigned 16 people to Survey 1, and 16 to Survey 2.

Survey 1

Survey 1 was designed using the principles of Idealized Design. Instead of focusing the users on what currently exists, I attempted to get them to envision what they would build if they could have whatever they desired (Ackoff, Magidson & Addison, 2006). I asked five demographic questions (age, gender, rank, years of service, and specialty) mainly to show the diversity of the sample group. Because the group was small, I did not link any qualitative information to these demographics. I then asked one open-ended question formulated around the idealized design concept. The question read as follows:

Imagine that you have the task of designing a completely new web portal for the Coast Guard, something that would be used by all Coast Guard personnel. What would you design if given this opportunity?

Don't be concerned about what currently exists. Don't limit your ideas based on budget, resources, connectivity issues, or security, but do keep in mind current and possible future technological feasibility. Consider all possible uses that you or others could imagine for this website. Don't just think only about content; also think about where, when, how, why and what.

Remember the idea is to create something entirely new, not add or subtract to what currently exists. In fact, a good way to begin is to imagine that the current web portal (CG Central) was completely destroyed and your job is to replace it with anything you would like. Keep in mind the Coast Guard's missions, goals and your own work needs.

Survey 2

The challenge with Survey 2 was to gain quantitative data on the current state and qualitative data on the desired state. The survey started with the same five demographic questions asked on Survey 1. The users surveyed were then asked to rate five different aspects of the current system using a 10 point Likert scale (from 0=none to 9=very much). They were also given the option of providing comments in addition to their ratings. The five questions read as follows:

1. Rate the degree to which you use CG Central overall (for all purposes).
2. Rate the degree to which CG Central is necessary to accomplish your “everyday” work.
3. Rate the degree of success which CG Central meets your work needs.
4. Rate the ease of use of CG Central.
5. Rate your overall satisfaction with CG Central

In order to ease the transition from current to desired state questions, and to get the survey respondents thinking more about what could be instead of what is, I asked two open-ended questions:

Think of other websites you’ve used at home or at work. What features do you like most about those websites?
Give some examples of websites which have features you like.

I then asked three questions concerning what each user thought the initial purpose of CG Central was, how they would rate the achievement of this purpose, and what they thought the purpose should be.

Lastly, I had the survey respondents brainstorm ideas for a better, more ideal system. The last question read as follows:

BRAINSTORM: Please write down EVERYTHING you would change on CG Central if you could improve any part of the site without being bound by budget

or resource limitations, technological constraints, security issues, or connectivity. Keep in mind the Coast Guard's missions, goals, and your own work. Be specific. For example, instead of "make it more user-friendly," explain what specifically you would want changed to make it more "user-friendly."

Affinity Diagramming

The challenge with both first round surveys was to find a way to synthesize and categorize the vast amounts of qualitative data generated by the open-ended questions. One method, from quality management, is the affinity diagram. The concept was originally designed by a Japanese anthropologist, Jiro Kawakita, to organize his observations, and was eventually adopted by the Japanese Society for Quality Control Technique Development. The affinity diagram is a commonly used by quality management professionals to sift through large amounts of qualitative data and identify patterns (Babbar, Behara & White, 2002).

After the qualitative information is gathered, a team then divides each individual statement or idea and writes them on separate Post-It Notes. These notes are then posted on a large sheet of paper. Once all ideas and statements are posted on the sheet of paper, the team will then start organizing each statement into like groupings. This is generally done without discussion and consists of moving each Post-It into clusters of similar or closely related statements. Once all statements have been sorted into categories, general headings are given to each group (Babbar, Behara & White, 2002).

Once all data were collected, I analyzed each respondent's statements into separate ideas on separate Post-It notes. I wrote the ideas from Survey 1 on pink Post-It notes and Survey 2 on yellow Post-It notes. The different colors allowed me to visually see what idea was generated by what survey once the two were combined. I initially

affinitied each survey's responses separately (Appendices C and D), generating separate categories for each. I then combined both surveys' affinity groupings into one large affinity for both first round surveys (Appendices E and F). Because there was a large degree of overlap, I used the combined affinity diagram to generate the second round survey. I divided the responses into two separate general categories, with several sub-categories in each. The two general categories were Design Ideas and Content Ideas.

The affinity diagram process generated 16 Design Ideas and 21 Content Ideas from the qualitative data provided in the first round survey. I then took these 37 items and generated another survey asking the same 32 members to rate the degree of importance of each of the ideas. I used a 10-point Likert Scale with 1 representing "not very important" and 10 representing "very important." This was a way of discovering which items were of greatest importance to the greatest number of people in the group. The highest rated ideas would be the focus points for designers, or the "vital few demanded qualities." Low ranking of ideas does not necessarily mean that they should not be incorporated in the design, but they should not get in the way or impede attainment of the highest ranked ideas. For example, in my pilot study, "customization and personalization" was ranked fairly low, where as "current up-to-date information" and "keep it simple" were rated high. This doesn't mean that there can't be a component of customization in the final product, but it must not sacrifice the demanded qualities of ease of use and up-to-date information. The demanded qualities also give the organization a benchmark for user satisfaction surveys. These are the qualities the organization should measure to judge success.

CHAPTER 4

RESULTS

Survey Distribution

I sent Survey 1 and 2 to all 32 people on October 8, 2008. Using the online survey tool, SurveyMonkey (www.surveymonkey.com), each person was contacted with a request to participate. The participants were given until October 20, 2008 to respond.

Table 2 shows the responses received for each survey.

Table 2. Response Rate for First Round Surveys

Survey	No of Responses	Response Rate (%)
1	7/16	44%
2	11/16	69%
Total	18/32	56%

As the results show, there were not as many responses to the idealized design concept survey (Survey 1) as there were for the more traditional customer satisfaction survey (Survey 2).

Demographics

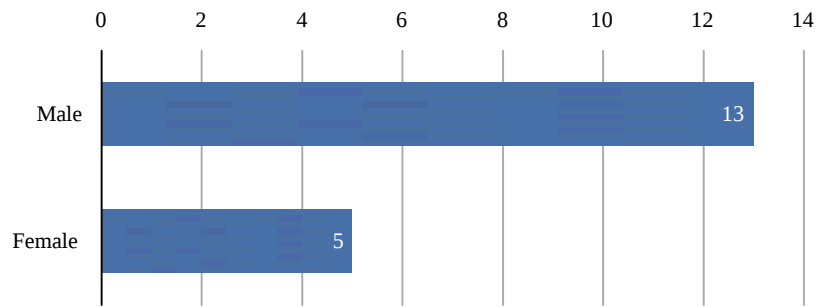
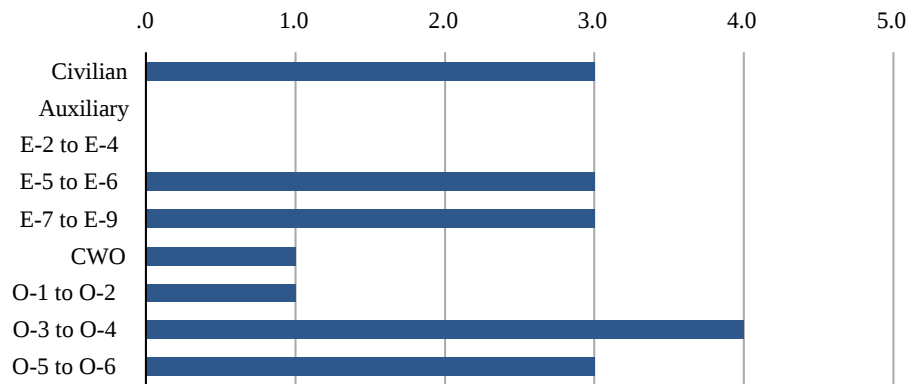
Since each survey had identical demographic questions, and due to the small size of each group, I combined the demographic results for both surveys to show the diversity of the sample. Table 3 contains a breakdown of the 18 respondents:

Table 3. Demographic Characteristics of First Round Survey Respondents (n=18)

Age

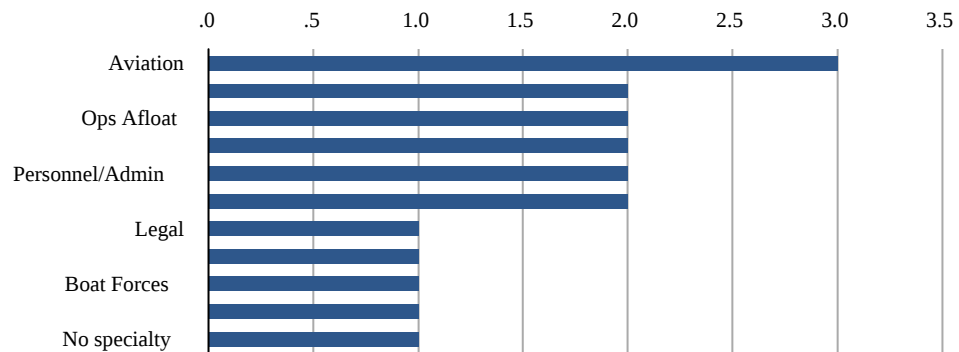
Range 24 to 56

Mean Age: 39

Gender**Rank****Years of Experience**

Range 3 to 33

Mean Yrs Experience: 14

Specialty

This was a very good diversity breakdown for such a small group of surveyed members. One of my goals was to try and capture a diverse and wide-ranging set of ideas from different segments of the organization, and I feel the demographic breakdown shows that this goal was met to the greatest degree possible.

First Round Survey 1 Qualitative Results

Survey 1 (Appendix A) was composed of one open-ended question, and therefore contained only qualitative information. I took each narrative and broke it into separate individual statements. For example, one respondent wrote:

A truly user-friendly tool akin to Google would be a starting point. Currently CG Central does not have the capacity to search for information across existing CG sites. I would design the portal to include all the resources of the current system but add functionality. For example, our link to pubs & directives does not allow a cut & paste from Adobe to Word. This prohibits ready access and use by commands who may want to highlight a certain aspect of policy but currently have to retype the guidance if they want a “clean” presentation. By ensuring this information is readily accessible and easier to process would promote member access. Moreover, if a program were added to the portal which captured actions & comments, and used operational units, their numbers would be captured, validated and compared in a one stop shop, eliminating the need for several layers of data calls.

This statement was broken into 5 separate verbatim statements written on 5 different Post-It notes to be affinity'd. These were:

1. A truly user-friendly tool akin to Google would be a starting point.
2. Currently CG Central does not have the capacity to search for information across existing CG sites.
3. I would design the portal to include all the resources of the current system but add functionality. For example, our link to pubs & directives does not allow a cut & paste from Adobe to Word. This prohibits ready access and use by commands who may want to highlight a certain aspect of policy but currently have to retype the guidance if they want a “clean” presentation.

4. Ensuring this information is readily accessible and easier to process would promote member access
5. If a program were added to the portal which captured actions & comments, and used operational units, their numbers would be captured, validated and compared in a one stop shop, eliminating the need for several layers of data calls.

Each statement was divided in this way and out of the 7 responses, 55 separate Post-It notes with verbatim statements were generated (40 design ideas, 15 content ideas). These statements were then arranged via the affinity diagramming process for the two categories (design and content). The affinity diagrams (Appendices C and F) consolidated the 40 design statements into 13 subcategories, and the 15 content ideas into 14 subcategories (most content was specific and harder to affinity).

The subcategories generated through the affinity diagramming process are presented in Table 4.

Table 4. First Round Survey 1 Affinity Groupings

Design Ideas
1. Keep it simple/Easy Navigation/User-friendly
2. Collaboration Tools
3. Ability to Access System/Email outside CGDN
4. Customization & Personalization
5. One-stop shop for information
6. Single Access Password
7. Links to outside internet sources
8. Feedback & User Input
9. Well-maintained/current up-to-date information
10. Outside design ideas from DOD/Federal partners
11. Training
12. Too slow/faster load time
13. Detailed search capability
Content Ideas
1. White pages
2. CG News/Newsticker

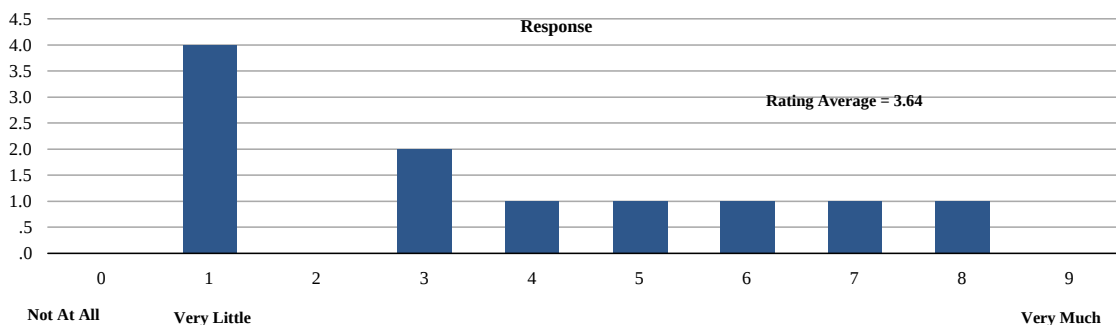
3. CG History
4. Message Boards
5. Links to Units/Commands
6. CG Product Links
7. Time zone/zulu clocks
8. Links to Recruiting Info
9. Forums
10. Pictures of Top Chain of Command
11. Reference Tools
12. Weather
13. C-School Links
14. Ads

First Round Survey 2 Quantitative Results

Survey 2 (Appendix B) contained five questions (Items 6-10) asking the respondents to rate their satisfaction with different aspects of CG Central. Table 5 shows the results.

Table 5. First Round Survey 2 Quantitative Results for Questions 6-10.

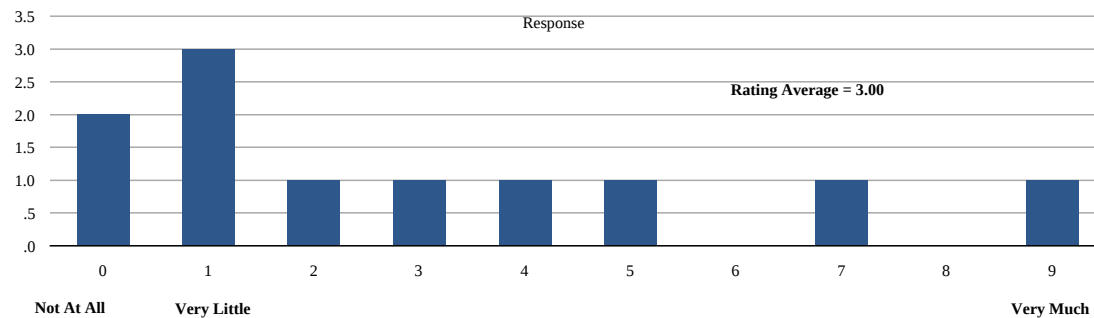
Rate the degree to which you use CG Central overall (for all purposes)



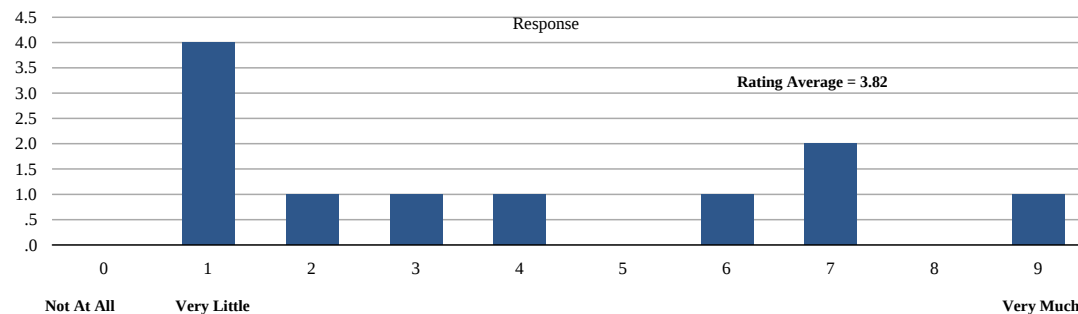
- Slow
- It is a one-stop shop that contains everything from History, COMDT's speeches, manuals, e-learning, etc. Very helpful!
- Not user friendly
- A separate "portal" is used on my unit. At my previous unit, I used CG central everyday.
- I use for PUBS and Forms, must web pages I need are saved as favorites.
- slow, cumbersome, a depository of documents
- Frankly, its not user friendly at all. I can get most anything I need about the CG online, either thru the intranet, internet, or just doing a "google" search.

Table 5. First Round Survey 2 Quantitative Results for Questions 6-10 (cont.)

Rate the degree to which CG Central is necessary to accomplish your “everyday” work

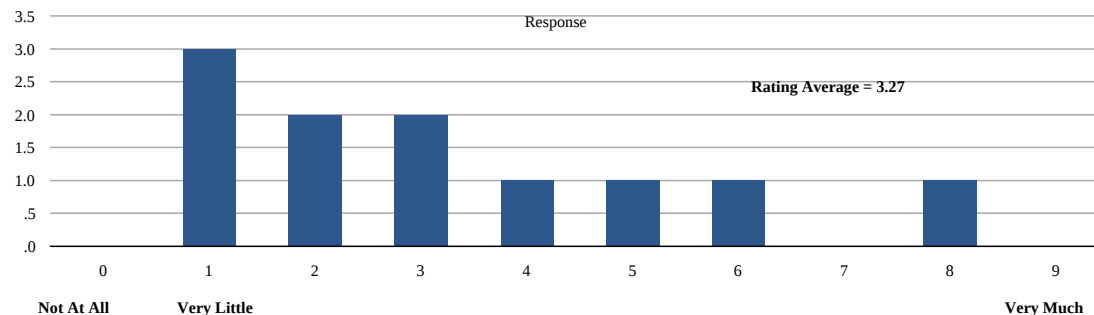


- More often will have subordinate make queries eg training status of staff
- I need it to find info on references, I use the Google function to find examples of Instructions and policies, and even PPT presentations I may want to use.
- Only use it to obtain personal information and / or post information to a micro site



Rate the degree of success which CG Central meets your work needs

- Doesn't do much that I need. Easier to get information quickly via Google.
- Not user-friendly at all.

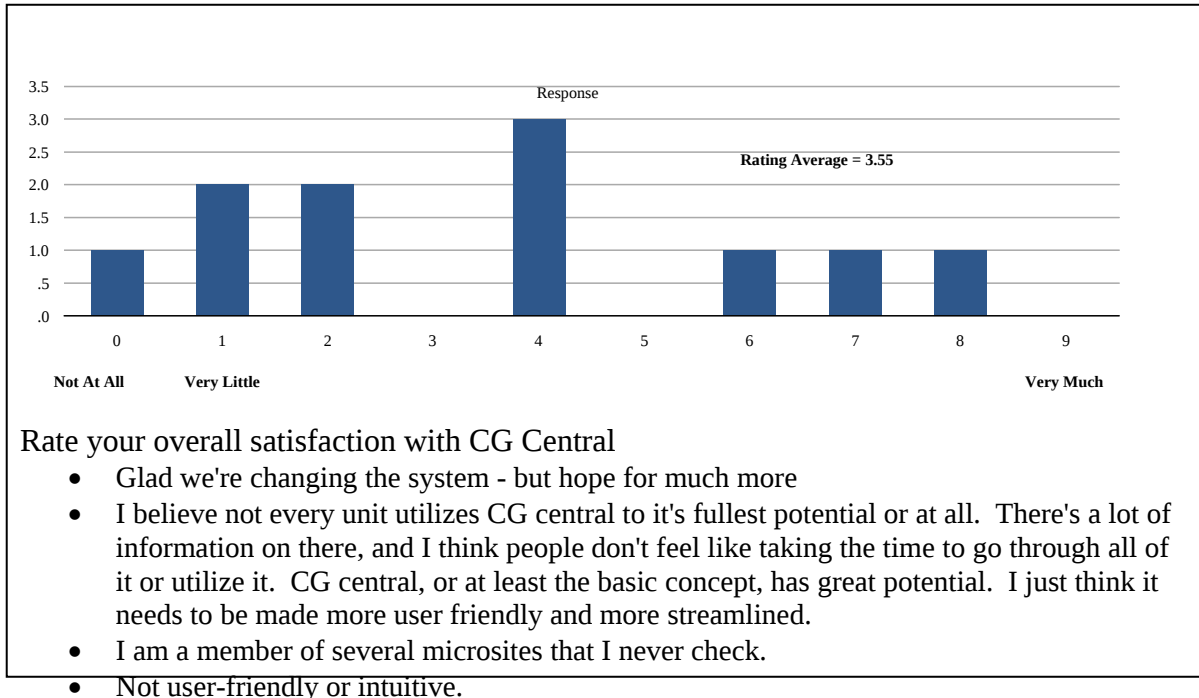


Rate the ease of use of CG Central

- cumbersome, cryptic, and slow. too many options, not enough road signs.

- To cumbersome, not user friendly, struggle to find information, information often outdated
- Difficult to find new things if I am in a hurry, many dead end links.
- Auto log-on made it better, but it is too difficult to navigate.

Table 5. First Round Survey 2 Quantitative Results for Questions 6-10 (cont.)



The numbers generated from these questions give a general idea of user satisfaction in this small survey group. The rating averages in descending order are shown in Table 6.

Table 6. Ordered Rating Averages for First Round Survey 2 Quantitative Results

Degree to which it meets your work needs	3.82
Degree of use of CG Central overall	3.64
Overall satisfaction	3.55
Ease of use	3.27
Degree necessary for “everyday” work	3.00

I used a 10-point Likert scale with 0 representing “Not At All”, 1 representing “Very Little” and 9 representing “Very Much”. If you divide the 1-9 into Low (1-3), Medium (4-6), and High (7-9), all aspects of CG Central (needs, use, satisfaction) rated between the high end of Low and the lower end of Medium. This validated my theory that there is

a general dissatisfaction with the current product among users, and somewhat mirrored the trend of the OAS data (Table 1) gathered across the Coast Guard (more satisfaction with meeting work needs than ease of use).

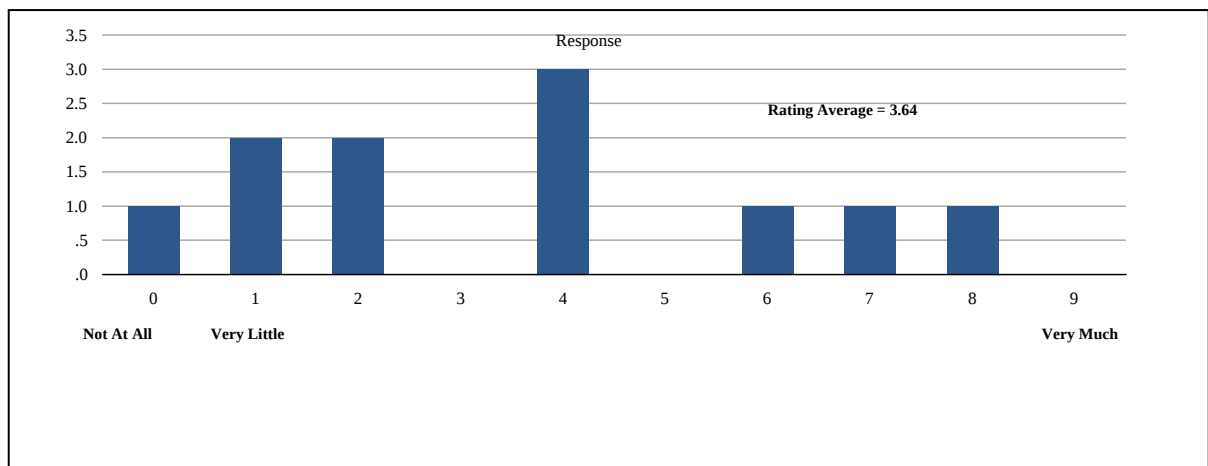
I felt the qualitative data generated from the Optional Comment section needed to be captured as well. I wrote each comment on a Post-It note and collected them for affinity diagramming with the other qualitative data later in the survey.

There was one additional quantitative question among the three questions asking the perceived purpose of CG Central and the desired purpose. The three questions were as follows:

1. What do you think were the Coast Guard's main purposes for creating the intranet portal, CG Central?
2. Rate the degree to which you think CG Central is meeting their purposes.
3. What do you think (in your opinion) the main purpose of CG Central should be?

I grouped the qualitative data from the third question in with the optional comments and qualitative data from the final question on the survey. I synthesized the answers from question 1, and there was a pretty common consensus that the Coast Guard's purpose was to create a one-stop shop that would ease communication and encourage collaboration. Below was the rating the respondents gave to the question of how well CG Central was meeting these purposes, with the one optional comments provided.

Table 7. First Round Survey 2 Quantitative Results for Question 14



- Connectivity to CG Central from outside the workplace is non-existent; too many firewalls.

This rating was notable since it is not tied to user satisfaction, but rather is a rating of how well CG Central is meeting its own purposes, the ones for which it was designed. A rating of 3.64 ranks it between high Low and low Medium.

First Round Survey 2 Qualitative Results

There were several categories of qualitative data captured in Survey 2. The first was from the two questions asking about general websites the survey respondents liked and used. The questions were:

1. Think of other websites you've used at home or at work. What features do you like most about those websites?
2. Give some examples of websites which have features you like.

From the responses to these two questions, I grouped specific website names into one group and wrote the specific features on Post-It notes to be affinity with the other qualitative data on design and content. Table 8 shows specific websites mentioned by the survey respondents.

Table 8. First Round Survey 2 Website Examples (Question 12)

Google MSN Yahoo CNN Wikipedia Facebook MySpace GPO (Government Printing Office) PSC (Personnel Service Center) MLCLANT (Atlantic Area) ARSC (Aircraft Repair & Supply Center) TRICARE Thomas School research sites Joomla-run site

The rest of the qualitative data, including optional comments, other website features liked, desired purpose of CG Central and the results from the final brainstorming question (Questions 6,7,8,9,10,11,14,15,and 16) were written on Post-It notes similar to the example in Survey 1. Out of the 11 responses, 90 separate Post-It notes with verbatim statements were generated (76 design ideas, 14 content ideas). These statements were then arranged via the affinity diagramming process for the two categories (design and content). The affinity diagram (Appendices D and F) consolidated the 76 design statements into 11 subcategories, and the 14 content ideas into 11 subcategories.

The subcategories generated through the affinity diagramming process had many categories similar to the categories generated from Survey 1. Table 9 shows the categories generated by the Survey 2 results with the categories that overlap Survey 1 categories in bold.

Table 9. First Round Survey 2 Affinity Groupings

Design Ideas
1. Keep it simple/Easy Navigation/User-friendly
2. Collaboration Tools
3. Ability to Access System/Email outside CGDN
4. Customization & Personalization
5. One-stop shop for information
6. Increase transparency
7. Detailed search capability
8. More operational focus
9. Too slow/faster load time
10. More training
11. Start from Scratch
Content Ideas
1. White pages

2. CG News/Newsticker
3. Personal & Unit scorecards
4. Individual Development Plans (IDPs)
5. Links to Units/Commands
6. Message Boards
7. Maps
8. CG YouTube
9. Leadership Corner
10. Access to Databases
11. CG Netflix-type training library

First Round Survey Combined Results

Since there was a large degree of overlap between the survey result categories, and since my eventual goal was to gain group consensus on which ideas were most important, I combined the results of both surveys (Appendices E and F) to generate the Second Round survey. The combined categories generated 16 design ideas and 21 content ideas. The combined syntheses of both surveys' ideas are shown in Table 10 (bolded items show overlap between surveys).

Table 10. First Round Survey Combined Affinity Groupings

Design Ideas
1. Keep it simple/Easy Navigation/User-friendly
2. Collaboration Tools
3. Ability to Access System/Email outside CGDN
4. Customization & Personalization
5. One-stop shop for information
6. Detailed search capability
7. Too slow/faster load time
8. More training
9. Single Access Password
10. Links to outside internet sources
11. Feedback & User Input
12. Well-maintained/current up-to-date information
13. Outside design ideas from DOD/Federal partners
14. Increase transparency
15. More operational focus
16. Start from scratch

Content Ideas
1. White pages
2. CG News/Newsticker
3. Message Boards
4. Links to Units/Commands
5. CG History
6. CG Product Links
7. Time zone/zulu clocks
8. Links to Recruiting Info
9. Forums
10. Pictures of Top Chain of Command
11. Reference Tools
12. Weather
13. C-School Links
14. Ads
15. Personal & Unit scorecards
16. Individual Development Plans (IDPs)
17. Maps
18. CG YouTube
19. Leadership Corner
20. Access to Databases
21. CG Netflix-type training library

Second Round Survey Results

The 37 synthesized ideas were then used to generate the Second Round Survey (Appendix G), which asked the original 32 members surveyed to now rank the importance of each of the ideas generated from the First Round Survey. A 10-point Likert scale was used (1-10) with 1 representing “Not Very Important” and 10 representing “Very important.” The group was given one week to respond. The response rate for the Second Round Survey was 16 out of a possible 32, for a 50% response return.

I took the result averages for all 16 responses to each design and content idea and arranged them in a chart from highest ranking to lowest. I then created a Pareto chart for each category to show the ranking of each idea. The results and Pareto charts for each category are shown in Tables 11 and 12.

Table 11. Second Round Survey Rating Average of Design Ideas in Descending Order

Design Ideas	Rating Average
Well-maintained/current up-to-date information	9.69
Single-Access Password	9.56
Keep It Simple	9.50
One-stop shop for information	9.06
Ability to Access System/Email Outside CGDN	9.00
Faster Load Time	8.88
Detailed search capability	8.81
Increase transparency in the organization	8.56
Collaboration Tools	8.00
Links to Outside Internet Sources	8.00
Utilize already existing ideas from DOD/Fed partners	7.88
More operational focus	7.69
More training	7.56
Feedback & user-input	7.50
Customization & Personalization	6.13
Start from Scratch	4.81

Figure 1. Pareto Chart of Design Ideas by Rated Importance

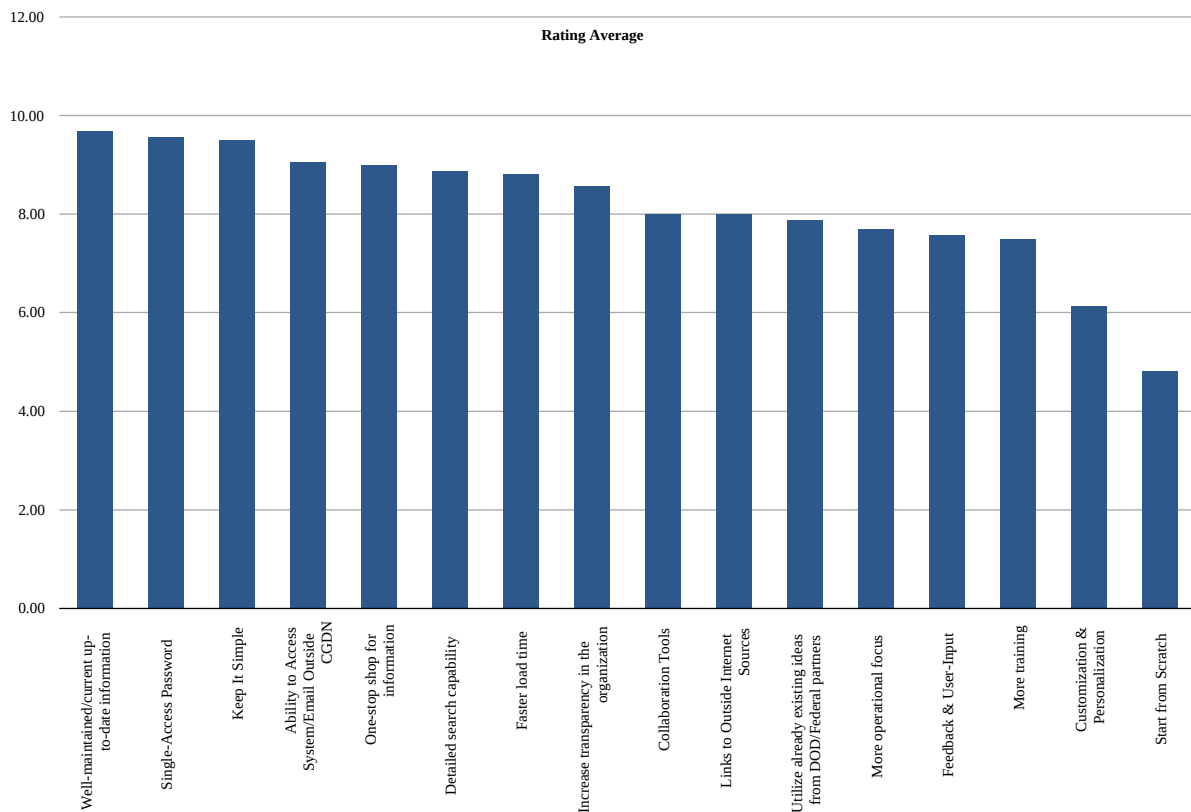
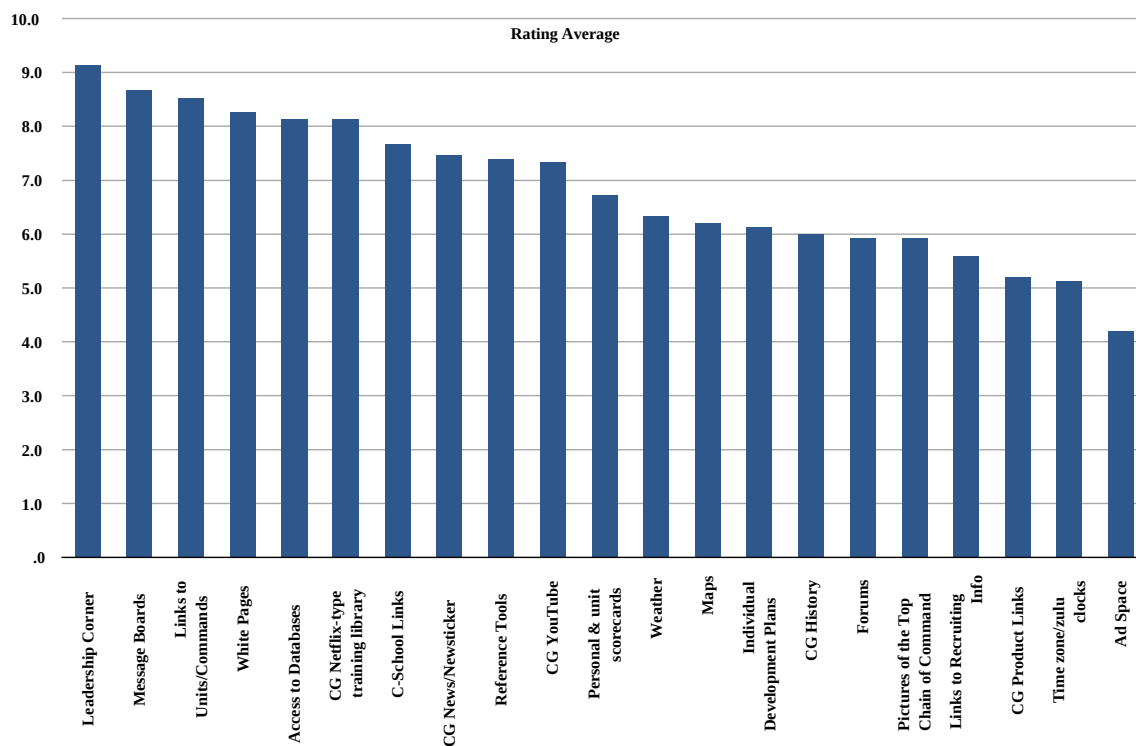


Table 12. Second Round Survey Rating Average of Content Ideas in Descending Order

Content Ideas	Rating Average
Leadership Corner	9.13
Message Boards	8.67
Links to Units/Commands	8.53
CG Netflix-type training library	8.27
White pages	8.13
Access to Databases	8.13
C-School Links	7.67
Reference Tools	7.47
CG News/Newsticker	7.40
CG YouTube	7.33
Personal & unit scorecards	6.73
Weather	6.33
Individual Development Plans	6.20
CG History	6.00
Forums	5.93
Pictures of the Top Chain of Command	5.93
Links to Recruiting Info	5.60
CG Product Links	5.20
Time zone/zulu clocks	5.13
Ad space	4.20

Figure 2. Pareto Chart of Content Ideas by Rated Importance



The top 5 “desired qualities” for design were:

1. Well-maintained/Current up-to-date information
2. Single-Access Password
3. Keep It Simple
4. One-stop shop for information
5. Ability to Access System/Email Outside CGDN

These are the qualities that, if achieved, would bring the most increase in satisfaction.

It is interesting to note that although Survey 1 did not receive the response rate that

Survey 2 did, the top two most desired design qualities were ideas generated from Survey

1. The remaining 3 were ideas generated on both surveys.

The top 5 “desired” content ideas were:

1. Leadership Corner
2. Message Boards
3. Links to Units/Commands
4. CG Netflix-type training library
5. White pages (contact information for personnel, units, homeports)

Two of the top five content ideas were generated solely from Survey 2, and the other three were generated on both surveys.

CHAPTER 5

SUMMARY AND CONCLUSIONS

This capstone project was to illustrate that user involvement in the design process of a web portal site was not only possible, but preferable, in a large, diverse, and geographically-dispersed organization. This design project demonstrates one method for soliciting user input into the front end of the design process. I designed a process that was relatively simple, inexpensive, and could reach the most people. As the Coast Guard enhances its social media platforms, more extensive projects and research can be conducted on using more advanced collaboration tools, such as wikis, blogs, and crowd sourcing to involve a much larger group of stakeholders in the design process. Sorting qualitative information takes time, but I believe this project has shown that the robustness and creativity of the ideas generated by even a small group will pay enormous dividends in creating a tool that can be used effectively to increase productivity and mission effectiveness. I believe it also illustrated that the members of the organization are intimately familiar with not only the problems they face, but also the solutions they require.

Organizational Assessment Surveys are often useful in determining what is wrong with the organization and where the problems lie, but they are not very useful in designing solutions. This project shows how we can involve the organization not only in the assessment of problems, but in designing solutions for them as well. An oft heard mantra of leadership is “don’t come to me with problems, come to me with solutions.” Our organizational assessments need to mirror this. Asking people to tell us what is wrong and then guessing how to fix it seems a poor strategy. It is better to draw on the

collective experience, skills, and creativity of all the members of our organization to design the solutions. I believe this project has illustrated that this is possible even in a geographically dispersed organization. This approach to problems mirrors the recent trend in Organizational Development and psychology towards focusing on what an organization/individual is doing right, and building on that, rather than simply focusing on what is going wrong. Methodologies such as Appreciative Inquiry and Idealized Design, which grew out of systems thinking and positive psychology, are becoming increasingly popular organizational intervention tools. The U. S. Navy's use of Appreciative Inquiry at their 2001 Leadership Summit (Appreciative Inquiry Commons, 2008) illustrates that these trends are also being recognized and embraced by the U. S. military.

This capstone illustrates a process for involving the people of an organization in solving their own problems. It is at its heart a design process, but in many ways it mirrors essential elements for good leadership. Participation, ownership, allowance for mistakes, and feedback are all cornerstones of good design and good leadership. Bevan, Glenn, Bate, Maher and Wells (2007) cite literature describing both leaders and designers as “makers of meaning” and further hypothesize that “if we accept that leaders and designers are both meaning makers, then again, it seemed possible they may have much to learn from each other about their respective methods, concepts, and practices” (p. 138). My hope is that by starting small, with small improvements in the tools we use, we can begin to appreciate the power of interactive design. Once we've designed the tools, we can use the same principles to begin designing the organization we want, one that is equipped to deal with an unpredictable future. Peter Senge (2006) illustrates this principle

with the metaphor of a ship. He suggests that the leader of a ship is not the Captain, helmsman, navigator, or engineer, but the designer of the ship. He argues that all the experience, skills, and will of the crew mean nothing if the ship is not designed to do what everyone needs it to do. Leadership starts with design, not problem solving. We shouldn't be planning or reacting to the future; we should be designing the future.

Design thinking has been around for almost 40 years (see Rittel & Webber, 1973). Though not a new idea, it is becoming increasingly popular in business, education, and other professional literature. A recent *Harvard Business Review* article (Brown, 2008) was dedicated to the topic of design thinking as well as the entire March 2007 issue of the *Journal of Applied Behavioral Science*, the professional journal read by many consulting professionals and academics. Our increasing connectedness, access to information, and complexity requires a holistic approach rather than the outdated analytic model. Design thinking allows organizations to leverage these new realities to ensure not only survival, but success.

Part of the power of interactive design occurs through participating in the process. Through participation we create ownership, which creates responsibility. A person may not put premium gas in a rental car, but often will for one's own car. We take care of what we own. We take even greater care and pride in things we design and build ourselves.

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APPENDIX A

FIRST ROUND SURVEY 1

APPENDIX B

FIRST ROUND SURVEY 2

APPENDIX C

DESIGN IDEAS AFFINITY DIAGRAM – SURVEY 1

APPENDIX D

DESIGN IDEAS AFFINITY DIAGRAM – SURVEY 2

APPENDIX E

DESIGN IDEAS AFFINITY DIAGRAM – COMBINED

APPENDIX F

CONTENT IDEAS AFFINITY DIAGRAM – COMBINED

APPENDIX G

SECOND ROUND SURVEY