

White Paper
Creating a Culture of Innovation
in Aerospace and Defense

A Knowledge-Driven Consulting

Apr 2014



**Better
Innovation**

Contents

Introduction	01
What is Culture?	01
Innovation Landscape – Where Do You Fit?	02
Culture of Information Hoarding	03
Resistance to Challenging Authority	04
Perceptions of Idea Generation	05
Command and Control	05
Innovation Isn't Free	06
If it Was Easy, Everyone Would Change	06
Transforming to a Culture of Innovation	07
Author Bios	08
About Hitachi Consulting Corporation	08
About Hitachi, Ltd	08

Introduction



In the race to be an industry leader, a company's ground-breaking ideas can quickly separate the winners from the losers. Check the value statements and annual reports of any Aerospace and Defense (A&D) company and the recurring message is that the road to industry leader is paved with innovation. Yesterday's breakthrough technologies have become today's cash cows, but the challenge is that your competitors also understand this innovation urgency. Today's innovations are tomorrow's bread and butter, driving the need for smarter, better, and most importantly, faster innovation.

A&D companies have built strategies to drive innovation and have made significant capital investments to support those strategies, yet as forward-looking as most corporate strategies are, many companies fail to see the factors in their own backyard that can slow their ability to innovate. Time and time again, we have seen how companies often neglect to evaluate the degree to which their own organizational culture can support or hinder strategic goals. These companies don't recognize how characteristics common in legacy A&D culture can be in direct conflict with behaviors and

values that drive an innovative organization. For example, values common in A&D legacy culture, such as command and control, clash with innovation imperatives like openness and experimentation. By missing the warning signs, companies risk being delayed by cultural roadblocks and falling behind in the innovation race.

What is Culture?

We've referenced this notion of culture, but what really is it? Simply put, culture is the personality of an organization. You can see how this organizational personality is reflected in what a company does well, where it has difficulty, or employee behavior and decision-making. Tangible artifacts such as the organizational structure, value and mission statements, processes, reward systems even office layouts can tell you something about culture. More subtle indicators are corporate decision making prioritizations when faced with a problem (i.e. "Cost savings is king," "The customer is always right," "Minimize Risk, Maximize Profitability").

An organization's culture can be both an asset and a risk to achieving strategic goals. It can accelerate and enable companies to exploit innovation to its fullest or it can be an enormous obstacle. The mistake that A&D companies make is assuming that a culture will evolve to support a strategy. While this may happen, those who wish to accelerate their goals need to take a proactive approach to forming and driving a culture and organizational personality that supports its strategy.

"The mistake that A&D companies make is assuming that a culture will evolve to support a strategy."

"Simply put, culture is the personality of an organization."

Innovation Landscape – Where Do You Fit?

Before we delve deeper into A&D culture, let's first talk about the innovation landscape and the corresponding complexities that result from the nature of A&D companies and the types of products they produce. Companies outside the industry have the liberty of maintaining a more specific outlook when it comes to innovation. For decades, Toyota has been known for its ability to manufacture efficiently by employing "lean," "Kaizen" and related practices. It builds a product type that is mature in the technology lifecycle – the automobile – and focuses on predominantly incremental innovations to remain competitive in the marketplace. A&D companies, on the other hand, have extremely diverse portfolios of products and services. These companies build aircraft, satellites, launch vehicles, ground stations, RFID, maritime systems, missiles, and provide a wide array of services. They must be able to innovate at different levels.

Differing innovation types require a different mindset. For example, a certain mentality is required for incremental innovations – those inward, linear improvements, such as process improvements, waste removal and added efficiencies. While a different mentality is necessary for breakthrough innovations where higher risk is involved, results are unforeseen and failures are more prevalent. A&D companies must do it all. The Innovation Framework below shows where some industries focus their innovation efforts. How does your company fit in this framework?

One top innovator, General Electric, recognized this need to use a varied innovation mindset across the company. As a conglomerate, the company's product offerings and resulting innovation landscape is complex, like that of large A&D companies. Known for its extensive Six Sigma expertise, GE universally employed the Six Sigma approach – a controlled approach that looks inward at process improvement, increased efficiency, and waste removal. The resulting incremental

innovations allowed the company to build its products better, faster, and cheaper. However, GE soon recognized the limitations of this business management strategy. They realized that the approach did not provide for breakthrough innovations that gave their customers new products/services and new ways of doing things. Sure, they had an R&D organization but it wasn't enough. To move up the innovation scale (the y-axis in the Innovation Framework), GE recognized the need to introduce an alternate innovation mindset. The company adjusted how it evaluated its leadership in certain areas

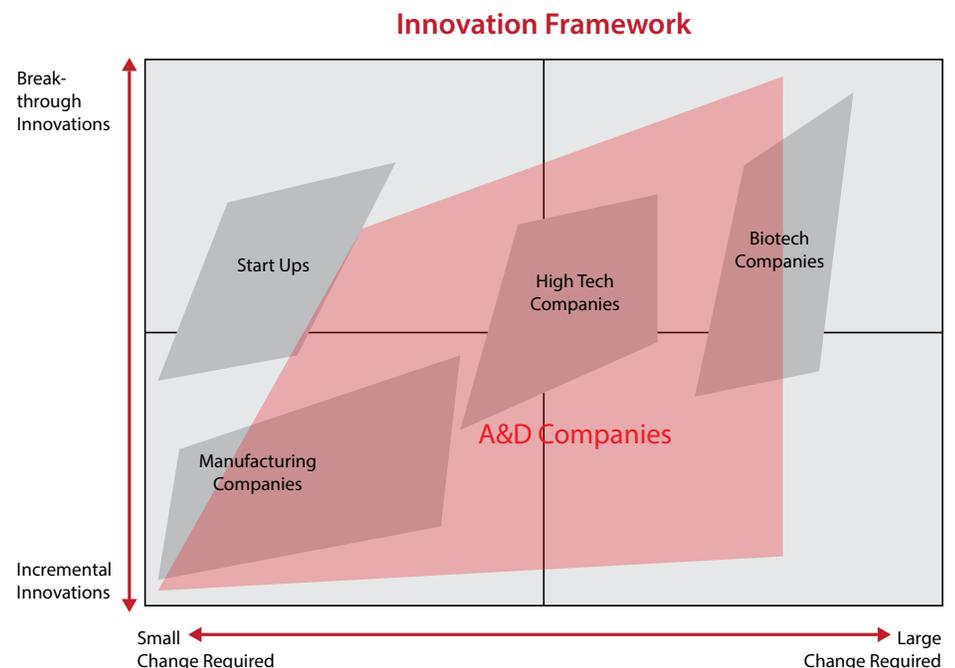
of the organization to encourage nonlinear thinking and more risk taking. It measured management on traits such as "external focus" and "imagination and courage." What GE ultimately did, was maintain its Six Sigma expertise in areas that needed continued incremental innovation, such as manufacturing and operations, while developing its breakthrough innovation mindset in other areas of the company.

Certain aspects of an organization's personality can support all types of innovation – from incremental to breakthrough -- which is our focus for this white paper. Moving forward, we'll identify some characteristics typical of Aerospace and Defense cultures and how they prevent these companies from becoming leading innovators, no matter where they sit on the innovation scale:

- Culture of Information Hoarding (Share and Share Alike)
- Resistance to Challenging Authority (360° Collaboration)
- Perceptions of Idea Generation (The Numbers Game)
- Command and Control (A Balancing Act)

The second part of this white paper walks through considerations and expectations when trying to transform an organization to an innovative culture:

- Innovation Isn't Free
- If it was Easy Everyone Would Change



Culture of Information Hoarding (Share and Share Alike)

The need for information security in the industry has had an unintended consequence. It has created a culture of caution where information is kept close, even hoarded. Information is even viewed as the currency that buys job security. This attitude toward communication clashes with the type of culture needed to promote innovation within a company

How many times do you run across a coworker that will not explain what they did for fear of losing the thing that keeps them employed – the knowledge of how things are done? Information hoarding comes up in anecdotes about work experiences in the industry on an alarmingly regular basis. It also is a significant roadblock to innovation in more than one way. First, without information on existing methods, it's hard to tell if you're being innovative or not. Second, it's indicative that your culture may not be open to change. Information hoarding is security while Innovation is change, and, in that world, innovation means someone loses.

The value of information communication is illustrated by the Pentagon's approach to detecting and defending against Improvised Explosive Devices (IEDs), the leading killers of troops in Afghanistan. Billions of dollars have been spent to develop various methods and devices to detect and defend against IEDs yet, according to Lt. General Thomas Metz -- who led the Joint Improvised Explosive Device Defeat Organization -- the most effective approach to detect and defend against IEDs was simply information sharing. Metz and his

team determined that no single piece of datum was sufficient to uncover the terror networks behind IEDs. Rather, it's the collection of pertinent data intelligently tied together, like a jigsaw puzzle, which more clearly brings out a picture of who is behind the terror. Likewise, innovation thrives on open information sharing – synergies are created when information across disciplines and functions is shared, creating opportunities to identify points of intersection that can drive an innovative solution or approach. The sum of this collective wisdom becomes much more powerful than the parts.

Employees must embrace the notion that the free exchange of information is not only helpful to the company, but it creates a competitive advantage enabling companies to grow. Job security lies in embracing free communication.

An added hurdle for the A&D industry is the need to provide information security – especially on classified programs. In fact, large sections of the industry practice information segregation. "Need to know" is the operative phrase for an increasing percentage of programs. Classification became a large impediment to information sharing in the war in Afghanistan, which may have resulted in the unnecessary loss of coalition lives. Lt. General Metz and his team addressed the issue while ensuring no classified information was compromised. Their solution was to simply build clarity around what was classified and what was not.

To combat communication issues as leaders, first understand that information sharing doesn't mean that you let everyone know everything all the time. That's just not good business and has its own consequences. There is a happy medium that can be achieved and encouraged. Show "information hoarders" that by sharing they actually increase their value to the company and enhance their job security. They have experience and depth of knowledge, as experts, which is needed throughout the company. Finally, open and sometimes difficult conversations with both customers and Information Security teams need to be had. Typically, customers control the classification rules and can provide the necessary guidance on what can and cannot be shared. But, there is often a reluctance to even breach the subject with customers which needs to be addressed either through building a stronger customer relationship (always a good thing) or a reasonable business case on the benefits. Ultimately, employees must clearly understand what information cannot be shared due to sensitivity or classification. They must be able to clearly delineate what's sensitive/classified from what is not. By undoubtedly knowing what they cannot share, they will feel safe to communicate other information.

"The sum of this collective wisdom becomes much more powerful than the parts."



Resistance to Challenging Authority (360° Collaboration)

Formal and informal beliefs around challenging authority also act as a barrier to information sharing, preventing ideas from those closest to the actual work to bubble to the surface. This filter has the danger of resulting in a very narrow point of view, where only unchallenged managerial ideas become what actually become visible.

The tragedy of Korean Air Flight 801 is an example of the high cost of a culture that lacks an ability to challenge authority. Subsequent investigation to the crash discovered that the dynamics between pilot and copilot in the cockpit were a major culprit. Korean culture values a deep respect for those in higher authority, and therefore they do not question the decisions of superiors. Those cultural norms seeped into the cockpit where, at Korean Air, the captain had the highest rank and, therefore, made the final decisions without scrutiny. In fact, Flight 801 was an example of a systemic problem. In the late „90s, Korean Air had one of the worst crash records of any airline worldwide. Between 1999 and 2006, the company transformed itself to become one of the safest airlines in the world by addressing the culture in the cockpit.

Earl Weener who served as chief engineer for safety at Boeing stated "... for a long time it's been clear that if you have two people operating the plane cooperatively, you will have a safer operation than if you have a single pilot flying the plane and another person who is simply there to take over if the pilot is incapacitated." ¹ Korea Air transformed its safety record by having both captain and first officer fly the plane. The airline, like others in the industry, went to great lengths to ensure copilots were trained to speak up.

Just as collaboration in the cockpit transformed Korea Air's safety record, collaboration in the meeting room can transform A&D companies' abilities to innovate. Employees need to understand how to properly communicate with management, escalate issues, and maintain a focus on what's best for the organization. Managers need to maintain an open environment that provokes the thought processes of the entire team and places more accountability on the individuals

involved in creative thinking. Likewise, though managers hold higher rank than their subordinates, it doesn't mean managers always have the best ideas or solutions. Due to the nature of their work, employees often have a higher level of intimacy with problems. They see and understand issues that managers don't. Managers need to build an environment where it is not only acceptable, but also encouraged for employees to speak up, offer new ideas and challenge decisions, particularly when they feel things might go awry.

Perceptions of Idea Generation (The Numbers Game)

Other ways A&D companies can build a culture of innovation are by challenging typical perceptions about where ideas come from and embracing the ideas of many people. Janitors, lunch ladies, engineers, users, and, yes, even accountants (they can be creative, too) all have the capability to provide ideas. A winner of multiple Nobel Prizes once said, "The best way to have a good idea is to have lots of ideas." Organizations should broaden their perception of where ideas can come from, identify a way to capture those ideas, pinpoint those most useful, and implement them.

Innovative companies build systems that unite solutions with the appropriate decision makers. They motivate employees with meaning and purpose. They allow their employees, not just those in R&D, the time, autonomy and resources to develop new ideas. Their employees know that even if their ideas are not implemented they are appreciated and heard. These companies invest in idea generation even though the results can be uncertain. Here are some examples of companies that play "the numbers game:"

Procter and Gamble's "Connect and Develop" program uses ideas from people outside the company. As of July 2009, "About half of P&G's new products used ideas, ingredients, or technology that originated outside the company."²

Google provides 20 percent of an engineer's time (one day per week) to birth and develop their own ideas. Fifty percent of the new products Google produced in 2005 originated from the 20 percent time.³ Popular products such as Google News, Gmail, and AdSense stemmed from this innovation initiative.⁴

These companies are considered some of the most innovative in the world and can be learned from. Employees and outsiders empowered with time, tools, and a supportive culture for innovation, become an engine for new ideas. Couple that empowerment with a deep meaning and purpose behind idea generation and you'll see amazing results as long as the purpose aligns with the organization's vision. In the case of the defense industry, meaningful purpose might be to: protect our country, support the troops, or win the war on terrorism. While the

aforementioned company experiences have proven successful, the entire process required the dedication to build a culture of innovation over time.

"The best way to have a good idea is to have lots of ideas."

-Linus Pauling, Scientist and Nobel Prize Winner

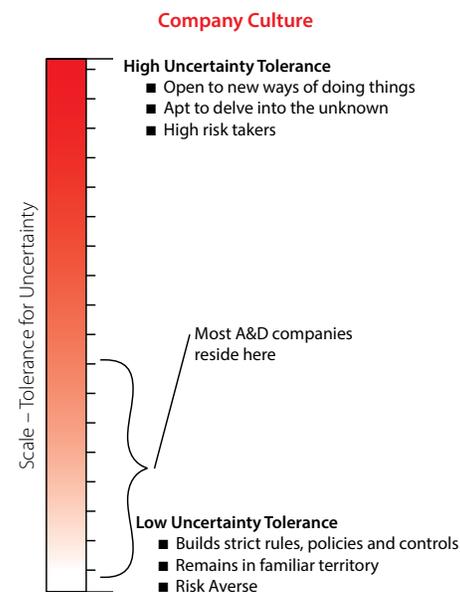
Command and Control (A Balancing Act)

The role of managers in defining and setting the tone for culture continues in the balancing act between the culture of control typical in A&D companies and innovation traits such as autonomy and empowerment. To understand this balancing act we have to understand the root of this culture of control in A&D companies. Research from Professor Geert Hofstede, Emeritus Professor at Maastricht University in The Netherlands, points to a direct correlation between a culture's comfort level with uncertainty and the extent of controls that are put in place. Those cultures that tolerate less ambiguity tend to prefer controlled environments and "try to minimize the possibility of such situations by strict laws and rules, safety and security measures." Those cultures that embrace ambiguity "try to have as few rules as possible."⁵

Like global cultures, companies as a whole exhibit certain behaviors that show varying levels of tolerance around uncertainty. Companies that culturally strive to avoid uncertainty, like many A&D companies, build a

procedure-oriented, command-and-control environment. Hitachi Consulting's experiences within A&D tell us that the industry tends to emphasize uncertainty avoidance, and for good reason. A&D produces launch vehicles, weaponry, aircraft and other products where failure means tragic consequences. The industry uses highly sensitive and classified information, and must employ strict security measures to protect that information. Those safety and security measures require disciplined controls to avoid costly mistakes in the high-stakes A&D world.

The solution lies in not only balancing between the need to maintain safe and secure measures with the need for an unrestricted, creative environment but also knowing when to apply either of these cultures in the appropriate setting. In order to maximize innovation, A&D companies cannot let the restrictive mentality from procedure-heavy areas seep into areas that must thrive on creativity and new ideas. One way to approach



this is by understanding the types of innovation that may occur within the organization (as shown in the Innovation Framework earlier in this paper) and driving a distinct culture to support it. This means taking parts of your organization that can tolerate ambiguity and involve breakthrough innovations (such as an R&D organization) and matching them with a culture that cultivates the appropriate attitudes and behaviors.

Innovation Isn't Free

Just like anything worthwhile, it takes the application of resources to both create a culture of innovation and then to innovate. Time, money, expertise, and other company resources, such as company equipment, all fuel the innovation engine – sometimes in ways that are not obvious. For example, if an existing program has both a schedule and budget margin built into it, not only do engineers and other staff on the program have the opportunity to spend some extra time investigating potentially innovative solutions, but other key sources of innovation get fueled. If the staff is not under the exceptional cost and schedule pressure that is the normal result of having small to no margin, then they have the comparative luxury to investigate alternatives to the original concept. If something innovative is generated as a solution or product for the customer, the program has the resources to implement the innovation and not slip schedule or overrun.

Ultimately, the leadership team, employees, and customers must recognize the need to invest in innovation – to allow the innovation engine to burn fuel. Sometimes, the fuel is obvious like time or money. Other times, it is less obvious like margin on key performance parameters such as mass. Mass is a key performance parameter for nearly every aerospace product. Like money, it has a budget. It is reviewed. It's managed as a scarce resource. The innovative solution may require slightly more mass. So, to be innovative, the program has to be willing to pay the mass cost to implement it. If there is sufficient mass margin (resources), the willingness to pay is most likely high. Conversely, if there is insufficient mass margin, then an innovative solution will be cast aside.

To have resources available to burn, the entire company (executives, management, and line employees) needs to be willing to obtain it. An entire host of behaviors can be involved in building the fuel stockpile to drive innovation. Functions such as estimating, planning, scheduling, and engineering design practices all play a role. Human capital management has a role in terms of having the expertise, both breadth and depth, available to validate ideas and execute them. If an existing program has both schedule and budget margin built into it, engineers and other staff on the program have the opportunity to spend some extra time investigating potentially innovative solutions.

If it Was Easy, Everyone Would Change

To be innovative is to be constantly evolving and changing. But change is hard. It takes time, effort, and consistent commitment. To truly change culture, we have to invest consistently, over time. Often, the time period can be measured in years. People have to understand that innovation is not just the flavor of the month stemming from someone reading a management book summary on an airplane ride. It's not a diet – it's a lifestyle change. There has to be a commitment to it becoming a part of how operations are viewed and how others are held accountable to it on a regular basis. It requires a cultural shift.

Finally, Hitachi Consulting has seen great solutions horribly deployed and then fade away; both inside and outside of A&D. Outside of the industry, the simplest example is the restaurant. A myriad of business school case studies describe great ideas for restaurants failing within a year because of inadequate funding, poor location, poor operations, or any of a host of other deployment problems. Inside the A&D industry, processes deployed without enough training, infrastructure, or communication that never achieve their true potential are a generic example of good ideas poorly executed.

The A&D environment seems to always be populated with aggressive schedules, reduced budgets, and shifting priorities. These can make people rigid and resistant to change; like we just don't have the bandwidth to absorb the change. But, in a culture of innovation, embrace both the change and the need to change. Changes have to go from being a source of additional work to a method of creating relief.

Transforming to a Culture of Innovation

We've highlighted how A&D attitudes toward information sharing, collaboration, idea generation and command and control can challenge all types of innovation, from incremental to breakthrough. But this just scratches the surface. Beyond this, look outside these major themes and assess what other cultural aspects, unique to your own company and its history, may stunt innovation. Particularly difficult will be identifying those parts of the culture that are not overt and tangible, but rather those subtle habits deeply engrained in how your company makes decisions and approaches problems.

Understanding your cultural landscape may drive you to adjust your company's organizational structure, employee measurement methods, or reward systems. No matter the approach your company takes, the end goal is to create lasting behavioral changes that align culture with innovative strategies.

To be successful, companies must obtain the resources – time, money and people – necessary to research and investigate potential innovations, test them appropriately to reduce risk, and be able to deploy them

successfully. Leadership and management must be actively involved and willingly trade in past behaviors for new ones that spur innovation. Armed with an understanding of organizational culture and innovation landscape, successful innovators commit to the difficulties of change and commit the time, money and people to drive an organizational personality that supports and sustains a culture of innovation.

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About Hitachi Consulting Corporation

As Hitachi, Ltd.'s global consulting company, with operations throughout North America, Europe, the Middle East and Asia, Hitachi Consulting is a recognized leader in delivering proven business and IT strategies and solutions to Global 2000 companies across many industries. With a balanced view of strategy, people, process and technology, we work with companies to understand their unique business needs, and to develop and implement practical business strategies and technology solutions. From business strategy development through application deployment, our consultants are committed to helping clients quickly realize measurable business value and achieve sustainable ROI.

Its client base includes 35 percent of the Fortune 100 and 25 percent of the Global 100, along with many mid-market leaders. With offices throughout North America, Europe, the Middle East and Asia, Hitachi Consulting employs approximately 5,000 professionals across 12 countries with delivery centers in India (Bangalore, Pune and Hyderabad), China (Guangzhou) and the United States (Fargo, North Dakota) to offer global delivery scale. For more information, visit www.hitachiconsulting.com.

About Hitachi, Ltd.

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, is a leading global electronics company with approximately 320,000 employees worldwide. Fiscal 2011 (ended March 31, 2012) consolidated revenues totaled 9,665 billion yen. Hitachi is focusing more than ever on the Social Innovation Business, which includes information and telecommunication systems, power systems, industrial, transportation and urban development systems, as well as the sophisticated materials and key devices that support them. For more information on Hitachi, please visit the company's website at www.hitachi.com.



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