# WHITE PAPER

**What happens to experts when the rate of change exceeds the rate of learning?**

A Mission Centric, University Assisted, Professional Development Framework
for U.S. Army Special Operations Command

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**Readers Note:**

*If you are reading this, it means that someone taught you to read. Most likely, you spent a number of years in the educational system going to school. In order for this paper to have any value to you, I am going to request that you forget all that you know and have experienced about education and assume the beginner's mind. "The phrase Shoshin, means 'beginner's mind.' …In the beginner's mind there are many possibilities; in the expert's mind there are few." (Suzuki, 2010) The problems we are heading toward are fundamentally different than the problems that our current educational models - the ones you probably experienced growing up, were designed to address.*

## Introduction

The mission of the U.S. Army Special Operations Command (USASOC) is to "Organize, train, educate, man, equip, fund, administer, mobilize, deploy and sustain Army special operations forces to successfully conduct worldwide special operations" (USASOC, 2013). The intent of this paper is to determine what is meant by "train" and "educate" and the role Professional Development (ProDev) plays in creating a force that is "fully capable" to accomplish the evolving mission USASOC. In order to do that, we need to understand why USASOC was initially created and why we are still in need of "Mission Critical Teams."

## The Emergence of the Mission Critical Team

By 1950, the British Army was encountering a series of radical change events that were triggering a shift in the traditional military paradigm (Kuhn, 1996). The recent introduction of the jet airplane, the computer and the nuclear bomb had created new problem sets that emerged faster, with more complexity, and with greater impact. Instead of organizing their large forces along predictable battle lines, they were increasingly engaged in what are known as "small wars (Couch, 2007)." One way to view the emergence of radical change events is through the theory of Punctuated Equilibrium (Gersick, 1991), which states that radical change events can cause destabilizing adaptive problem set(s) which push social systems from equilibrium (normalcy) to disequilibrium (chaos). According to the theory, radical change events can emerge as positive destabilizing events such as social or technical innovation (end of slavery, the invention of the computer, etc.) or negative destabilizing events such as war, natural disaster, etc. (Rogers, 2010).

To cope with these radical change events, and the emergent problem sets they would cause, the parent organization, often after a number of failed attempts (Kuhn, 1996), would form a temporary Mission Critical Team. I am defining a Mission Critical Team as a small (4-12 agents) integrated group of indigenously trained and educated experts that leverage tools and technology to resolve complex adaptive problems in an immersive, but constrained (ten minutes or less), temporal environments. Historically, in the military context, Mission Critical Teams often took the form of unconventional commando units which were capable of rapidly adapting to the emergent complex adaptive problem sets that were

associated with small wars. They had traditionally been formed as temporary groups because history had shown that when the small wars ended the unconventional commando units would only create unnecessary friction within a conventional garrison force (Beckwith & Knox, 1983; Dobbie, 1944). As a result, both the British and the American Armies had disbanded their unconventional commando units five years earlier at the end of WWII (Asher, 2008).

The primary challenge confronting the British Army was that if they created a permanent unconventional unit within their conventional organization, it could threaten their ability to remain a high reliability organization (HRO) (Weick, Sutcliffe, & Obstfeld, 2008). A high reliability organization, sometimes referred to as a "learning organization," is one that engages in significant amounts of complexity and uncertainty but is able to avoid catastrophic incidents through continuous organizational learning (Peter M. Senge, 1994). At the same time, it was clear that the core problem they were facing was not the phenomenon of change itself, but rather the increased *rate* of change. To be able to resolve these emergent small wars and remain reliable (Martin, 2009), they were going to require a permanent Mission Critical Team. So, on May 31, 1950, for the first time in recorded history, the British Army reformed the British SAS and made into a permanent command. This decision would be the first in a many events that would bring into question the sustained validity of the theory of punctuated equilibrium.

> Skeptics might explain today's fast moving events as merely the latest episode in the "punctuated equilibrium" model, which argues that technological discontinuities periodically arise to interrupt larger periods of relative stability. As the conventional thinking goes, once organizations learn to harness the disruptive element, everything will settle back into equilibrium. But what if the historical pattern- disruption followed by stabilization – has itself been disrupted?
>
> (Center for the Study of Intelligence (U.S.), 2010)

If these theorists are correct and the historical pattern of disruption, followed by stabilization, has been disrupted then we are going to become increasingly dependent on small mission critical teams to resolve the increased emergence of complex adaptive problem sets.

***The Diffusion of Mission Critical Teams***

By 1980, 30 years after the creation of British SAS, it was clear that a diverse set of organizations throughout the world had not only adopted the concept of Mission Critical Teams, but had started reinventing the concept (Rogers, 2010). After finding a solution that worked, some of those teams have been exploiting that solution ever since, while others have continued to explore addition innovative solutions (March, 1991). In the context of the U.S. Military, the need for Mission Critical Teams had become so great that the U.S. government created both the U.S. Special Operations Command and the Joint Special Operations command. The age of the Mission Critical Team had arrived:

- 1952: The U.S. Army creates **U.S. Army Special Forces,** its own unconventional warfare command.
- 1961: Larger forest fires lead to the creation of **Wildland Hotshot Crews**.
- 1962: In response to guerrilla warfare in Vietnam the Navy creates **Seal Team One & Two**
- 1963: Emerging technology leads to the **Johnson Space Center** and the **Mission Control.**
- 1966: The Accidental Death and Disability report leads to **EMS** and **Trauma Surgery**.
- 1974: Increased sophistication of urban crime leads to the **LA SWAT** team.
- 1977: Rise in terrorism leads to the Army creating **Delta Force**.
- 1980: Failure of Operational Eagle Claw and the need for an integrated international response leads to the creation of **USSOCOM** and **JSOC**.
- 1981: Ronald Reagan is shot the **U.S. Secret Service** creates the **Counter Assault Team**.

- 1983: Need for a domestic counter terrorism leads to **FBI Hostage Rescue Team.**
- 1986: Need for Urban Search and Rescue leads to **Fairfax VA, Task Force 1.**
- 1989: U.S. Army Special Operations Command is created to oversee Army Special Operations
- 2001: 9/11 **FDNY** Change Event –Special Operations Command

**The Emergence and Evolution of the Problem Set**

By 1989, there were enough Special Operations Units (Military Mission Critical Teams) that the U.S. Army reorganized them all to work under one organization, the U.S. Army Special Operations Command (USASOC). The U.S. Army had recognized that its strength lay in the resolution of technical problem sets. Technical problems are ones that are mostly predictable and where the solution is clear, even though you may need an individual expert to resolve them (Heifetz, 1994). The teams within USASOC, however, like all other Mission Critical Teams, were created to resolve "adaptive" problems. These are problem sets that emerge unpredictably and continue to evolve, which means that established technical solutions will not work. Therefore USASOC needed to create teams that were agile enough to adapt their capabilities to the emergent complex adaptive problem set. Put another way, while the U.S. Army was building potential contingency plans for specific future events, USASOC was building the capacity of the teams to be able to respond to any contingency that emerged.

In the aftermath of the events of September 11, 2001, however, it became apparent that regardless of how fast a team could adapt to emergent threat, adaptation is still fundamentally reactive. Given that the rate of change continues to accelerate, we now need to find ways to innovate in the way that we select, train and educate new operators to enable them to go beyond just reacting and adapting to emergent problem sets (K. J. Klein, Kozlowski, Steve W.J., 2008) to creating generative solutions that move from reaction to preemption (Peter M Senge, 1990; Wittrock, 1992). The first step in developing a generative mission critical team is to understand the implications of an increasingly constrained temporal environment. Older models of decision making assume a certain amount of time to evaluate options (Army, 2006). But in today's rapidly evolving battle space, multiple complex and critical decisions need to be made in very short time periods, which invariably lead to errors. Those errors potentially pose the greatest threat to mission success: "Historically, the U.S. Army has had more accidental losses, including fratricide (friendly fire), than losses from enemy action" (Army, 1998). It turns out that the greatest threats to the mission are the operators themselves. It was this new understanding of the problem, and a motivation to reduce accidental losses, that led the military to create programs such as Composite Risk Management (CRM) and Operational Risk Management (ORM) which were based on the premise that the root causes of accidents and incidents are human error (Helmreich, 2000; Perrow, 1984; Reason, 1990):

> "Human error is in existing literature cited as a contributing factor or main cause in the majority of industrial accidents and incidents. Specifically, 60-80 percent of accidents in aviation are attributed to human error (Luxhoj, 2003), 80 percent of accidents and incidents in offshore and maritime industries involve human error (Rothblum, 2002)." (Aas, 2009)

At the time CRM and ORM were created, it was believed the primary cause of human error was poor decision-making (Army, 1998). Accordingly, the designers of those programs believed that the best place to start was to create programs to train military personnel in making better decisions, thus reducing incidents. The flaw in this logic can be seen when on a closer look at the cause of human errors, which are not primarily caused by poor judgment; they are primarily caused by lack of situational awareness (M. R. Endsley & Garland, 2000): "…in a study of accidents among major air carriers, 88% of those involving human error could be attributed to problems with situation awareness" (Endsley, 2000), which she defines as: "[Situational awareness is] the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the

near future" (Endsley, 1988). It turns out that when human beings are helped to achieve reasonable levels of situational awareness they are inherently pretty good decision makers. Therefore, if the overall goal of USASOC is to create a ”fully capable” mission centric force, it needs to begin refocusing its ProDev programs from helping individual operators improve their decision making to increasing the entire teams situational awareness.

**Rethinking the Professional Development Lifecycle**

Traditionally, the U.S. Military views ProDev as something that comes after an individual's initial training and indoctrination. For the purposes of this paper, we are viewing Professional Development as encompassing the entire lifecycle of the individual from recruitment to retirement. It is this frame that forces us to consider how to redesign the Professional Development lifecycle of the next generation of Mission Critical teams to optimize their ability to be generative. In the face of complex adaptive problem sets the organization will need to evolve, and like all human based systems evolution will come in the form of ongoing learning. With that said, we need to be specific about the learning profile of the average Special Forces operator as well as the types of learning that USASOC will provide.

***Experience***

The type of learner that most commonly self-selects to join the MCT's that make up USASOC are typically those already biased toward experiential learning (David A Kolb, 1984); the on the job training and "notes to self" that mostly say "don't do that again." The experiential learning model (David Allen Kolb & Fry, 1974), is typically framed as a four part "learning cycle." The first stage in the cycle involves the learner experiencing a discreet event (experience). Following the experience, the learner then reflects back on it to make meaning of what they experienced (reflection). They then start asking themselves what they might do differently the next time (abstract conceptualization). Then, armed with their reflections and new ideas they start experimenting with new ways of doing things (experimentation). The cycle then starts over with a new experience and continues to iterate throughout one's life. The biggest challenge with experiential education, however, is that it can lead to miseducative behaviors if not managed appropriately. For example, if a child touches a hot pan in the kitchen he may become cautious about all pans and all kitchens. The key to good experiential education is that there is time for the learner to reflect and the presence of someone senior who is able to help the learner to make meaning of the lived experience (David A Kolb, 1984). When it is done correctly it creates:

> "The ability to assess and understand a situation from multiple points of view and to intuitively adapt operations as necessary requires mature soldiers who have the ability to combine their education and experience to solve a problem." (U. S. Army, 2013a)

As we think about designing a ProDev model for USASOC we need to find a way to leverage the lived experience to increase the operator's ability to be generative. To do that, we need to begin to be clear about our terminology. According to the U.S. Army Command and General Staff College, training is for certainty and education is for uncertainty (U. S. Army, 2012). Put another way, we train people to fix a car; we educate people to invent one. As we look ahead to the future needs of USASOC, these terms require much greater scrutiny.

***Training***

When we speak of "training" in the classic sense we are really talking about Operant Conditioning. Created by B.F. Skinner in 1937 (Skinner, 1937), operant conditioning describes how we can influence people's behavior through positive and negative reinforcement. It is the theory that most military boot camp experiences are based upon (Grossman & Christensen, 2004). The benefit of this methodology is soldiers can be conditioned to override the fight, flight or freeze response, or an "amygdala high jacking,"

to react predictably under great stress and danger. It is also one of the historical underpinnings of the modern public educational system, which was originally designed to prepare middle and high school students, in large numbers, for the industrial revolution at the turn of the 20th century (Committee, 1999). The strength and weakness of Operant Conditioning is that it fosters convergent (linear) thinking and problem solving, while expressly discouraging divergent (nonlinear) thinking and problem solving (Csikszentmihalyi, 2001; Woodman, Sawyer, & Griffin, 1993). As emergent problem sets become more adaptive and chaotic, we are going to need operators who go beyond reaction and response and begin achieving generative solutions (Kohn, 1999).

***Education***

In higher education, the traditional training pedagogy has been broadened to include learning more complex problems sets, allowing students to engage in more divergent (non-linear) thinking and problem solving. With that said the act of learning new information can range from the simple to the complex. In order for us to engage in a meaningful dialogue about professional development, we need to be able articulate how "simple" is different from "complex." For example, when I refer to technical learning, some theorists have also described this type of learning as "single loop" learning (Argyris, 1991) or "level one" learning (Bateson, 1972). For the purposes of this narrative we are adapting Tosey's (Tosey, Visser, & Saunders, 2012) framework as it combines both theories and allows us to use a metaphor related to perspective. For example, when you talk with people who are accustomed to learning about technical problems, or **Level One** learning, they will often use phrases such as "I am deep in the weeds" or "back to the trenches." Part of what they are referring to is the diminished perspective that comes with dealing with very detailed problem sets. This type of learner is really focused on error correction or incremental improvements within a closed system.

**Level Two** learning, or what Heifetz would refer to as "adaptive learning" requires you to get up "on the balcony" (R. A. Heifetz & Laurie, 1997) to be able to get "above" the problem set in order to gain a larger perspective which enables you to reframe the problem set in a way that incorporates larger patterns. A classic example of reframing is when a small coffee machine supply company in the 1970's reframed their question from how to sell more coffee machines, to how to create a space that will grow a community of coffee drinkers. You know them today as Starbucks (Koehn, 2002).

**Level Three** learning (Tosey et al., 2012), what Senge would call "generative learning" (Peter M Senge, 1990) allows us to move from reframing the patterns to disrupting them. It moves our perspective from the balcony to just outside the space station. To do this requires going beyond the cognitive and into the metacognitive. One way to think about this is to reflect on the answer that Henry Ford is said to have given to the question of seeking customer input. "If I had asked my customers what they wanted they would have said faster horses." Level three learning is fundamentally about helping operators relearn *how* to learn, so they can help their team continue to learn.

The point of describing these theories is not to value one level over another, in the same way that the third gear in your car is no more important than first gear; they are both needed for different purposes. The point is that we need operators who can not only do all three, but can also quickly shift between them. In other words, to be able to rapidly shift from the trenches to the space station and then back to the balcony.

Lastly, it is important to remember that any strength taken to far becomes a weakness. Education, while filled with possibilities can also be misapplied to simple and complicated problem sets. For example, sometimes the answer really is "hit it with a hammer" and a lot of time spent getting up on the balcony can disrupt operational momentum. In order for operators to learn and innovate in the face of complex and chaotic (adaptive) problems we need to start leveraging the synergy that occurs between training and education. Yet, knowing the "how" is only part of the problem; we also have to understand the "who."

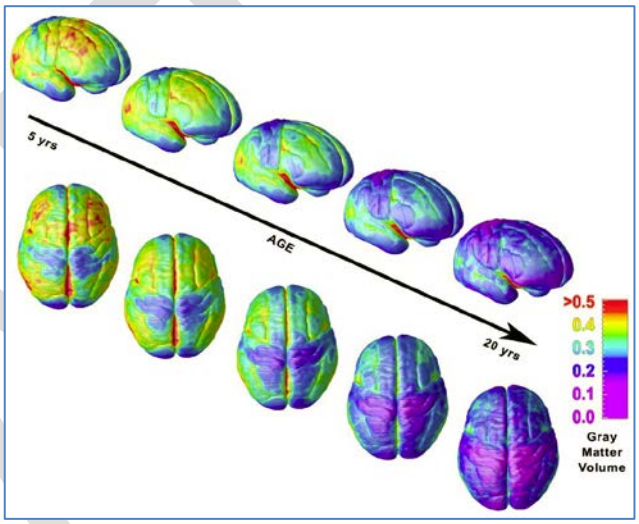
**The Operator**

The reason outdated training and educational traditions persist is because they work. They are very efficient and in the context of teaching children to resolve technical problem sets. With that said, as we develop a ProDev program for Special Operations we need to recognize that just as there is an important methodological difference between training and education there is also a fundamental difference between how adolescents learn and how adults learn.

***Pedagogy: "Leading of Children"***

The term pedagogy is used by teachers to talk about the "art" and "craft" of teaching; literally translated from Latin it means the "leading of children." This is why when we think of modern education, or pedagogy, we tend to visualize rows of students with a teacher in the front repeating memorization exercises. What most people don't realize is that we don't leave adolescence until we are about 25 years old. This is because it takes that long for the human brain, specifically the prefrontal cortex, to stop developing (Figure 1). The prefrontal cortex is the part of the brain responsible for things such as problem solving, making predictions, forming strategies and assessing risk (Casey, Jones, & Hare, 2008; Services, 2013). These are actually great characteristics for front line soldiers who need to charge a hill, but terrible characteristics for negotiating with local authorities. When you consider the average age of a U.S. Army Soldier is 22 (U. S. Army, 2013b) it stands to reason that much of military education was built using traditional training pedagogy. The problem is that the average age of a Special Forces A-team is 32 (Couch, 2005), which means that those two cohorts are not only different in terms of accumulated experience, but that they are neurologically different. This means is that USASOC will have to go beyond just relying on traditional pedagogy and begin to develop an innovative andragogy that enables operators to navigate both linear and nonlinear problem sets.

Figure 1




The side bar shows a color representation in units of Grey Matter volume by age. (Lenroot & Giedd, 2006)

***Andragogy: "Leading of Men"***

Imagine for a moment that you are learning to reassemble a sophisticated car engine. At first, the sheer number of parts and the precise movements required to reassemble them will feel overwhelming. As you go through the slow and deliberate process of taking it apart and putting it back together (Kahneman, 2011) you will start to build mental models around how the engine "should" look when things are going right and heuristics that allow you to automate certain of your own assembly behaviors. Then, as you gradually become an expert, you will begin to rely on your heuristics and switch to a far more efficient process that seeks out what is not right or "dissonant" either on the engine or in your movements (G. A. Klein, 1998). Over time you become increasingly less aware of these automated processes and risk complacency, which is why many Mission Critical Teams rely on checklists (Gawande, 2010; Useem, 2011). In order to remain focused on maximizing their situational awareness, experts rely heavily on looking for breaks in established patterns (mental models and heuristics) to determine what "feels right"

or “feels wrong.” So much so, that it is common to hear a special operations instructor use the expression “that is what right should feel like,” when training new candidates. As you gain competence in the engine building process, you also begin to grow confidence in both yourself and the system of construction.

Now imagine that someone shows up with a redesigned engine. It is similar to the old engine, but has a certain amount of new and additional parts that require a different method of assembly. According to Generative Learning Theory (Wittrock, 1992) this new information now has to be integrated into your existing neural network. Each time you learn something new, your neural network strengthens some connections (myelination) and also creates some new connections. These changes in turn change the overall character of the network (referred to as schema) itself. Younger brains have less sophisticated networks, so the process of integrating new knowledge can appear easier. More mature learners have denser, more sophisticated networks, and as a result need to exert more energy on integrating new information into their existing neural network. As a result, when instructors experience resistance from students trying to take on new information, that resistance is not just emotional, it is also structural. The student’s strategy of targeting dissonance, is now working against them, because as they are asked to learn new things it often “feels” wrong because it is in conflict with an existing patterns. It is this reason that older learners will often retreat to competence and justify their entrenchment as it is “good enough” and “worked so far” even if they know that competence is flawed because the new information is threatening to both their competence and their confidence. While this may present like stubbornness or apathy, keep in mind that for someone responsible for making rapid, high consequence decisions a loss of confidence in either themselves or the system can be catastrophic.

> “Habits, values, and attitudes, even dysfunctional ones are part of one’s identity. To change the way people see and do things is to challenge how they define themselves (p.27)” (R. A. Heifetz & Linsky, 2002)

In order to help an adult expert become a beginner again, to take on the “beginners mind,” we need to get them to “buy into” learning new information. The good news is that adults tend to be very practical and goal oriented so if you are able to see how new information is relevant to their lived experienced they can be far more internally motivated and self-directed than adolescent students (Knowles, 1978). What all this tells us is that as we start to design training and education programs for the more seasoned operators, it is going to be important to get them involved in the design process. Now that we understand that we are talking about specific kinds of adults who need to be both trained and educated it is important to understand that they are not being developed to work alone, but to work on a very specific kind of a team.

**The Team**

One of the challenges that all Mission Critical Teams face, due to the unique type of problem sets they encounter, is that they have a faster innovation loop than their parent organization, which influences both their practice and their culture. It is one of the reasons all MCT’s experience a certain amount of friction with the parent organization. In the case of USASOC, that friction is compounded by conflicting traditions. “As is the case with most of the rest of the Army, the strength of the SMU (Special Mission Unit) is in its NCOs (Non Commissioned Officer). However, NCOs play a much more significant role in the unit than anywhere else in the Army” (Jacobs & Sanders, 2004). The role of the NCO in the SMU’s continues to be significant, but those significant contributions are often accomplished in spite of the way that USASOC differentiates their ProDev opportunities. The current structure of ProDev within USASOC dictates that individual enlisted personal are sent to “training” schools (U. S. Army, 2008) while officers are sent to schools of “education” (U. S. Army, 2010). While in those programs, it is not uncommon to hear trainers and educators say “You will get that information/training back at the teams.” This differential creates a few different challenges in terms of content, expectations and how the

knowledge that is learned (differently and separately) is integrated back into the team. In order to maintain the agility of their Mission Critical Teams, USASOC needs to reconsider how it develops all of its personnel in way that improves team performance, and then how the team itself is developed. Given the history and tradition involved, it might be worthwhile to see how other organizations have adapted their team performance to an evolving problem set.

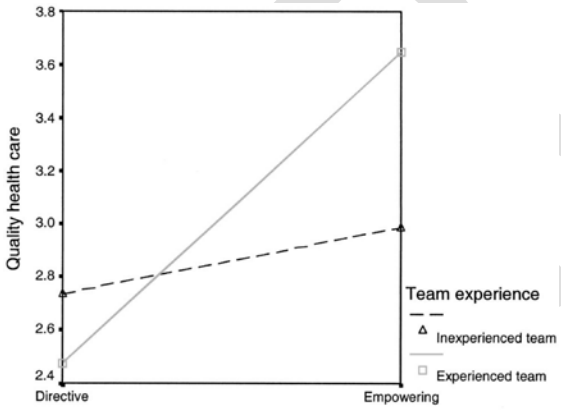
***Case Study: Trauma Surgical Teams***

In 1966 the National Academy of Sciences published a white paper called the "Accidental Death and Disability Report" (Trauma & Shock, 1971). In it they described the rise of traumatic injuries in the U.S. and the systemic lack of appropriate care including the startling statistic that one had a greater chance of surviving a gunshot wound in Vietnam than a serious highway accident in the United States. Out of that report emerged the modern EMS and trauma surgery systems that we see today. At the time, the Trauma Surgical Teams were organized the same way a traditional surgical team was organized, with a lead surgeon working directly on the patient with support from a medical team. It was military surgeons, during the Vietnam War, who found that if they moved the lead surgeon away from working directly on the patient and had them stand at the foot of the bed during the resuscitation and evaluation of critically wounded soldiers (C. W. Schwab, 2013), they could increase the number actions being done simultaneously (Figure 2). As those surgeon's returned they began to try and implement these practices, but by the onset of the crack cocaine epidemic of the late 1980s, one person (the surgeon) could not effectively maintain expertise in all of the rapidly evolving technology, pharmaceutics and techniques (Gawande, 2010; C. Schwab, 1993). The natural result was the movement toward defining trauma surgical teams as "cross-functional and multidisciplinary knowledge-based action team (Yun et al., 2005)," where leadership and authority was more distributed.

**Figure 2: UPENN Trauma Team**

Photo: Ryan Donnell for the New York Times
http://www.nytimes.com/2007/04/15/us/15philadelphia.html?_r=0

**Figure 3:**




Interaction effect of leadership and patient condition on quality health care (Yun, Faraj, & Sims Jr, 2005).

Like all Mission Critical Teams, trauma surgical teams need to have the situation under control within about 10 minutes or less of the patient arriving. The challenge was that even with the move to a more integrated cross functional team, researchers began to discover that if the lead surgeon could move from a directive leadership style to an empowering one, then the team became more successful (Figure 3). In other words, the trigger for starting operations was transferred from the leader to the moment of recognition (radio call, patient arriving, etc.). Once the patient arrived the team would then immediately begin doing what they were trained to do and the role of the lead trauma surgeon went from being the person who gave permission to act, to someone who held shared situational awareness, de-conflicted overlapping processes and stepped in if the situation escalated or to reverse errors by the team. What they found was that the "time taken to complete the resuscitation was reduced by over half from 122 to 56 min." (Driscoll &

Vincent, 1992) While this supported existing research that showed that teams who had more experience working together, or greater cohesion (MacCoun, 1993), performed better, the research also showed that inexperienced teams also increased their performance under an empowered leadership style (Yun et al., 2005).

***Integrating the agents into the team***

Most of the teams that comprise USASOC have already embraced an empowered team model. While on mission their actions are typically triggered by emergent events rather than a leadership directive. The challenge is that decisions around ProDev, both at the individual and team level, are often made based upon U.S. Army tradition rather than on emergent USASOC needs. As discussed above, one strategy for designing a ProDev model that is aimed at improving mission success is to reduce the potential for incidents by increasing the operators Situational Awareness (SA). One method for doing this is to develop training around "Mindfulness" (Weick & Sutcliffe, 2007):

> "Mindfulness training can develop the situational awareness of the individual actor beyond a mind focused on 'what' we want to achieve, into a mind constantly engaged in updating 'how' to achieve it, given the evolving operational situation" (Darwin & Melling, 2011).

The weakness in this solution is that it still assumes that we are talking about a single operator against a technical problem. To optimize an MCT's ability to resolve a complex adaptive problem set we need to go beyond improving individual SA and begin improving the entire team's shared situational awareness (SSA, aka: Shared Cognition). Shared Situational Awareness (SSA) is developed among an intact team "by a process of integrating the mission-essential overlapping portions of the situational awareness of individual team members—thus, developing a group dynamic mental model" (Nofi, 2000). While research has shown that increased SSA can improve team performance (Salas, Cooke, & Rosen, 2008), we also have to consider that teams are operating within a tactical environment saturated with data and communications. As a result, in addition to increased SA and SSA, they also need to be operating within an effective Joint Cognitive System (JCS) (Woods & Hollnagel, 2006). JCS is defined as the "…combination of human problem solver and automation/technologies which must act as co-agents to achieve goals and objectives in a complex work domain" (Potter, Woods, Roth, Fowlkes, & Hoffman, 2006). Therefore, we need a ProDev model that will increase the operators SA and team's SSA by improving the way that they are leveraging technology and communication (JCS) and to do this, we need enablers.

***The Role of Technology and Enablers***

While the first Special Operations (SOF) "truth" is that "humans are more important than hardware" (USSOCOM, 2012), the last SOF "truth" is that "most special operations require non-SOF assistance (USSOCOM, 2012)." As problem sets become more complex and chaotic, MCT's are going to become increasingly reliant on both technology and their enablers. The reality is that technology will continue to rapidly evolve and impact, both positively and negatively, the situational awareness of the operator. We have moved from the 70% solution, (where decision makers had to make decisions with only 70% of the required information) to the 700% problem where we have so much data and information we are drowning in it. This new flood of data is acting to overwhelm our natural ability to filter and prioritize critical information, which acts to decrease our individual and shared situational awareness and makes it harder to identify weak but important signals (Taylor, Brunyé, & Taylor, 2008). The increase in the speed of communication, for example, has acted to decrease the amount of time we have to analyze the communication; "The workload prevents much time for such reflection" (Bolger, 1990). Given that the cause of the problem is technology, it would be easy to assume that the solution is more technology, but a purely technical solution to adaptive problems will not work.

***Case Study: The Ault Report: Technological vs. Human Factor Solutions***

During the Korean War the kill-to-loss ratio (how many Korean planes were shot down for every American plane) was roughly 10:1. Part of the explanation our air superiority was that most pilots (Air Force and the Navy) were experienced veterans of WWII. By 1967, the height of the Vietnam War, most of the veteran pilots had retired and the kill to loss ratio had dropped 3.7:1 (1965-1967). To better understand this phenomenon the U.S. Navy directed Captain Frank Ault to engage in an "Air-to-Air Missile System Capability Review." The intent of the review was to study air-to-air missile performance during the period of 1965 to 1968 (Clancy, 2004). In 1968, Captain Ault released his report with the recommendation that the Navy should employ realistic training that "can only be gained through the study of and actual engagements with, possessed enemy aircraft or realistic substitutes." Specifically, the need for an "Advanced Fighter Weapons School"(Ault, 1968)

In response to his findings, the U.S. Navy immediately created United States Navy Fighter Weapons School, otherwise known as "TopGUN." The goal of the school was to provide pilots with iterative opportunities to experience aerial combat. Conversely, when the leadership of the U.S. Air Force read the Ault report they came to a very different conclusion. For a variety of reasons they determined that pilots simply needed better equipment, and as a result made no changes to their training program. By 1972, the pilots who had participated in TopGUN had now returned to Vietnam and all of the Air Forces new technology had come online. The results:

- **Navy** kill to loss Ratio jumped to 31:1 before settling down to **13:1**
- **Air Force** kill to loss ratio dropped to **.89:1** (they were effectively losing)

Three years later, in 1975, the U.S. Air Force created Operation Red Flag (their version of TopGUN) that is still in operation today. To be clear, the above example is not indictment of technological innovation, in fact, "well designed technology can improve team performance" (Salas et al., 2008). With that said, any attempts at resolving complex adaptive problems have to start with the human factor and build out. In part, this is why the first SOF truth privileges humans over technology. To this end, we need to design a ProDev system that is running in parallel with technological development. Just as another SOF truth states that "competent SOF cannot be created after emergencies occur" (USSOCOM, 2012), neither can effective enablers or well-designed technology.

**The Parent Organization**

As stated in the beginning of this paper, Mission Critical Teams exist because their parent organizations encountered an emergent problem set they weren't designed to resolve. With that said it is important to remember that Mission Critical Teams exist within nested human based systems that continue to include, and are beholden to, the parent organization. One of their responsibilities is to make sure that the MCT continues to innovate, and continues to "shed" (Simons, 2012) those tasks that have been "normalized" into a technical process and no longer require adaptive or generative thinking. Since 1950, we have seen some of the "permanent" Mission Critical Teams unable to adapt to newer problem sets and get replaced by newer teams. While there are merits to this Darwinian approach to evolution there are also a lot of costs associated with lost investments in time, money, experience and lessons learned. The goal of this paper is to articulate an alternative approach to the Darwinian model, the generative model, where high reliability organizations like USASOC take up their role as learning organizations. This will require a new focus on developing leaders who are committed to lifelong learning but who also understand that a core part of their job as a future leader will be the ability to be a great instructor. (R. A. Heifetz & Laurie, 1997; Peter M Senge, 1990). To do this, the parent organization will need to entirely rethink how it organizes and develops its indigenous instructor cadres. In order for a high reliability organization to remain reliable, and sustainable, these organizations must maintain internal mechanisms to

simultaneously support the ongoing learning of their personnel, the development of their technology, and the continuous transformation of the organization itself (Pedler, Burgoyne, & Boydell, 1991).

**The Current Mission Critical Team Instructor Cadre**

One of the shared foundational traits of all MCT's is that their selection, training and education programs are indigenous. In other words, you do not go to college to learn to become a Special Forces Operator, or a Firefighter, or an Astronaut, you go through their culturally and technically specific training and education pipeline. This pipeline is also the primary way in which the older generation of operators transfer the teams culture from one generation to the next (Dewey, 1916). This transmission takes many forms, but in the context of mission critical teams all of those forms rest upon the ancient foundation of the oral tradition. These oral traditions manifest in those "scraps of time"(Draude, 2011) where a senior member of team is telling some (usually funny) story to a group of "new guys." Typically, these senior members are not random, but are those who have been "down range" or "smelled the smoke" and have stepped back to reflect upon their lived experience and then relate it to the next generation. Over time, these "gray beards" become vested by the community with the gravitas necessary to protect and pass on the shared mythology of the group (Campbell & Moyers, 2011). The challenge is while these "grey beards" are vested by the community, they are not developed by the community to take up the role.

As stated earlier, ProDev in its most basic form is a framework for understanding the lifecycle of a learner. As an agent progresses through the cycle on their way toward becoming an operator the goal is for them to move from ignorance to expertise. Then, just when the agent feels as though they have achieved some sense of competence, they will be asked to walk back from the tip of the spear, to the schoolhouse and commit themselves to developing the next generation of agents. Except that, when it comes to joining the instructor cadre to train and educate the next generation, the expertise that they currently possess may not be the one that they need to be an instructor. The reality is that just because you are an expert in *doing* a thing, does not make you an expert in *teaching* a thing. The understanding of how hard it is to convey complex material to a group of your peers does not become obvious until you are put in front of a class without any instructional training. It is there where your lack of competence becomes crystal clear and with that clarity comes numerous threats to your confidence. It is not uncommon for someone who is an extremely competent operator, someone who not only executes well but also integrates well with the team, to lose their sense of purpose and to begin to feel incompetent when they become an instructor. In order for us to build the next generation Mission Critical Teams, we will have to first start by building the instructor cadre that will create those teams.

**The Next Generation Instructor Cadre**

The paradigm shift that the British Military was experiencing in 1950 was caused by the recognition that they were moving from technical problem sets to adaptive problem sets. To do this, they needed to create a small team of adaptive thinkers, the SAS. In the last 10 years we have been undergoing another paradigm shift (Kilcullen, 2009), where just reacting to emergent problem sets are no longer enough. The question then becomes what happens to experts when the rate of change exceeds the rate of learning? "They cease being experts" (Kahneman, 2013). The challenge we now face is taking our adaptive thinkers and helping them to become generative. While this paper has been focused on pointing out some weaknesses in the current USASOC ProDev model, Army Special Forces remains the benchmark by which most other teams measure their success. This paper is aimed at helping the best in the world to remain the best in the world. To that end, it is no longer enough to rely on old training and education solutions to resolve emerging complex adaptive problems. To move forward USASOC is going to have to rethink how it conceptualizes the way in which the operators and the teams learn and adapt throughout their lifecycle. It will require the organization, at every level, to rethink how it constructs culture,

leadership structures, promotion and incentives for Special Operations. Most all, it will require the acceptance that while the problem is clear there is no current solution and any future solution will require the collaboration of outside experts.

**A Framework for Innovation**

In 2013, a group of researchers and practitioners based at the University of Pennsylvania published a paper aimed at showing how a University could be effectively leveraged to transform a community of learning (Harkavy, Hartley, Axelroth Hodges, & Weeks, 2013). Based on two decades of proven practice, they have updated John Dewey's argument that:

> "working to solve complex, real world problems is the best way to advance knowledge and learning, as well as the capacity of individuals and institutions to do that work" (Benson, Harkavy, & Puckett, 2007; Harkavy et al., 2013).

This framework has enabled universities around the country to develop interdisciplinary partnerships with local schools and educational organizations to better support educational communities of practice (Wenger, 2000). By adapting this same framework, and their lessons learned, we will be able to create a ***University Assisted, Mission Critical Team Instructor Cadre Development Program.***

***Operational Elements***

1. **Integrated Logistical Support by the University**
   A central office within the University that coordinates University resources. For this work to sustain, it must become integrated into the mission of the higher educational institution, and not remain the effort of a few faculty members.

2. **Interdisciplinary engagement by University Faculty**
   Engagement across the University that involves multiple schools and departments.

3. **Committed engagement by the Mission Critical Team Instructor Cadre**
   The leader of the instructor cadre who welcomes and encourages the partnership, and conveys this philosophy to the instructor cadre.

4. **Integrated Logistical Support by the Mission Critical Team Instructor Cadre**
   A coordinator at Training Center who is the link between the Cadre, the Parent Organization, and the University.

5. **Integration of Mission Critical Team Staff and Enablers**
   Staff and enablers are integrated into the Training Cadres operation, so that planning for and provision of supports for students, instructors, leadership and other stakeholders are as seamless as possible.

6. **Long Term commitment by Mission Critical Team Leadership**
   An ongoing commitment by the Mission Critical Team leadership to have a permanent representative on an advisory board to exchange ideas and advise on emergent needs of their specific instructor cadre.

***Programmatic Elements***

1. **Selection: University Supported Cadre Selection**

Teaching is a different kind of hard. If being a great instructor was just about improving your methods or your public speaking, it would be easy, but being a great instructor is about more than just tactical expertise or being a subject matter expert. The University can partner with Mission Critical Teams to evaluate instructor candidates along criteria that is both co-created and scientifically validated so they can better support their selection, training and education efforts.

2. **Practice: Access to Collection of Professional Educators**

Even if we are able to get the "gray beards" to walk back from the tip of the spear to work in the school house (knowing that some in the community will accuse them of taking a holiday from the real work), they still need to have the skills of a motivating instructor (Wlodkowski, 2011):

- Expertise: The power and knowledge of instructional preparation
- Empathy: The power of understanding and consideration (respect)
- Enthusiasm: The power of commitment and animation
- Clarity: The power of language and organization

Working with professional university educators, the instructor cadres can identify specific effective practices and then collaboratively create ways to develop those capabilities within the selected instructors.

3. **Research: Access to Emerging Research on Training and Education**

Research on training and education continues to evolve. With that said, Mission Critical Teams need to stay focused on the mission upon which they were built. By partnering with a tier one University, Mission Critical Teams will have access to the knowledge creation pipeline and those that can synthesize and interpret emergent theories. At the same time, the instructor cadres can inform the Academy about emerging best practices for screening, training and educating Mission Critical Teams.

4. **Crosstalk: A Forum for Mission Critical Team Instructor Cadres**

USASOC was an original U.S. adopter of the permanent Mission Critical Team and over the years have become their own communities of practice (Wenger, 2000). With that said, other teams have taken the original concept and have "reinvented" the idea in service to their own complex adaptive problem sets. In the process they have created their own cadres of theorists, operators and instructors. It is time to bring them all together to start comparing effective practices.

5. **Design: Collaborative curriculum design that balances theory and pragmatism**

By creating a curricular design forum that includes scholars and instructors we will provide access to a diversity of conceptualization that will allow us to balance innovating exploration with pragmatic exploitation in creating learning curriculum.

When we talk about current ProDev within the U.S. army (U. Army, 2008, 2010), it is generally defined as how an individual can get better at the job to which they are assigned, primarily though the established military training and education schools and for the larger army, this may well be appropriate. In the context of Special Operations, however, ProDev is not a separate category from your initial training; it is the most effective tool you possess to counteract a rapidly evolving problem set.
Unless USASOC is able to create a ProDev model that enables operators, teams and the organization to get in front of the emergent problem sets, they will risk becoming obsolete.

**Lexicon**

**Agents:** In this context it refers to any member of a Mission Critical Team. Agency is a term used to define the capacity for human beings to make choices and to impose those choices on the world.

**Andragogy:** Latin for "Leading of Men" It is used to represent the art and science involved in educating adults.

**Complex Adaptive Problems:** Comes from Complexity Science (or Complexity Theory): These are problems that exhibit non-linear dynamics and unpredictable behaviors. These behaviors emerge as a result of interactions between multiple dynamic variables, the system and its environment.

**Diversity:** In this context it refers to cognitive or conceptual difference. Literally, will your team mates approach a problem set from a different perspective.

**Education:** In this context, it is the way in which we develop learner's ability to resolve adaptive, non-linear or uncertain problem sets.

**Generative Learning:** Is the active integration of new ideas and behaviors within the learner's existing mental models.

**Heuristic:** Are open ended prompts, or rules of thumb, to think or act in a particular way. "Look in the rearview mirror before passing" It does not guarantee an outcome, only opens up possibilities.

**Invisible College:** The informal network of researchers, educators and practitioners who form around an intellectual paradigm to study a common subject.

**Joint Cognitive Systems (Joint Cognition):** The combination of human problem solver and automation/technologies which must act as co-agents to achieve goals and objectives in a complex work domain. (i.e., you, your team, your computer, your enablers all looking at the same problem).

**Mental Models:** Psychological representations of real, hypothetical, or imaginary situations. It is how you know where your ignition on your car is without looking.

**Mindfulness:** Is a state where the operators mind is constantly engaged in updating 'how' to achieve the mission, given the evolving operational situation.

**Mission Critical Team:** Defined as a small (4-12 agents) integrated group of indigenously trained and educated experts that leverage tools and technology to resolve complex adaptive problems in an immersive temporal environment of ten minutes or less.

**Moment of Recognition:** The moment that an operator discovers the emergence of new problem set.

**Operator:** A term to describe an ideal agent. It is not an official term, but one given by the community.

**Pedagogy:** Latin for the "leading of children" it has come to mean the art and science of teaching, but in this context is specific to the art and science of teaching children.

**Problem Sets:** Refers to a taxonomy of problems based on complexity and urgency. There are many problem sets; this paper specifically refers to Snowden and Heifetz models.

**Professional Development (ProDev):** In this context it refers to the formal and informal learning that occurs throughout the lifecycle of a Mission Critical Team Agent.

**Punctuated Equilibrium:** A theory that describes how history is characterized by having extended periods of normalcy (stasis) occasionally punctuated by the emergence of a radical change event that acts to introduce a new type of problem set(s).

**Reinvention:** The degree to which an innovation is changed or modified by a user in the process of its adoption and implementation.

**Schema: A** specific pattern or structure of thought or behavior which acts to categorize bits of information and the relationships between bits of information (i.e. white + stitching + round = baseball).

**Shared Situational Awareness:** The process of integrating the mission-essential overlapping portions of the situational awareness of individual team members—thus, developing a group dynamic mental model.

**Situational Awareness:** The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.

**Special Operation Forces (SOF) Truths:**

1. Humans are more important than Hardware.
2. Quality is better than Quantity.
3. Special Operations Forces cannot be mass produced.
4. Competent Special Operations Forces cannot be created after emergencies occur.
5. Most Special Operations require non-SOF assistance

**Training:** In this context, it is the way in which we develop learner's ability to resolve technical, linear or certain problem sets.

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