

Organizing Amid the Fog of War: Data-Driven Decision Making in High-Reliable Operations

Andrea Salvi
Luiss University

Paolo Spagnoletti
Luiss University

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Introduction and Case

Uncertainty is a constant and systematic element on the battlefield and profoundly influence military operations. As Clausewitz (1982) argued, war is intrinsically bound to chance and a thick fog embraces decision-making in that context. This element dictates the need for frontline military functions to craft and implement processes to confront contingencies while minimizing the chances of errors and maximizing reliability. Mission-oriented organizing is an organizational doctrine (often called “Mission Command”) created to address these systemic characteristics through diffused leadership and collective mindfulness. In other words, members of the organization should have situational awareness towards the missions’ ends and be able to contribute to the decision-making process if the contingencies dictate so. Accordingly, digital systems and awareness-enhancing tools may be powerful mediums for mission-oriented organizing and may prove instrumental to the flourishing of beneficial practices in frontline contexts. Yet, data on which these systems rely may be inaccurate, discontinued or simply not available due to technical malfunctioning or human errors. Those pitfalls, given the peculiarities of the settings whereby frontline military organizations, can be extremely costly in terms of resources and human lives. Over-reliance on these systems may hamper the organizational nature of frontline functions and hinder their resilience and focus on reliability. This teaching case brings the users amid the fog of war (Willink & Babin, 2017): it takes place in the Ma’Laab district in Iraq during the “Second Battle of Ramadi” (2006). U.S. Forces and Iraqi Soldiers are conducting a series of operations to retake the district from the clutch of insurgents. They sweep through several areas of the city checking each building and each compound to detect hostile forces and to dismantle stashes of explosive materials and weapons. While on a mission, troops are monitored through a GPS tracking system called “Blue Force Tracker” (BFT). The system sends the position of allied troops (“blue”) to the Tactical Operations Centre (TOC) and each user can input enemy positions, obstacles, and other tactically relevant elements. During one particular “*sortie*”, the TOC receives a fierce firefight report from a U.S. Marine Corps Air Naval Gunfire Liaison Company (ANGLICO) platoon - accompanied by an Iraqi platoon - with an unknown enemy unit hiding in building *H204*. Accordingly, the threat is inputted and mapped on the system. The marines report heavy fire from a compound, that resulted one casualty and several wounded operators. The TOC sends in a Quick Reaction Force (QRF) of armored infantry consisting of four Humvees to relieve the units that are still under the fire of an unseen enemy hiding behind concrete walls. Contemporaneously, the TOC gets another request for a QRF: a SEAL¹ sniper squad in the same area - with declared position in a building (*H142*) - asks for immediate armored support calling in two Abrams Tanks. They are pinned due to heavy enemy fire: the squad is surrounded, outnumbered, and requires support for immediate extraction. The ANGLICO team – still engaged in the firefight - asks for clearance for an airstrike on the building in order the neutralize the threat. TOC immedi-

1. US Navy Sea, Air, and Land.

ately realizes what is happening. The SEAL sniper squad originally appeared to be in H204 on the BFT, they then declared by radio that they were abandoning the location to relocate in another building, then their trace disappeared from the system. The teaching case focuses on data-driven decision making in high-reliable operations and shows the advantages and pitfalls of live tracking systems in emergency frontline situations. Moreover, it highlights the interplay between technologies and coordination practices under extreme conditions.

The Battle of Ramadi, Urban Warfare and frontline organizing: setting and aims

The case illustrates an incident in a front-line scenario drawn and adapted for teaching purposes from a real event that took place in Ramadi during the war in Iraq (Willink & Babin, 2017). In our narration, it describes a case of Blue-on-Blue² between a squad of 8 SEALs and a platoon of ANGLICO marines accompanied by a platoon of Iraqi soldiers. More units sneak into the pictures since reinforcements are called both by the marines and the SEALs, further exacerbating the delicate *impasse*.

A “*lost unit*” is not an uncommon issue in warfare throughout history. We have accounts from World War One of nine companies of the 77th Division of the United States Army launching an attack into the Argonne and maneuvering well past their allies into the enemy lines. They remained isolated for six days with no means of communications aside from carrier pigeons. Similar risks are still present in modern warfare and become particularly salient in urban counterinsurgency (Army, US and Corps, US Marine, 2010). The urban battlefield is in fact a particularly difficult context for military operations, even more so in asymmetric warfare (Kilcullen, 2010). Frontline military organizations are faced with more complex challenges linked to the environment, the problematic identifications of enemy forces, tech savvy insurgents and guerrilla strategies such as IEDs and ambushes (Kilcullen, 2015).

The case of Ramadi between 2005 and 2006 well describes this dynamically uncertain environment. The city had become the neuralgic center of the Iraqi insurgency after the fall of Fallujah in 2004. From March to November 2006, the US deployed over 5000 soldiers, marines, and Special Operations operators to retake the city from the clutch of the insurgents in what is called the “Second Battle of Ramadi”. The insurgents had been able to launch a series of coordinated offensives taking advantage of the environment of the war-torn city.

As mentioned in the narration, the scene sees the interplay of several forces: “brothers in arms” parts of different functions of an organization or even to entirely different ones (e.g. Marine Corps, Army, Navy). This multiagency nature of the operations adds a further layer of complexity to the scenario as different “teams” need to operate in the same hostile environment coordinating in fragmentation (Chen, Sharman, Rao, & Upadhyaya, 2008; Wolbers, Boersma, & Groenewegen, 2018) and attaining to common operational picture (COP) (Steen-Tveit, 2020) but being resilient enough to be comfortable with uncertainty and chaos as scenarios unfold (Fraher et al., 2017). Reliability is thus a key element as errors are extremely costly.

For those reasons, in this piece, we frame frontline functions of military organizations as High Reliability Organizations (HROs). They are peculiar in their relying on organizational and structural hallmarks that lead to “*mindfulness in action*”, which in turn generates reliability. For operating in such harsh conditions, minimizing the chances of errors, they require several characteristics which are often achieved through an adamant training pipeline. We will illustrate this focusing on the case of US Navy Seals. *Section 3* will serve as spotlight onto this organization.

2. Friendly fire event.

Section 4 will briefly analyze the functioning of HROs illustrating the hallmarks of mindfulness with particular attention to military organizations. These two sections aim to invite the readers to discuss how organizations resist adversity or proactively deal with uncertainty and change (Bundy, Pfarrer, Short, & Coombs, 2017; Ishak & Williams, 2018; Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017). Furthermore, they aim to sketch the properties of extreme contexts (Hannah, Uhl-Bien, Avolio, & Cavarretta, 2009). Finally, we discuss the role of digital systems in HRO showcasing their role in frontline settings.

Exhibits: Support material for the scenario

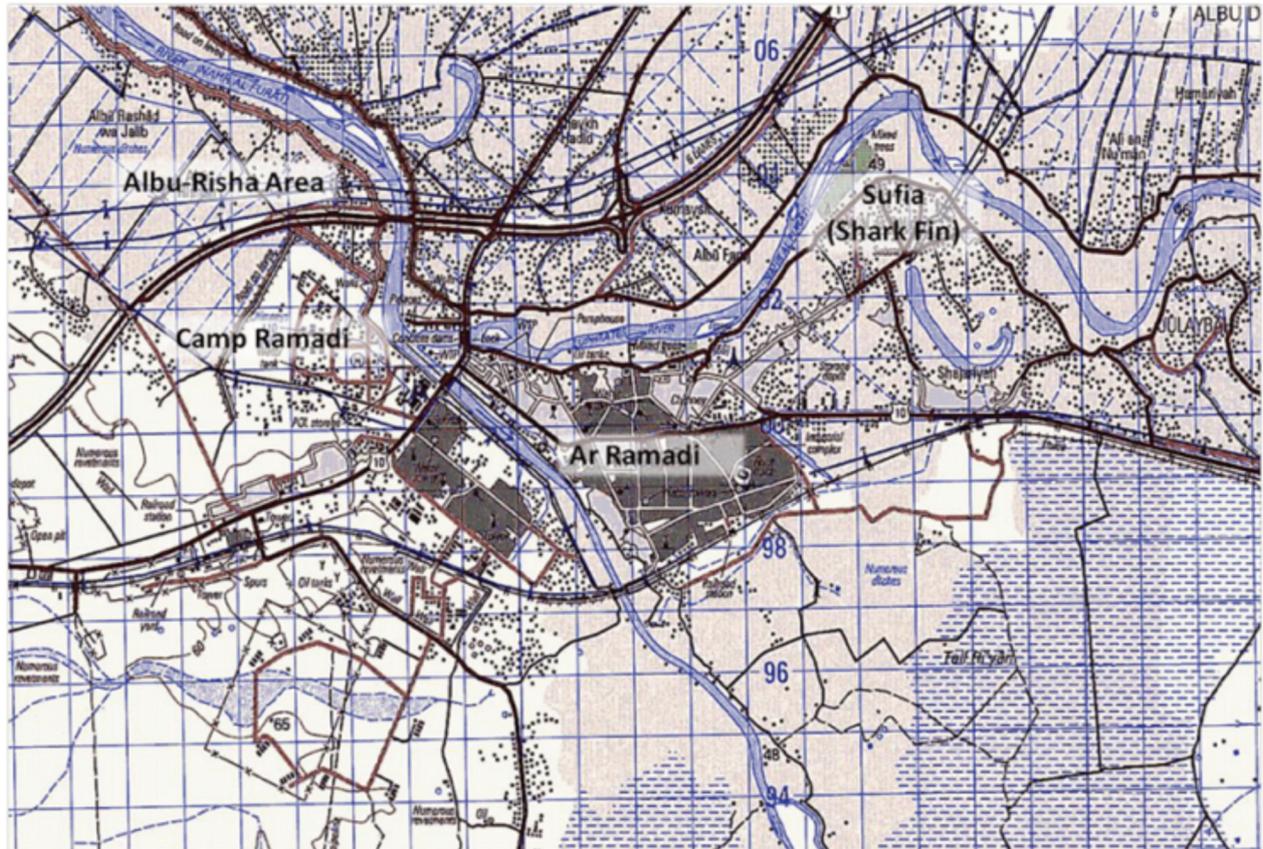


Figure 1 - Map of Ramadi - (Knarr et al., 2016, p. 134)

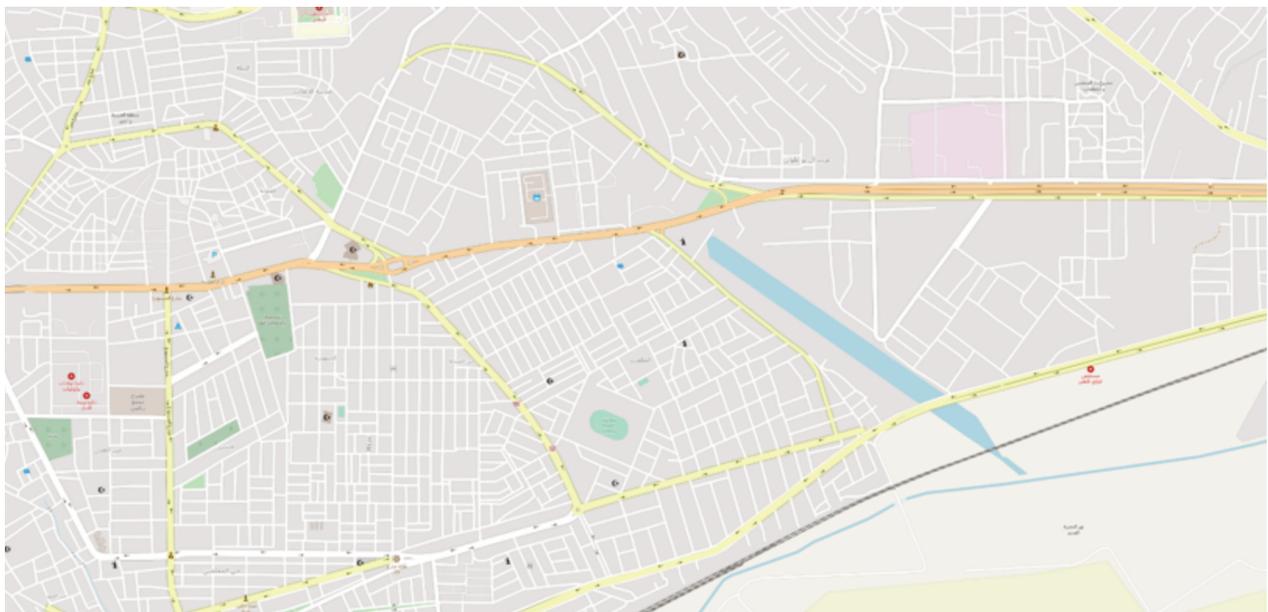


Figure 2- Ma'Laab District of Ramadi: setting of the scenario (Map View).

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Figure 3 - Ma'Laab District of Ramadi: setting of the scenario (Satellite View)

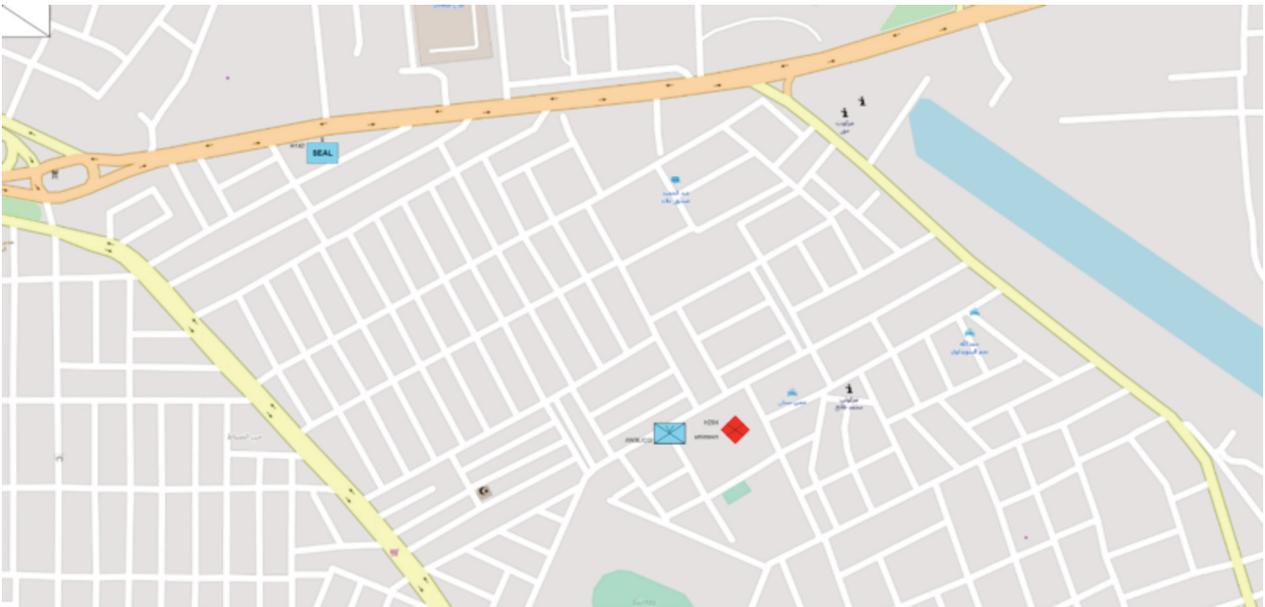


Figure 4 - Ma'Laab District of Ramadi: tactical view of the scenario. Incident between the SEALs and the Marines at.

US Navy SEALs and training pipeline: “the only easy day was yesterday”

The United States Navy Sea, Air, and Land (SEALs) Teams, who appear in our story, are an elite force part of the Naval Special Warfare Command. They are specialized in small-units’ operations with extremely high stakes and equally high risks. They are offspring of the first “frogmen” from World War II and were officially established in 1962. They soon earned the fame of being a prime example of Special Operation Forces (Dockery, 2004) and hit the spotlight of the international press with Operation Neptune Spear in May 2011.

There are eight SEAL teams overall: each of them is composed by six platoons. Platoons in turn are composed by 16 SEALs. While a platoon may be an operational unit, normally SEALs operate in smaller groups (“squads” or “elements”) due to the surgical nature of their operations.

A key element to the SEAL teams is their training pipeline which is known as one of the most selective – and tough – program in the domain of special operations. As recounted by Fraher (2017), Basic Underwater Demolition/SEAL training (BUD/S), is the first gatekeeper for those who aspire to be SEALs and contemporaneously a neuralgic organizational “ritual”. It consists in 30 weeks of strenuous training within which falls the infamous “Hell Week”: five days of evolutions with virtually no sleep, defying the waves of Coronado (CA). The main aim of this phase of the program is to filter out “those who quit”. Normally 75% of each BUD/S class drops out before the end of Hell Week (Fraher et al., 2017). BUD/S de facto constitutes a first rite of passage for the recruits and seeks to select for traits of individual mindfulness.

The subsequent training is far from being an easy path as it encompasses advanced tactical training and first-class specialization schools. The learning and rehearsing process never really ends as it serves a twofold purpose. In first place it technically and physically prepares the operators to face the perils of the battlefield. Secondly, it creates a mindset for heedful performance, heedful interrelating, familiarization with failure through trial and error towards a macro-level mindfulness (Fraher et al., 2017). These elements are confirmed and reiterated in a large body of anecdotal and empirical evidence that show how SEALs thrives in uncertainty and chaos. These elements coalesce in a profoundly marked organizational culture made of deep-rooted artifacts and shared values.

All in all, they came to be one of the most famous, and most reliable Special Operations Forces in the world due to a combination of selection, prime and continuous training, organizational culture, and first-class equipment.



*Figure 2 - SEALs Insignia: the trident.
Earned by recruits upon successful completion of BUD/S.*

High Reliability Organizations: an overview

High-Reliability Organizations (HRO) need to operate in a nearly error-free manner. The environment and the circumstances in which they operate is intrinsically uncertain and confronts them with high – and costly – risks (Weick & Roberts, 1993). Errors often results in large losses in terms of resources or even human lives.

Due to the systematic and contingent risks they face, HROs cannot operate in a purely routine-based manner. That applies particularly to their operative functions, or as in our case, frontlines. This reliability-oriented organizing is originated from the capacity of coping and correcting errors stemming from uncertainty (Weick & Roberts, 1993) through “organizational mindfulness processes” (Mohun & Sagan, 1995; Salovaara, Lyytinen, & Penttinen, 2019). The literature has successfully identified some key differences between traditional organizations and HROs focusing on their organizing in emergency situations and extreme contexts. A notable example is provided by Bigley and Robert (2001): they looked at the work of first responders through incident commands systems suggesting avenues to maximize reliability in complex and volatile task environments. HROs, in general present a market inclination towards reliability and safety even at the expenses of efficiency if necessary (Sutcliffe & Vogus, 2003; Vogus & Sutcliffe, 2012). The theory suggests that this cognitive mindset is originated by five hallmarks: chronic preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience and deference to expertise (Weick & Sutcliffe, 2006). These hallmarks are briefly illustrated in **Table 1**. Further studies have analyzed hallmarks for individual mindfulness that are illustrated in **Figure 3** in the HROs context.

Table 1 - Hallmarks of Mindfulness in HRO. Based on the descriptions of Weick (2015)	
Principle	Description
Preoccupation with failure	Need for continuous attention to anomalies that could be symptoms of larger problems in a system.
Reluctance to Simplify	Simplification obscures unwanted, unanticipated, unexplainable details and in doing so, increases the likelihood of unreliable performance.
Sensitivity to operations	Sensitivity to operations is associated with close attention to the present.
Commitment to Resilience	Commitment to resilience intended as a combination of keeping errors small, of improvising workarounds that keep the system functioning, and of absorbing change while persisting.
Deference to Expertise	Deference to expertise includes a pattern of respectful yielding, domain-specific knowledge, compressed and generalizable experience, and relative expertise.

Furthermore, frontline functions – and particularly military organizations - exhibit a sixth trait labeled as “comfort with uncertainty and chaos” by Fraher (2017). The combination of these hallmarks creates the state of collective mindfulness that enable high reliability organizing in the form of rich awareness of discriminatory detail, heedful interrelations and capacity for action (Fraher et al., 2017; Weick & Sutcliffe, 2006). As Weick and Roberts (1993, p. 357) argue a collective mind is made by “a pattern of heedful interrelations of actions in a social system”. Consequently, an increase “in heedful interrelating and mindful comprehension of unfolding events decrease the potential for organizational errors. HROs enact aggregate mental processes that are more fully developed than those in organizations that are primarily concerned with efficiency” (Linnenluecke, 2017, p. 10). Accordingly, this creates a process of “sensemaking” (Weick & Roberts, 1993) that enable actions in a dynamically uncertain environments (Christianson & Barton, 2020).

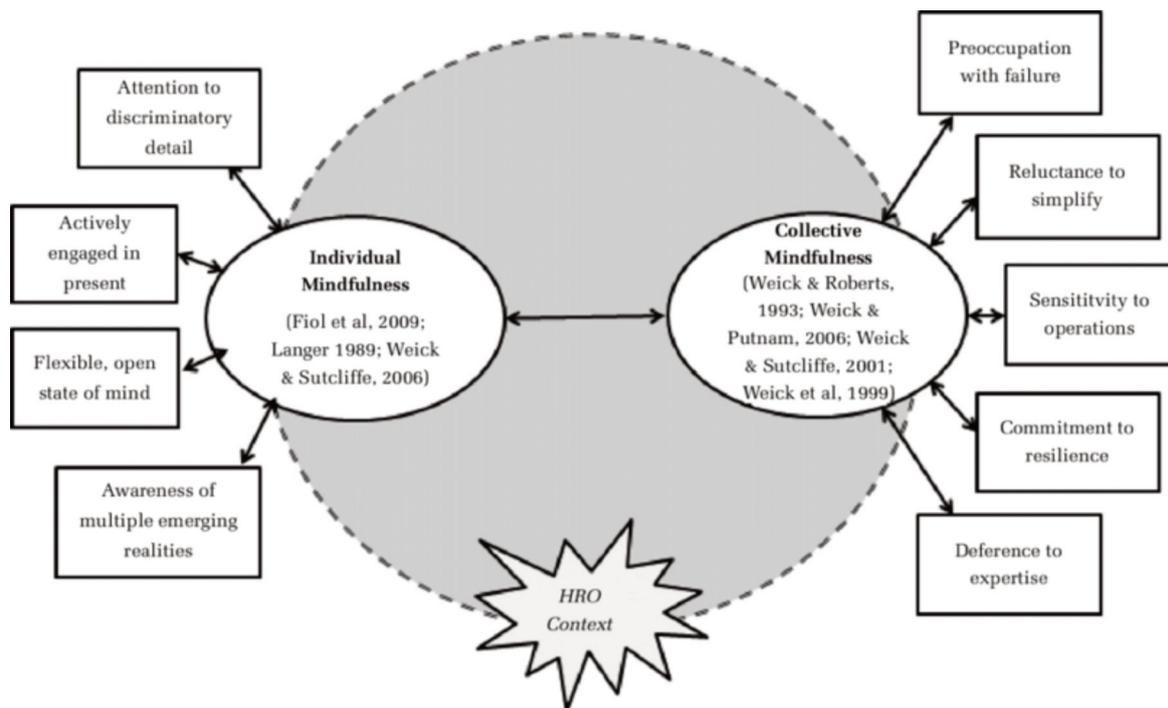


Figure 3 – “Unpacking HRO Mindfulness at Individual and Collective Levels” (Fraher et al., 2017, p.256).

Data-driven decision making in extreme contexts

There is a vast amount of scholarly work on the role of digital tools in extreme-contexts operations and emergencies (Aedo, Diaz, Carroll, Convertino, & Rosson, 2010; Turoff, Chumer, Van de Walle, & Yao, 2012; Van De Walle, Turoff, & Hiltz, 2014). We invite the reader to appreciate the role of the BFT – a digital tracking system – in the scenario we presented. A malfunctioning of the system or a human error – of not updating the declared position – has created a dangerous impasse resulting in a casualty and in wounded operators. This episode offers an occasion to reflect upon the role of digital systems as enabler of reliable and mission-oriented organizing. It is undeniable that digital systems may foster beneficial practices, when augmenting the sensitivity and the awareness of extreme-contexts operators towards the present (Opach et al., 2020). This applies to awareness-enhancing systems, tracking systems and intelligence systems. Yet, they may be a double-edged sword due to their reliance on data or specific infrastructures. As shown in the case, data may be inaccurate, incomplete, or unavailable for a plethora of reasons. Such conditionality may bring gargantuan costs to the organization if the malfunctioning, or the human error, occur in a situation such as the one described in our case. Therefore, we invite the readers to reflect upon the association between digital features and the nature of operations, structures and cognition to improve tactical awareness and operational effectiveness in high-reliable organizations. In other words, how much should organizations rely on these systems in emergencies and extreme contexts? What is the point of equilibrium between increased efficiency and reliability? And even if digital systems are designed to maximize the latter, how do organizations should prepare for the chance of technical failure?

To facilitate the discussion of these questions we present a brief showcase of the main affordances of digital systems widely implemented and used in extreme contexts and emergency response. The Blue Force Tracker (BFT) described in the case can be placed in-between these three categories depending on its implementation. It allows the Tactical Operation Centre with GPS coordinate of the units facilitating the tracking of dispersed units (Chevli et al., 2006). In principle and in its basic form, it presents features of SA systems, COP systems and C2 systems. The picture is clearer in terms of capabilities as it is commonly classified as a “combat identification” instrument (CID)(Bryant & Smith, 2013).

In practice, the systems has been proved well suited for urban scenarios of asymmetric warfare and in Iraq it has produced substantial results in reducing Blue on Blue events as confirmed by empirical evidence (Augier, Knudsen, & McNab, 2014). Yet, in this scenario, we aimed to portray a case of failure whereby the system alone could not be used as the sole criterion for decision-making. Accordingly, a thought-provoking simulation study have tested how most of the substantive benefits brought by the BFT correlate with the quality of the data and the quality of their transmission (Bryant & Smith, 2013), an element that may be highly volatile in extreme contexts. Nonetheless, another simulation study tested the effect of a malfunctioning BFT against that of a perfectly reliable device finding no significant differences in soldiers performances between the two (Ho, Hollands, Tombu, Ueno, & Lamb, 2013). In this study the teams equipped with a BFT – regardless of its spatial accuracy – engaged the hostile targets faster than the control group equipped with a digital map.

Table 2- Showcase of Digital Systems for emergency response and extreme contexts (Opach et al., 2020; Steen-Tveit, 2020).	
Digital Systems' Affordances	Features
Enhancing Situational Awareness (SA)	<ul style="list-style-type: none"> • Level 1 SA: perception of relevant elements and related attributes. • Level 2 SA: relevant elements and attributes provide insights on the situation. • Level 3 SA: use of elements and insights from previous levels to foresee the evolution of the situation.
Information Sharing and Common Operational Picture (COP)	<ul style="list-style-type: none"> • Supports multi-agency Situational Awareness • Solves issues of collaboration and information sharing • Situational Awareness from different actors coalesces into a COP • Open problems: <ul style="list-style-type: none"> - Whose' SA needs to be prioritized in multi-agency settings? - How to avoid redundancies?
Command and Control (C2)	<ul style="list-style-type: none"> • Functions employed by a commander for planning, directing, coordinating and controlling force and operations.

Further items for discussion and extensions

The teaching case identify a general organizational problem and delve into it through the examples provided by military organizations. Using the tools and the framework of analysis provided by this contribution, users may consider the following points for discussion:

- Compare decision making and coordination in military organizations and business companies (Augier et al., 2014).
- Apply High Reliability Organization concepts to conventional organizations (Schulz, Geithner, & Mistele, 2017) and digital operations (Salovaara et al., 2019).
- Design effective incident command systems (Bigley & Roberts, 2001; Moynihan, 2009).
- Apply safety principles to mitigate risk in complex socio-technical systems (Leveson, Dulac, Marais, & Carroll, 2009).

Acknowledgement, Disclaimer

The scenario presented in this teaching case is inspired by the events recounted by Willink and Babin (2017) – two former US Navy SEAL Officers - in their book “Extreme Ownership”. The story has been adapted to fit the needs of the teaching case and does not represent – nor it claims to be – an accurate depiction of the facts pertaining this episode. Conversely, it serves the purpose of introducing users to the topic of frontline high reliability organizations, mission-oriented organizing and digital command, and control systems.

The war-torn city of Ramadi had been one of the most violent theatre of Operation Iraqi Freedom: the US forces amounted to almost six-thousands soldiers, marines and SpecOPS operators. Among others we want to mention the I Marine Expeditionary Force, the I Armored Division and the famous “Band of Brothers” 101st Airborne Division. Since this piece focuses on the Navy SEALs, we want to mention SEAL Team 3, 5 and DEVGRU that played a crucial role in the theatre of Ramadi. We remember Marc A. Lee, posthumously awarded the Silver Star, the Bronze Star with Valor and the Purple Heart and Micheal A. Moonsor, posthumously awarded the Medal of Honor, for their deeds and sacrifice. We also mention Christopher Scott Kyle, who took part to the operations as a SEAL sniper. The casualties among the counterinsurgents in the Battle of Ramadi amounted to 94 US soldiers, 30 Iraqi troops and policemen.

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