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## **FUTURE WAR PAPER**


*MEF Innovation Team (MIT): Addressing MEF's Complex Problems*

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF OPERATIONAL STUDIES

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*The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge.*  
--Stephen Hawking

The United States military's peer-competitors are identifying cost effective and timely technologies that counter the United State's expensive and time-consuming military acquisitions that advance the Department of Defense's (DoD) military capabilities. Unfortunately, expensive military acquisitions countering potential adversaries are planned in five-year increments via the DoD Program Objectives Memorandum (POM).<sup>1</sup> With the private technology sectors out-pacing the DoD's innovation capabilities, the speed of innovative technology and business are shaping future warfare considerations. To close the innovation gap in technology advancement, each service has created an office to procure developing technologies. The concern for the Marine Corps is the inability to rapidly discover and deliver emerging technologies for deploying Marines. An opportunity to rapidly discover and deliver emerging technologies is through the creation of the Marine Expeditionary Force's (MEF) Innovation Team (MIT) that uses design thinking to advance geographically-based Marine concepts that counter future warfare challenges. Creating the MIT will serve as an innovative medium to provide an opportunity for Marines to (1) collectively communicate ideas, (2) grow innovative knowledge, (3) mass observations and results to (re)assess emerging capabilities, and (4) incorporate a repeatable process through design thinking. By establishing the MIT, the MEFs can solve complex problems while educating Marines, creating a collaborative environment for innovative thinking, and accelerating the application of new and emerging technologies to meet future warfare considerations.

This research is divided into five sections. The first section provides foundational information about *innovation, organizations, and design thinking*. This section reviews the three categories of literature to support generating an innovation organization at the MEF-level from an entrepreneur perspective. The second section, *(re)framing the operating environment*, discusses *why* the Marine Corps requires a MEF innovation organization based on an existing gap between service organizations and the individual Marine. The third

section, *MEF innovation team*, describes *how* the MEF can structure an innovative organization with a defined mission and purpose. The fourth section, *MEF innovation design*, describes the utility of design thinking as a process to aid an innovation team in discovering and delivering developing technologies to the MEF. Finally, the *MEF innovation campaign*, articulates opportunities for the MEF to create an outreach program using the MEF innovation lab.

### **Innovation, Organizations, & Design Thinking**

To conceptualize appropriate models for incorporating design thinking in the Marine Corps, the literature review focuses on four primary sub-research questions:

- (1) What is innovation?
- (2) What is design thinking?
- (3) How are innovative organizations structured and resourced?
- (4) How can design thinking aid in solving complex problems?

#### *(1) What is innovation?*

There are many definitions and perceptions related to innovation. Unfortunately, there is not a military definition, particularly in the Marine Corps, for what innovation means. The concept of innovation enables the military and the civilian sectors to identify new solutions or adaptations to overcome existing problems. Since the military does not have a definition for innovation, much of the literature reviews business perspectives from entrepreneurs. Everett Rogers is a pioneer in the field of innovation. He describes innovation as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption.”<sup>2</sup> In his work, Rogers describes the diffusion of innovation as a process of communicating innovation through channels over time among the members of a social system.<sup>3</sup> In 1899, Gabriel Tarde first described the idea of diffusion as an innovation-decision process with a diffusion curve or ‘s-curve’ depicting the rapid growth of new innovations and the alternation of the

innovation's lifecycle.<sup>4</sup> Both Rogers and Tarde describe innovation as an adaptive process for altering circumstances within an environment. *The Innovator's DNA* further advances Rogers and Tarde's research by discussing criteria for the type of organization required for the MEF by articulating how innovation is a learned behavior via five skills called 'disruptive innovators.'<sup>5</sup> The skills are questioning (framing an environment), observing (understanding and reframing the environment), networking (promoting dialogue with organizations to obtain different views), experimenting (trying and testing innovations), and using associational thinking as the catalyst for creativity.<sup>6</sup>

It has been argued creativity cultivates self-efficacy because individuals believing they effect change are more likely to set higher standards, try harder, and persevere longer to solve complex problems.<sup>7</sup> Marines can expand military creativity through ideas codified in the book *Collective Genius* by embracing creative abrasion (discourse), creative agility (test-experiment-adjust), and creative resolutions (decisions).<sup>8</sup> Creativity and innovation are not synonymous nor do the terms have agreed meanings between social science academics and industry. This research uses industry's definitions. Creativity is the mental ability to conceptualize new ideas, or identify new connections between unrelated objects. Innovation is the transformation process of maturing creative ideas to support an environment.<sup>9</sup> The difference between the civilian and the military sectors are the defined markets, products, services, or processes of enhanced value. Design connects creativity to innovation by navigating from the current to desired state. Inferring an industry perspective to the Marine Corps' history, Peter Drucker states creativity may transition to creative imitation as individuals understand the capabilities of an innovation and transform it to suit their needs.<sup>10</sup>

Military organizational barriers in the Marine Corps stifle innovative ideas by aligning the Corps' standards, experiences, and values to support its organizational culture. Throughout the Marine Corps' history, innovation has been driven by the service-level down

to the infantryman. Limiting cognitive innovation in the Corps results in a service culture whose binding fabric deteriorates in a fiscally constrained environment portraying a lack of Marine Corps' preparedness and an inability to improvise to solve future wars' ill-defined challenges.

*(2) What is design thinking?*

The Marine Corps continues to face complex ill-defined challenges that support the application of design thinking. The design thinking ideology asserts a hands-on, user-centric approach to problem solving leading to innovation, and innovation leading to differentiation and a competitive advantage.<sup>11</sup> The design thinking approach combines what is desirable with what is technologically and economically feasible.<sup>12</sup> Furthermore, design thinking attempts to understand the needs of various actors in an environment, define problems in human-centric ways, deliberate ideas through brainstorming, and adopt hands-on approaches to prototyping and testing.<sup>13</sup>

Although the Marine Corps does not have a definition for innovative design or design thinking, the Marine Corps Warfighting Publication (MCWP) 5-10 defines an approach to design as "...achiev[ing] understanding gained largely through critical thinking and dialogue."<sup>14</sup> Additional research describes design as the action of bringing something new and desired into existence. Furthermore, the design approach uses experience, routine, and adaptation to dismantle complex problems. Unfortunately, many design practices are "...faith based rather than research based..."<sup>15</sup> Steve Jobs stated, "Most people make the mistake of thinking design is what it looks like... It's not just what it looks like and feels like. Design is how it works."<sup>16</sup> The Marine Corps uses design to navigate from current to future states through an operational approach, whereas design thinking allows Marines to transition from creativity to innovation from a different perspective.

*(3) How are innovative organizations structured and resourced?*

The literature from business model innovations articulates three mandates for creating an innovative organization. The three mandates are: (1) create a strategy for innovation, (2) create a culture of innovation, and (3) implement a process for innovation experimentation and effectuation.<sup>17</sup> Specifically, innovative organizations require flexibility to cultivate a creative culture and reduce a resistance to change.<sup>18</sup> For these reasons, the authors of *Fast Second: How Smart Companies Bypass Radical Innovation to Enter and Dominate New Markets* propose organizations should create innovation institutions in small, independent units with different skills and attitudes.<sup>19</sup> Small, cross-functional, independent units mirror start-up environments with faster decision-making processes and iteration with close interaction with users operating the product for validated learning.<sup>20</sup> In many large organizational business models, managers avoid innovative change since change requires the leadership to leave their comfort zone—questioning the leadership’s mental model and dominant logic.<sup>21</sup>

The MEF becomes innovative through design thinking by solving complex problems and maturing developing technologies for future operating requirements. To adapt requires a cultural change supporting innovation and an alteration to military leadership’s perspectives supporting a creative environment, thereby setting the conditions for innovative thinking. Leading inhibitors to innovation derive from a fear of failure, bureaucratic/hierarchical intervention, and intra-service rivalries undermining the Marine Corps’ survival and ability to flourish. A risk-averse Marine Corps sees innovation as an inhibitor vice an opportunity—discouraging learning, adapting, and improvisation. Risk-aversion draws from a lack of leadership embracing an adaptive organizational culture meeting and resolving future conflicts.

*(4) How can design thinking aid in solving complex problems?*

Herbert Simon provided one of the first models of design thinking in the *The Sciences of the Artificial*. Design thinking uses mental models of metacognition—the process of thinking about thinking, and applying creativity—through an ability to create new and better answers.<sup>22</sup> Transitioning Simon’s ideas, Richard Buchanan wrote about ‘wicked problems’—social system problems with a fundamental indeterminacy without a single solution and where much creativity is needed to find solutions—via problem definition and problem resolution.<sup>23</sup> To solve the future environment’s complex problems, planners study the interactions of the observed opposition system while understanding the commonalities, unpredictable behaviors and interactions of the environment’s subsystems while applying design methodologies supporting a perceived desired endstate.<sup>24</sup> Incorporating design thinking into military processes explores causal relationships in the environment, which increases the knowledge and understanding of the users by solving the right problem.

IDEO, the world’s largest design company, provide an innovation perspective of a design process and way of thinking that non-designers can incorporate into their organizations.<sup>25</sup> The CEO of IDEO, Tim Brown, labeled his organization’s design practice as ‘design thinking’ via a series of steps.<sup>26</sup> Roger Martin, a strategy consultant for cognitive processes of successful executives, embraced IDEO’s design thinking concept in ‘the knowledge funnel’ model.<sup>27</sup> His research led to a cycle of generating ideas (abduction), predicting consequences (deduction), testing, and generalizing (induction) as a method to approach organizational problems.<sup>28</sup> Lessons from industry provide perspectives for a MEF innovative organization to address geographical priorities. If industry’s innovative organizations can find utility via design thinking’s process, the Marine Corps too can adjust through a paradigm shift from the product-centric business model currently in use.

### **(Re)Framing the Operating Environment**

Secretary McNamara developed the DoD's planning, programming, and budgeting system (PPBS) with a product-centric business model for a five-year POM cycle that the Marine Corps uses.<sup>29</sup> Unfortunately, the product-centric process creates increased timelines for uncertain future operating requirements. An alternative to the PPBS is a mission-centric system incorporating the design thinking process that allows for procurement of commercial off the shelf (COTS) products, which allows the DoD to posture toward solving clearly defined challenges in a predictable near-term future. Concurrent to near-term fixation, capability development over time focuses on low-risk steps vice large, high-stakes, high-costs bounds addressing warfighting requirements.<sup>30</sup> The product-driven, systematic process delays new and developing technologies' rapid transition.

The primary concern is the Marine Corps' inability to rapidly discover and deliver emerging technologies for deployments over the next year. The Marine Corps attempted to decrease the discover-to-deliver five-year timeline by creating the Rapid Capabilities Office (RCO) at the Marine Corps Warfighting Laboratory (MCWL) in 2017. The RCO's mission is the "ability to accelerate the identification, assessment, and development of emergent disruptive capabilities that will inform [the] requirement development and investment planning for the acquisition process."<sup>31</sup> Unfortunately, the RCO is not postured to meet emerging demands due to a limited outreach program requiring education in how the office serves the Marine Corps, and how Marines request support for innovative ideas.<sup>32</sup> In 2018, service-wide outreach programs reached elements of the Marine Corps through the Commandant of the Marine Corps' (CMC) Innovation Symposium, the quarterly CMC Innovation challenges, the POM Wargame, the Advanced Naval Technology Exercise, and the Defense Naval Science Technology Exercise. The RCO annually attempts to visit the operating forces of the Marine Corps, but limited outlets exist for rapid innovative concepts consolidated for the MEF's priorities and geographical regions.<sup>33</sup>

The challenges for the RCO are their inability to identify, assess, and inform the delivery of emerging capabilities to the warfighter. Section 804 and 806 authorities in the National Defense Authorization Act (NDAA) for Fiscal Year 2016 enables the RCO to procure new and emerging technologies.<sup>34</sup> Section 804 describes rapid prototyping as “...the use of innovative technologies to rapidly develop prototypes to demonstrate new capabilities and meet emerging military needs...within five years of the development of an approved requirement.”<sup>35</sup> Meanwhile, Section 804 defines rapid fielding as “the use of proven technologies to...begin production within six months and complete fielding within five years of the development of an approved requirement.”<sup>36</sup> Section 806 provides flexibility for the RCO to accelerate acquisitions for existing technologies if additional prototyping and safety requirements are not necessary. Although 804 and 806 provide avenues for fielding technologies in less than the five-year POM cycle, 804 requires additional research, design, and safety development, whereas 806 fields existing commercial capabilities for military purposes. The RCO process may take one year to develop the proposal and obtain general officer board approval for up to three projects per year. Developing the proposal, deconflicting proposals from existing programs of record, and operating force urgent and deliberate universal needs statements are required to ensure the RCO is not duplicating service initiatives. Once approved with the correct funding and authorities, the process commences a timeline spanning an additional two years to meet the deploying Marine’s requirement. Unfortunately, the Marine may have already returned from the deployment, transitioned from the position warranting the emerging technology, or exited the Marine Corps.

Each service has an RCO. For example, the Army’s RCO “serves to expedite” technologies while incorporating some aspects of design thinking by “execut[ing] rapid prototyping.”<sup>37</sup> The Air Force’s RCO “expedite[s] development and fielding...by leveraging

defense-wide technologies.”<sup>38</sup> Finally, the Navy’s Office of Naval Research initiated the Navy Innovation Process Adoption (NIPA) to “collaborate, overcome obstacles and swiftly deliver new capabilities to America’s Sailors and Marines.”<sup>39</sup> Service organizations collaborate with entrepreneurs in Silicon Valley, as well as DoD affiliates like Defense Advanced Research Projects Agency (DARPA) to close the gap with technologies and processes developed by Secretary McNamara. Each organization falls into the innovator’s dilemma by residing in a ‘sandbox for innovation’ based on a set of rules to operate in semi-autonomous teams.<sup>40</sup> Residing in the ‘sandbox’ results in desires to pursue innovation, which inhibit innovation by its inherent structure.

The proposed rapid definition means delivering the deploying MEF Marine’s innovative requirement in six months. A six-month innovation horizon prepares and fields Marines with the technology prior to deploying. In the event the product fails to meet the user’s requirements, a feedback mechanism from the user to the developer initiates modifications to reassess the requirement. To meet a six month timeline, there are four proposed requirements: (1) the technology must exist in a COTS capability for alteration, (2) safety certification requirements must be met, (3) the technology does not duplicate a program of record or urgent need, and (4) the product achieves a technology readiness level (TRL) of seven or greater. The MEF can use operations and maintenance (O&M) appropriations to finance COTS technologies to continue the rapid innovation cycle. The one-year, “rapid” cycle fills the gap between the RCO and deploying Marine by ensuring the emerging technology is used in today’s operating environment vice several years after his/her deployment. If the purchase is under \$4999.99, the MEF or subordinate command uses the government commercial purchase card (GCPC). In the event the commercial technology exceeds \$5,000.00, the purchase is required to be contracted via the regional contracting office at Marine Corps Installations East or West.

## **MEF Innovation Team: Connecting the Enterprise to the Marine**

A Marine Expeditionary Force (MEF) innovative culture can incorporate design thinking to meet the demands of rapid discovery-to-deliver requirements. To close the gap between service processes provided by the RCO and the Marines, the integration of the MEF Innovation Team (MIT) provides a medium for Marines to (1) communicate ideas, (2) cultivate innovative knowledge, (3) mass observations and results to (re)assess emerging capability requirements, and (4) incorporate a repeatable process. The MIT's mission is to educate, collaborate, and accelerate the application of technologies supporting MEF priorities in order to prepare the MEF to combat the future operating environment. The MIT would have a facility—called a laboratory—to provide a safe space for conducting discovery learning and fostering creative confidence, which considers alternative approaches to solving complex problems free of censorship. J.F.C. Fuller stated a lab for the future forms a creative center as a place in which new discoveries are made and progress is fashioned.<sup>41</sup> The MIT fosters a collective genius of Marines aimed at mutual learning and critical thinking. The purpose of the MIT is to codify the exchange of ideas in the art of war, avoid lengthy military acquisition processes, and harness innovative ideas in an institutional architecture.<sup>42</sup> By establishing a MIT, the MEF integrates the needs of geographically based subordinate commands with service-wide organizations and capabilities, displayed in Figure 1. The MIT is not a redundant organization, but meets the immediacy requirements of deploying Marines. Meeting the deploying Marines' requirements allows the RCO to focus on service-wide 2-5 year requirements as an intermediate capabilities office.

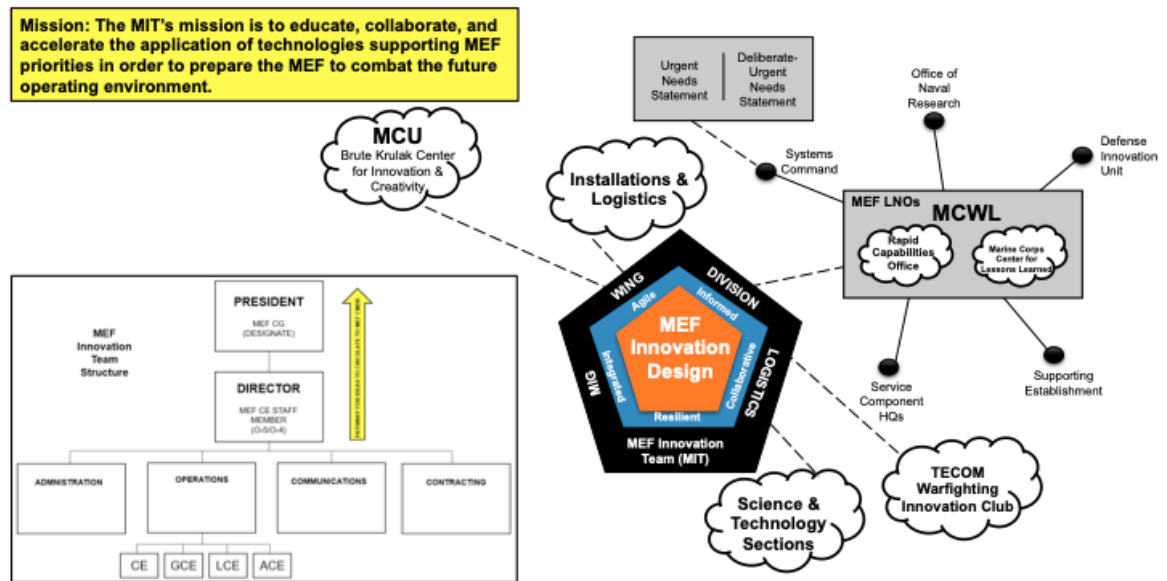


Figure 1. MEF Innovation Team (MIT) Architecture

Figure 1 displays the structure of the MIT. Some of the MIT structure may be sourced from the MEF's Science and Technology Sections or augmented by the MCWL's liaison teams. The MIT President is the MEF commanding general (CG), or his/her designated representative with the authority to approve innovative ideas and allocate funding. The President sets the tone and agenda based on the MEF's priorities. Next, the Director is an O-4/O-5 on the MEF Staff, and coordinates with the RCO and external agencies for emerging requirements. Since the MIT focuses internally to the MEF, the RCO refocuses on service-wide developing technologies meeting the CMC innovation concepts. The Director position may be a payback tour for the Defense Innovation Unit (DIU) fellows, DARPA, or RCO Marines. Additionally, the Director manages and supervises the MIT, and serves as the lead innovation coordinator for the Major Subordinate Commands/Elements (MSC/MSE). The Director ensures MIT members attend MEF, MSC, and MSE exercises where innovation begins. Furthermore, the Director coordinates external briefers like DARPA, DIU, Office of Naval Research (ONR), MD5, PhaseZero, and MCWL to explore innovative ideas with the MEF on how to meet geographical challenges.<sup>43</sup> The intent for the Director is to provide an

outlet and venue for the generation of ideas from Marines at the company, department, platoon, or squad level—where innovation begins.

To support the Director, a communication position is required. The communication Marine/civilian manages the MEF innovation website serving as an “Information Paper”-like outlet for the submission of prioritized, presented, or explored ideas for monthly MIT symposiums/meetings.<sup>44</sup> The PhaseZero or MD5 (Marine Maker)-like website supports: (1) academic and technological research, (2) application tools for creative thinking and project development, (3) “how to videos” posted by technology organizations and Marines to stimulate thinking about developing technologies, and (4) collaboration forums for members to circulate ideas and provide solutions to developing problems. Moreover, the communication member manages social media sites for the MIT’s outreach program that allows Marines to adapt their ideas from reading or seeing other Marines’ innovative concepts. Through the use of social media, Marines grasp innovative outlets, opportunities, and meetings to grow innovative capacity throughout the MEF. Through journal article submissions, graphic novels, YouTube channels, and technology research, the MEF has an outlet for the professional curiosity for learning and exchanging innovative ideas. Although the Marine Corps *Gazette* is considered the professional journal of the Marine Corps, it has limited scope and publishing windows for including innovation articles.

The final three positions are the administration, operations and contracting personnel. The administration personnel manage the administration of the organization, the MEF innovation-reading list, and organize the MEF’s innovation challenge boards. Next, the operations Marine facilitates the execution of the monthly meetings, serving as a liaison to the MSC/MSEs and attends exercises speaking with Marines as they discover how to perform their mission safely and more effectively. The operations section sub-divides into functional groupings—Command Element, Ground Combat Element, Aviation Combat Element, and

Logistics Combat Element—to provide conduits to the division, wing, logistics group, and command elements. Three main aspects of the operations section are: (1) conducting research of new and emerging technologies, (2) attending exercises and deployments to synthesize after action points, and (3) organizing and facilitating meetings, symposiums, briefs, and the laboratory. Finally, the contracting personnel use MEF O&M funds to deliver innovative concepts to the Marine. The contracting personnel bid in a commercial solution window of seven days, and solicit a cash award via alternative acquisition strategies for prototypes inside the rapid window. The contracting personnel coordinate with Marine Corps Installations (MCI) East and West for the generation of requirements. With the incorporation of the MIT, linkages exist inside the MEF for collaboration with external stakeholders like DARPA, ONR, DIU, and RCO.

### **MEF Innovation Design**

The MIT laboratory provides an outlet for design thinking and red teaming solutions to MEF problems—leading to MEF wargaming and analysis inputs. By using the design thinking methodologies from Figure 2, the MIT laboratory will generate creative resolutions as a prototype course of action (COA) for testing and evaluation prior to the MEF implanting an approved COA. The dueling hypotheses from the MEF staff and the MIT red team provide opportunities for the MEF commander to obtain a superior answer to complex problems that inform his/her decision-making. In dueling hypotheses, the MEF commander and his/her staff observe the tension between competing ideas as the understanding of the problem increases, thereby widening the aperture of possibilities for an innovative solution.

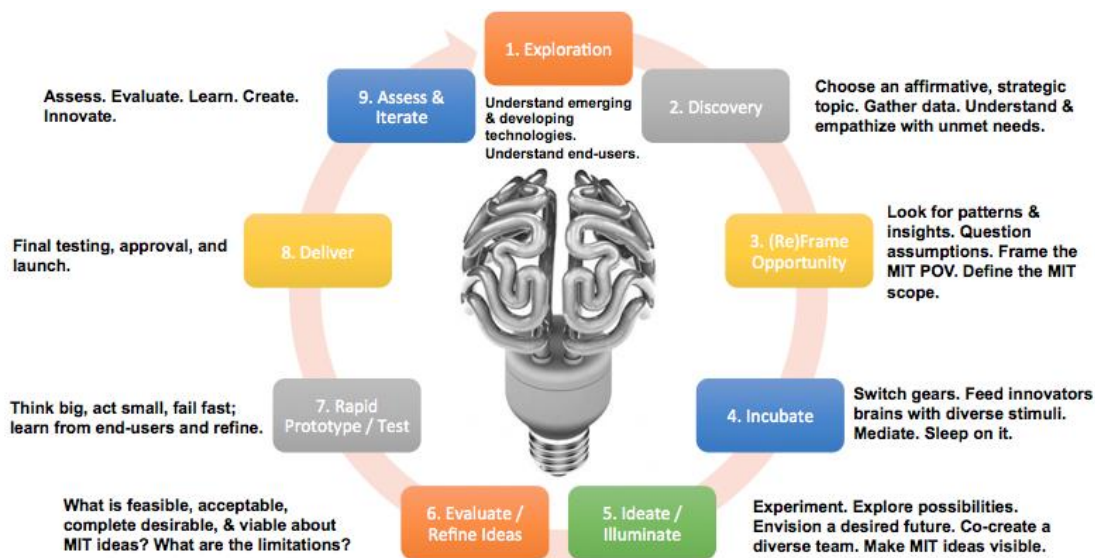


Figure 2. MEF Innovation Design

The MEF Innovation Design incorporates nine principles of design thinking, depicted in Figure 2. Understanding the applicability of the nine principles in the MEF Innovation Design, military planners use design thinking to surpass complex adaptive systems. For example, steps 1-4 aid in understanding the environment and defining the problem. To understand the environment, innovators must appreciate the time available, sociocultural factors, indigenous and neutral factors, impacts of the environment (i.e., weather, geography, and history), electromagnetic spectrum (i.e., cyberspace, information dimension, cognitive and physical dimension, etc.), friendly, adversary, and other actors. Much like in the business sector, an innovative idea in the Marine Corps is inserted into a given society with competitors, business partners, and needs to consider the utility of the product to the environment. When defining the problem from a business or military perspective, both entities identify critical issues by asking *why* or *what if* questions against available resources to achieve the desired state. If the innovation team seeks to reframe the problem, they look for ways to bypass resistance or mental blocks and think about the opposite of the research question to identify possible solutions.<sup>45</sup> Meanwhile, steps 5-7 develop and test COAs through wargaming to achieve the right force at the right time and place. Elements of these

steps continue to be tested against five innovation attributes for product or operational success: feasible, acceptable, complete, desirable, and viable (FAC-DV).<sup>46</sup> These collective steps ensure a knowledge-based innovation approach through the convergence of different inputs into the planning process.<sup>47</sup> Finally, steps 8-9 provide the opportunity to conduct operations or deliver products to Marines and obtain the necessary feedback to begin a new cycle, if required.

To face the future of warfare using design thinking, the MEF develops warfighting innovation attributes validating the innovative requirement. Five warfighting innovation attributes are used, like a checklist for the MIT, to evaluate technologies, ideas, or processes by focusing the MEF towards a common vision. The MEF Innovation Design attributes are agile, integrated, resilient, informed, and collaborative, defined in Figure 3. Employing these attributes as the center point for the MEF innovation strategy requires bold leadership. The MEF concentrates bold leadership when it innovates beyond the plan, critically thinks ahead of existing paradigms, and builds a MEF contributing to success in any operating environment.



Figure 3. Five Attributes of MEF Innovation Design

The five attributes of the MEF Innovation Design provide flexibility and focal points to vector components of the United States Marine Corps' innovation ecosystem to achieve victory in a highly competitive and innovative business environment that rapidly shapes military operations. The five attributes listed in Figure 3 provide multiple focus questions aiding in discovery or (re)framing opportunities. For example, *how can existing and emerging technologies increase multi-domain systems integration to create and exploit an advantage? How do we grow a MEF who think and operate in a multi-domain paradigm to ensure mission success? What networks will the United States Marine Corps require to integrate and collaborate across multi-domains in joint/coalition/combined operations? How is the MEF advancing in observed systems to counter adversarial technological advancements in multi-domain environments?* The five warfighting innovation attributes allow the DoD's business processes to modernize using flexible attributes vice lengthy

processes to enable the rapid transition of new capabilities into the environment and meet innovation adaptation requirements from future adversarial threats.<sup>48</sup>

### **MEF Innovation Campaign**

To start the circulation of information regarding the MIT laboratory, the MEF should create a network of innovative Marines through a MEF innovation campaign led by the Director. The Director's MIT Innovation Campaign has four lines of effort: (1) open access to innovative learning, (2) provide opportunities for innovative growth, (3) link MEF innovation and combat priorities, and (4) explore organizational knowledge. The first line of effort—opening access—alludes to increasing access, members, and growing the innovative network via mediums like the innovation website, innovation journal, after action reports with a section on innovation, innovation repositories of information, and innovation reading list.

Second, the MIT Director can provide opportunities for creative confidence that focuses on the CMC and MEF priorities by filtering innovation through design thinking. The MIT Lab maintains their online presence, monthly meetings, symposiums, expos, guest lecturers, and online collaborative website. Third, MIT Director's outreach can link everything to the MEF innovative priorities through the PhaseZero or MD5-like website housing academic and technological research for new and developing technologies, links to social media and external innovative organizations, points of contact and collaborative tools associated by elements of the MAGTF, and linking roles and responsibilities of the MEF with the Marine Operating Concept (MOC) and MEF mission sets. Finally, "ensure no organizational knowledge is discarded" focuses on providing papers, presentations, briefs, brainstorming sessions at the MIT Lab, and an attempt to link Marines with technology engineers to advance ideas or concepts. The lines of effort improve innovative awareness and

exploit technologies for a more effective and efficient MEF to meet future operating requirements.

The MEF Innovation Campaign must define a rapid innovation process to support the geographically based, deploying MEF Marines, which reinforces and leverages the United States Marine Corps innovation ecosystem. The MEF Innovation Campaign's operational approach mirrors the business models of discover, define, develop, and deliver (D4) displayed in Figure 4. Discover and define stages provide *what* the strategy attempts to achieve and the purpose via the *why*. To be effective, innovation requires simplicity and focus on a specific, clear, design application satisfying a MEF requirement.<sup>49</sup> The MIT Lab's planning starts with a vision or MEF commander's guidance affiliated to a consumer market or adversary focused on an identified product void or problem by understanding the *what* and *why*. Some of the answers may be defined by creatively employing aspects of design thinking with elements inherent to the Marine Corps Planning Process (MCP).<sup>50</sup>

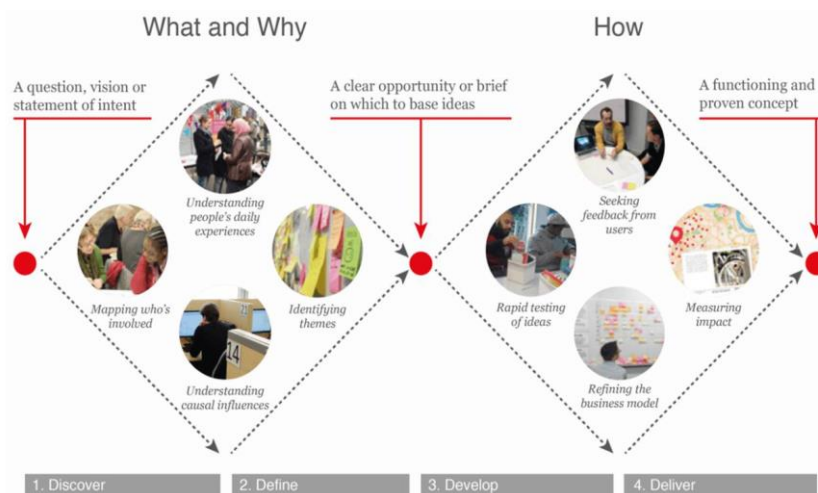


Figure 4. This diagram illustrates the design thinking framework created by The Design Council (UK), which maps the design process into four distinct phases: Discover, Define, Develop, and Deliver. This illustrates the divergent and convergent stages of the design process.<sup>50</sup>

## Conclusion

Whether the United States remains in another arms race with a near-peer competitor or fighting small wars around the globe, the MEF's innovation focus shapes the desired state of the opposition system vice competing with nodes of the observed system.<sup>51</sup> If the Marine Corps desires to use the MEF Innovation Design in the Fourth Industrial Revolution (4IR), the five innovation attributes employ global forces exploiting gaps in the adversarial system while harnessing the advancement in an industrial and innovative revolution.<sup>52</sup> However, globally dispersed forces need empowerment, equipment, and training with developing capabilities to maneuver and leverage intelligence assets, fires, and information warfare from a combined arms and integration approach on the modern battlefield. Our context for combined arms changed from integrating firepower and mobility to the employment of intelligence assets, information warfare, electronic warfare, surface and ground fires to facilitate maneuver. This change enables innovation survivability on the modern battlefield.

The Italian airpower theorist Giulio Douhet stated, "Victory smiles upon those who anticipate the change in the character of war, not upon those who wait to adapt themselves after the changes occur."<sup>53</sup> The U.S. military remains superior regarding size, global engagement, and technological capabilities. If technology corporations drive the speed of the future of warfare, then appreciating design thinking's business model applicability to the MEF, via the MIT, shapes how the Marine Corps responds to uncertain operating environments over the next several decades. A change in thinking from a military perspective to an innovative strategist has the potential to transform how the Marine Corps develops programs, processes, and military strategy. Although technology shaped the outcome of previous wars, utilizing the pentagon attributes of agility, integration, resiliency, inform, and collaborative provides focal points for modernizing the MEF. Collectively, the warfighting innovation attributes foster a resilient and flexible deterrent with the capability to impose

complexity and cost on adversaries while providing a broader menu of options for decision-makers.<sup>54</sup>

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- <sup>1</sup> Program Objective Memorandum (POM) / Budget Formulation. Program Objective Memorandum (POM) / Budget Formulation. Accessed March 24, 2018. <https://www.dau.mil/acquipedia/Pages/ArticleDetails.aspx?aid=79420a26-7a89-4e94-aad2-6d5d61bb7511>.
- <sup>2</sup> Everett Rogers is a Distinguished Professor Emeritus in the Department of Communication and Journalism at the University of New Mexico. Everett Rogers, *Diffusion of Innovations*, 5th ed. (New York: Free Press, 2003), 12.
- <sup>3</sup> Rogers, *Diffusion of Innovations*, 11.
- <sup>4</sup> Gabriel Tarde, *Social Laws: An Outline of Sociology* (Kitchener: Batoche Books, 1999). ProQuest Ebook Central.
- <sup>5</sup> "Innovation." *Strategic Direction* 28, no. 2 (2012): 9-11, doi:<http://dx.doi.org/10.1108/02580541211198373>. <https://search-proquest-com.lomc.idm.oclc.org/docview/915973431?accountid=14746>.
- <sup>6</sup> Associational thinking is the ability to make surprising connections across areas of knowledge, industries, and geographies. Jeff Dyer, Hal Gregersen, and Clayton Christensen, *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators* (Boston: Harvard Business School Publishing, 2011).
- <sup>7</sup> Jenifer Reil and Roger Martin, *Creating Great Choices* (Boston: Harvard Business Review Press, 2017), 43.
- <sup>8</sup> Linda Hill, Greg Brandeau, Emily Truelove, and Kent Lineback, *Collective Genius: The Art and Practice of Leading Innovation* (Boston: Harvard Business Review Press, 2014).
- <sup>9</sup> Laird McLean, "Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development," *Advances in Developing Human Resources*, 7, No. 2 (May 2005): 226-246. DOI: 10.1177/1523422305274528. <http://www.mcleanglobal.com/public/MGC/publications/Org%20Culture%20and%20Innovation.pdf>
- <sup>10</sup> Peter Drucker, *Innovation and Entrepreneurship* (New York: Harper Collins Publishers, 1985), 220.
- <sup>11</sup> Sarah Gibbons. "Design Thinking 101." *Nielson Norman Group*, (July 31, 2016). Accessed October 5, 2018. <https://www.nngroup.com/articles/design-thinking/>
- <sup>12</sup> IDEO U. Hello Design Thinking. Accessed March 24, 2018. <https://www.ideo.com/products/hello-design-thinking>.
- <sup>13</sup> Rikke Dam and Teo Siang. "5 Stages in the Design Thinking Process." *The Interaction Design Foundation*. Accessed March 24, 2018. <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>.
- <sup>14</sup> Headquarters US Marine Corps, *Marine Corps Planning Process*, MCWP 5-10 (Washington, DC: Headquarters US Marine Corps, May 2, 2016), 2-1.
- <sup>15</sup> Scott Klemmer and John Carroll, "Introduction to This Special Issue on Understanding Design Thinking." *Human-Computer Interaction* 29, no. 5/6 (2014): *Science & Technology Collection*, EBSCOhost (accessed August 31, 2018).
- <sup>16</sup> Klemmer and Carroll, *Introduction to This Special Issue on Understanding Design Thinking*.
- <sup>17</sup> Henry Chesbrough, "Business Model Innovation: Opportunities and Barriers," *Long Range Planning*, 43, No. 2-3 (2010): 354-363. Gregor Zellner, "Towards a framework for identifying business process redesign patterns," *Business Process Management Journal*, 19, No. 4 (2013): 600-623. DOI:10.1108/BPMJ-Mar-2012-0020. Michael Stanleigh, "Mandate for Innovation." Business Improvement Architects. Accessed August 31, 2018. <https://bia.ca/mandate-for-innovation/>
- <sup>18</sup> Bock, A., Opsahl, T., George, G., et al., "The Effects of Culture and Structure on Strategic Flexibility during Business Model Innovation," *Journal of Management Studies*, 49, No. 2 (2012): 279-305.
- <sup>19</sup> Constantinos Markides and Paul Geroski, *Fast Second: How Smart Companies Bypass Radical Innovation to Enter and Dominate New Markets* (San Francisco: Jossey-Bass).
- <sup>20</sup> James Euchner, "What Large Companies Can Learn from Start-ups," *Research Technology Management* 56, no.4 (July-August 2013): 12-16, Ebscohost (88923407).
- <sup>21</sup> Cavalcante, Sé, Peter Kesting, and John Uhløi. "Business Model Dynamics and Innovation: (Re)Establishing the Missing Linkages." *Management Decision* 49, no. 8 (2011): 1327-1342. doi:<http://dx.doi.org/10.1108/00251741111163142>. <https://search-proquest-com.lomc.idm.oclc.org/docview/888250494?accountid=14746>.
- <sup>22</sup> Reil and Martin, *Creating Great Choices*, 54.

- <sup>23</sup> Richard Buchanan, “Wicked Problems in Design Thinking,” *Design Issues* 8, no. 2 (Spring 1992): 5-21. Accessed August 31, 2018. [http://web.mit.edu/jrankin/www/engin\\_as\\_lib\\_art/Design\\_thinking.pdf](http://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pdf)
- <sup>24</sup> In a catastrophe system, two or more distinct steady states exist in an environment where one of the states exhibits a moderate change in the system parameter, which causes it to shift to a potential unstable state with limitless variables. Chaotic systems are deterministic dynamic systems with unpredictable behaviour that causes large changes. Herbert Alexander Simon, *The Sciences of the Artificial* (Cambridge, Mass.: MIT Press, 2008). Retrieved from [https://monoskop.org/images/9/9c/Simon\\_Herbert\\_A\\_The\\_Sciences\\_of\\_the\\_Artificial\\_3rd\\_ed.pdf](https://monoskop.org/images/9/9c/Simon_Herbert_A_The_Sciences_of_the_Artificial_3rd_ed.pdf)
- <sup>25</sup> Ulla Johansson-Skoldberg and Jill Woodilla, “Creating a Synergistic Dialogue among Design Thinking, Strategy and Innovation,” *Design Research Journal*, 2 (2009): 29–33.
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- <sup>29</sup> Defense Advanced Research Projects Agency, *A Blueprint for Winning* (Arlington: DARPA, 2017).
- <sup>30</sup> DARPA, *A Blueprint for Winning*.
- <sup>31</sup> Masco Settles, *Marine Corps Rapid Capabilities Office: NDAA Authorities Snapshot* (Marine Corps Warfighting Laboratory, 2018), PowerPoint presentation.
- <sup>32</sup> Masco Settles (Rapid Capabilities Office at Marine Corps Warfighting Laboratory), discussion with author, August 17, 2018.
- <sup>33</sup> Masco Settles (Rapid Capabilities Office at Marine Corps Warfighting Laboratory), discussion with author, August 17, 2018.
- <sup>34</sup> Section 804 is Middle Tier for Acquisition for Rapid Prototyping and Rapid Fielding. Section 806 is the Secretary of Defense waiver of acquisition laws to acquire critical national security capabilities. National Defense Authorization Act for Fiscal Year 2016, Public Law 114-92 (November 25 2015). Accessed on 18 August 2018. Retrieved from <https://www.gpo.gov/fdsys/pkg/PLAW-114publ92/pdf/PLAW-114publ92.pdf>
- <sup>35</sup> National Defense Authorization Act for Fiscal Year 2016, 882.
- <sup>36</sup> National Defense Authorization Act for Fiscal Year 2016, 883.
- <sup>37</sup> Army Rapid Capabilities Office, “Experiment, Evolve, Deliver.” Last modified May 31, 2017. <http://rapidcapabilitiesoffice.army.mil>
- <sup>38</sup> Air Force Rapid Capabilities Office, “Rapid Capabilities Office.” Accessed August 31, 2017. <https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104513/rapid-capabilities-office/>
- <sup>39</sup> Office of Naval Research, “Office of Naval Research Wants to Innovate at Startup Speed.” Last modified March 29, 2018. <https://www.onr.navy.mil/en/Media-Center/Press-Releases/2018/ONR-NIPA-Startup-Innovation>
- <sup>40</sup> James Euchner, “What Large Companies Can Learn from Start-ups,” *Research Technology Management* 56, no.4 (July-August 2013): 12-16, Ebscohost (88923407).
- <sup>41</sup> J.F.C. Fuller, *The Foundations of the Science for War* (London: Hutchinson, 1926), 40.
- <sup>42</sup> Ideas for the purpose of the MIT were drawn from Gerhard Johann David von Scharnhorst’s development of the *Militarische Gesellschaft*. Charles White, *The Enlightened Soldier: Scharnhorst and the Militarische Gesellschaft in Berlin, 1801-1805* (Westport, CT: Praeger Publishers, 1989).
- <sup>43</sup> The acronyms can be defined as: DARPA (Defense Advanced Research Projects Agency), DIU (Defense Innovation Unit), and ONR (Office of Naval Research).
- <sup>44</sup> The website medium can mirror the CMC Innovation Challenge site, or be an extension. Information on the CMC innovation site can be found at <http://www.marines.mil/innovate>
- <sup>45</sup> Tom Kelley and David Kelley, *Creative Confidence* (New York: Crown Business, 2013), 102.
- <sup>46</sup> Feasible: Does the course of action (COA) accomplish the mission within the available time, space, and resources? Acceptable: Is the COA proportional and worth the cost in personnel, equipment, materiel, time involved, or position? Is it consistent with the law of war and is it militarily and politically supportable? Complete: Does the COA include all tasks to be accomplished? Does it address the entire mission (main and supporting efforts, reserve, and associated risks)? Distinguishable: Does the COA differ significantly from other COAs? Suitable: Does the COA accomplish the purpose and tasks? Does it comply with the commander’s guidance? Headquarters US Marine Corps, *Marine Corps Planning Process*, MCWP 5-10 (Washington, DC: Headquarters US Marine Corps, May 2, 2016), 3-1.
- <sup>47</sup> Peter Drucker, *Innovations and Entrepreneurship*, 111.
- <sup>48</sup> DARPA, *A Blueprint for Winning*.
- <sup>49</sup> Peter Drucker, *Innovations and Entrepreneurship*, 135.

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<sup>50</sup> DARPA, *A Blueprint for Winning*.

<sup>51</sup> Small wars include: insurgencies and guerrilla conflicts, counterinsurgencies, terrorist movements, irregular warfare, peacekeeping and humanitarian intervention. An observed system is a system in its perceived present state without the influence of external or internal disruption mechanisms. On the other hand, a desired system is how the influencer wants the observed system to conform to their interests.

<sup>52</sup> The Fourth Industrial Revolution (4IR) is described as a range of new technologies fusing the physical, digital and biological worlds, and impacting all disciplines, economies, and industries. Klaus Schwab, founder and executive chairman of the World Economic Forum, believes the 4IR is the "second machine age" because of the effects of "emerging technology breakthroughs" in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3D printing, quantum computing and nanotechnology. The 4IR is expected to see the mass implementation of emerging technologies with a high potential of disruptive effects. These technologies have the potential to continue to connect billions of people to the web, drastically improve the efficiency of business and organizations, and regenerate the natural environment through better asset management. Klaus Schwab, "The Fourth Industrial Revolution: what it means, how to respond." *World Economic Forum* (January 14, 2016). Accessed March 24, 2018. <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>.

<sup>53</sup> Giulio Douhet, *Command of the Air* (New York: Coward-McCann, 1942), 30.

<sup>54</sup> DARPA, *A Blueprint for Winning*.