How to Think about Innovation

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What kind of innovation?

Navy senior leadership's recent effort to address innovation in the fleet continues a long tradition of naval innovation, and especially among dedicated innovation organizations. Some of these organizations still exist, such as the Naval Expeditions (NavalX) Agility Office, or Program Executive Office Enterprise Information Systems (PEO EIS) Innovation Cell, while others, having fulfilled their mission or were subject to external drivers, were eventually shuttered (e.g., the Strategic Studies Group and Deep Blue). One common thread among many of these innovation organizations is their attempt to address a wide range of innovative products but their lack of optimal organization to deliver. For instance, Deep Blue was given the broad mandate to innovate "new ways to fight wars" across various "cognitive" domains: intelligence, future operating concepts, manning, technology, operational art, and tactics [1]. Lacking a common framework or language to describe desired "innovation" can hinder how the Navy organizes to achieve innovation goals [2]. Having a more descriptive language would support design efforts in creating an organization optimally organized to achieve the type of desired innovation. All of this raises the question: What type of innovation does the Navy want? Below, we provide a rough framework to categorize innovation and provide other considerations that can affect how an organization should organize for innovation.

An innovation ontology

There is no simple approach to viewing innovation; the academic literature abounds with various definitions and frameworks. Attempting to categorize innovation is an even more complicated endeavor, with many extant frameworks of varying scope. (Deloitte lists 10 different types of innovation grouped into three categories [3].) While many frameworks, like the Deloitte example, are narrowly focused on business-related issues, we identified others that demonstrated greater applicability to the challenges the Navy faces. Two common factors stood out among these frameworks that support the *binning* of innovation: the degree to which the *problem* is understood and the extent to which the *domain* is understood (or the range of solutions available to address challenges in the domain). The domain factor includes not only technology (i.e., the extent that an innovation leverages existing or requires new technology), but also other procedural or process-based innovations.

In the diagram below, these two factors—understanding the problem and the domain—present a framework for thinking about binning innovation. How understanding the problem interacts with the domain yields four categories of innovation: sustaining, breakthrough, disruptive, and comprehensive.

Figure 1. Innovation ontology

Source: [4], CNA.
Note: Although this framework is based on Greg Satell's model, the category names are a synthesis of several frameworks. Given the number of extant frameworks, some may use a category title in a different manner than described here. We present this framework only as the initial step to a more formal innovation language, and we expect organizations to use a language that suits their specific purposes.

Sustaining innovation. This is "everyday" innovation: a clearly identified problem, addressed through minor improvements in existing technology or processes. Personnel across the organization to a degree have a role in contributing to these types of innovation. Some examples of this innovation would be a new Pixar film or next-generation model of the BMW 3 Series [5]. Although incremental innovation is relatively minor in its overall effect, when aggregated it is critical to the success of the organization. In many cases, the sum effect of incremental innovations can even outweigh the benefits from a breakthrough or disruptive innovation [6].

Breakthrough innovation. Think development of fiber-optic cables or jet engines. The problem is well defined (e.g., the need to communicate over long distances, or the need for a high thrust-to-weight-ratio propulsion source), but the technology does not yet exist. This type of innovation provides a competitive advantage, but does not necessarily lead to business transformation. Nevertheless, these innovations are critical for sustaining the productivity of an organization. Organizations focused on breakthroughs tend to favor models based on traditional R&D labs, but also rely on synthesizing across knowledge domains or crowdsourcing to expand the solution set. NavalX or Lockheed's Skunk Works are good examples of organizations focused on breakthrough innovation.

Disruptive innovation. This is Netflix- or Bird scooter–type innovation: using existing technologies in new ways to address changes in the external environment. Disruptive innovation can lead to significant transformation throughout not just the organization but also the marketplace as well.

Consider for example the implications that Netflix has had on movie theater sales or TV programming. Innovation strategies like Google's "20% Project," where employees are expected to use 20 percent of their time working on projects that interest them or on strategies that establish lean startups (i.e., organizations that are the offspring of design thinking and that have a light, experimental staff footprint), which tend to favor disruptive innovation [7].

One note on disruptive innovation: Our definition is distinct from the theory of disruptive innovation coined in 1995, which is narrowly scoped to describe small startups that create new markets within an industry where larger incumbents dominate [8]. While the incumbents concentrate on serving their largest and most profitable customers, startups focus on underserved and overlooked customers to provide a more customized product or service, generally at a lower price. Capitalizing on this initial success, the startup can begin to offer its products or services to a larger audience and eventually "disrupt" the market by overtaking the incumbents. According to the theory's authors, Canon was a disrupter when it began producing personal photocopiers before Xerox, which was considered the industry leader, but which focused on large corporations. Conversely, the authors do not include Uber as a disrupter, because it served an already established market, albeit in a more convenient and less expensive manner [9].

The *theory*, then, is focused on an approach to identifying and capitalizing on an underserved or overlooked market, whereas our term is based in part on Greg Satell and Gary Pisano's models and is defined by the understanding of the problem set and the tools available to address the issues [5]. Ultimately, the difference is that a desired innovation, whether disruptive, breakthrough, or other, is contingent on the strategic approach taken. Not all innovations that shake up a market are disruptive (per the theory), and a disruptive innovation approach may not be replicable in other markets [9].

Comprehensive innovation. This is the most expansive and challenging of the four types of innovation, requiring major technological breakthroughs, implementation of an entirely new technology/process, and organizational transformation. Examples of comprehensive innovation are the transformation of IBM from specializing in hardware to software or Kodak's transitioning from film to digital technologies. Comprehensive innovation is less conducive to a singular organization's leading innovative efforts due to the enterprise nature of the innovation. Given its strategic implications, comprehensive innovation is typically handled among select members of the organization's senior leadership. For example, when the Navy looked to innovation to address the challenges of the Soviet fleet after the Vietnam War, it was Chief of Naval Operations ADM James L. Holloway III, along with several champions (VADM James Doyle Jr; CAPTs Stu Landersman and Jerry Holland; and even a civilian analyst, Bernie Schneiderman), who led the effort to develop and implement the composite warfare commander (CWC) concept and the carrier battle group [10]. However, there are some examples of dedicated organizations, such as GoogleX (via its "20% Project"), that crowdsource ideas and apply resources to selected projects, with the ultimate goal of comprehensive innovation and spinning off new businesses to run with the new technologies and business models.

Additional considerations

There are a few more aspects to consider in determining what kind of innovation the Navy wants.

Innovation vs. Growth. Managing growth requires focusing on existing lines of business while also focusing on innovation, which capitalizes on potential or emerging opportunities. Balancing these two efforts can create a sense of building an airplane while flying it. McKinsey's three horizons framework provides a means to deconstruct innovation with an emphasis on timing rather than type: the

organization identifies core competencies and develops goals and an approach to those goals during the short term (Horizon 1), thus strengthening the organization overall; in the medium term (Horizon 2), the organization explores new or emerging opportunities for organizational growth; and the organization focuses on creating new possibilities or competencies with the potential for growth in the long term (Horizon 3) [11]. The three horizons framework emphasizes that each of the horizons requires a different approach to innovation and may require different means of management. Thinking through potential timelines of innovation projects in this way helps organizations to manage expectations and communicate more effectively about innovation among leadership and employees, which can help set up an innovative idea for success.

Singular vs. combination technologies. Innovation can bring to mind singular technologies, like the invention of the light bulb, but singular technology innovations presently make up only 12 percent of accepted patents [12]. The complexity of developing multiple technologies and then ensuring that this combination is able to work in tandem can require a robust prototyping and testing capability.

Structure vs. flexible innovation process. Innovation within organizations can follow a structured and phased process, or it can be more flexible and organic. Structured processes consist of formalized evaluation of ideas and accepting or rejecting prototypes that are deemed insufficient, thus requiring more oversight. A comprehensive innovation focus can benefit from a structured innovative process, where various stakeholders are involved in the development and implementation processes. Less-structured innovation processes can be more responsive and adaptable and are generally better suited for smaller-scale innovation.

Initiation vs. adoption vs. implementation. There are many ways to segment the innovation process, and one important consideration is which part or how much of the innovation process should be included within an organization's responsibilities. For example, AFVentures, one of three major efforts within AFWERX, is responsible for providing new operational capabilities using existing commercial technologies. Through Small Business Innovation Research (SBIR) funding, AFVentures essentially defines the problem, then solicits industry for potential technological solutions (adoption phase). AFVentures has also initiated "Open Topics" as a means to crowdsource ideas from industry and academia (initiation phase) that are then down-selected through a competitive, awards-based program and transitioned to the SBIR program. Data have shown that Open Topics awards, which essentially outsource requirements generation to nongovernmental entities, are more likely to receive defense contracts than when the Air Force internally generates the requirements via the SBIR program [13]. Ultimately, the key consideration in mapping responsibility for elements of the innovation process to components of an organization is ensuring that clearly understood linkages exist among the elements so that the innovative idea is brought to fruition. The end result is not the generation of ideas, or the prototyping of a solution, but the development and implementation of a viable and sustainable innovation that increases organizational effectiveness.

Summary

Defining innovation can be tricky, and categorizing innovation trickier still. The framework above attempts to capture some of the ongoing discussion regarding types of innovation and the four categories (sustaining, breakthrough, disruptive, and comprehensive). Given the broad extent of research available, this framework presents a rudimentary structure for discussions centered on innovation's relationship to organizational design. Though not all encompassing, it provides initial steps to helping US Navy organizations articulate the type of innovation desired in response to a renewed emphasis on innovation.

References

[1] *The US Navy's Deep Blue.* CNA. 2020.

[2] Lewis, Larry, David Knoll, Diane Vavrichek, Alexander Powell, Bradley Dickey, and Ciro Lopez. Sept. 2020. *Putting Innovation into Practice.* CNA. DOP-2020-U-027949. https://www.cna.org/CNA_files/PDF/DOP-2020-U-027949-Final.pdf.

[3] Deloitte Consulting LLP. "Ten Types of Innovation: The Building Blocks of Breakthroughs." https://www.doblin.com/dist/images/uploads/Doblin_TenTypesBrochure_Web.pdf.

[4] Satell, Greg. June 21, 2017. "The 4 Types of Innovation and the Problems They Solve." *Harvard Business Review*. https://hbr.org/2017/06/the-4-types-of-innovation-and-the-problems-they-solve.

[5] Pisano, Gary P. June 2015. "You Need an Innovation Strategy." *Harvard Business Review*. https://hbr.org/2015/06/you-need-an-innovation-strategy.

[6] Globerman, Steven, and Kristina M. Lybecker. June 2014. "The Benefits of Incremental Innovation: Focus on the Pharmaceutical Industry." Fraser Institute. https://www.fraserinstitute.org/sites/default/files/benefits-of-incremental-innovation.pdf.

[7] Blank, Steve. May 2013. "Why the Lean Start-Up Changes Everything." *Harvard Business Review*. https://hbr.org/2013/05/why-the-lean-start-up-changes-everything.

[8] Bower, Joseph L., and Clayton M. Christensen. 1995. "Disruptive Technologies: Catching the Wave." Harvard Business Review. Jan.-Feb. 1995. https://hbr.org/1995/01/disruptive-technologies-catching-the-wave.

[9] Christensen, Clayton M., Michael E. Raynor, and Rory McDonald. 2015. "What is Disruptive Innovation?". Harvard Business Review. Dec. 2019. https://hbr.org/2015/12/what-is-disruptive-innovation#:~:text=Disruption%20theory%20differentiates%20disruptive%20innovations,from%20what%20are%20called%20%E2%80%9Csustaining%20innovations.%E2%80%9D.

[10] Pierce, Terry. November 2018. "The Navy Needs a New Engine of Innovation." *Proceedings*. https://www.usni.org/magazines/proceedings/2018/november/navy-needs-new-engine-innovation.

[11] 2009. "Enduring Ideas: The three horizons of growth." McKinsey & Company. Dec. 1, 2009. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-three-horizons-of-growth.

[12] Buchanan, Mark. December 23, 2014. "Innovation slowdown." *Nature Physics*. https://www.nature.com/articles/nphys3222.

[13] Snelgrove, Eric. "Acquisition reform that works and no one has heard of." Breaking Defense. June 24, 2021. https://breakingdefense.com/2021/06/acquisition-reform-that-works-no-one-has-heard-of/.