

What Characteristics Do Organizations That Successfully Innovate Possess and Are They Transferrable to the Military?

A Monograph

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Abstract

What Characteristics Do Organizations That Successfully Innovate Possess and Are They Transferrable to the Military? by Col James A.K. Walker, British Army, 45 pages.

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This paper uses a literature review to select four determinants of innovation: organizational culture, the effective use of knowledge, experimentation, and acceptance of risk when combined with an absence of constraints.

The paper examines the determinants in two case studies in the technology sector, Google and Apple, identifying where the determinants contribute to the continued innovation in each company.

Transfer of the lessons from the case studies is problematic in a military context, especially those of organizational culture. Attempts at creating an ecosystem of innovation in the military have proven to be limited in effect. Wholesale change in culture is both difficult and potentially harmful to military effectiveness, but limited change has so far proved ineffective in achieving the scale of change necessary.

Evidence suggests that determinants of innovation may be context specific, so further work should examine innovation in a military context that has already overcome the cultural barriers. Further research should examine whether rapid adaptation is actually preferable to innovation for the military.

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Acronyms

CEO	Chief Executive Officer
GLAT	Google Labs Aptitude Test
iOS	iPhone Operating System
HR	Human Resources
IPO	Initial Public Offering
OECD	Organization for Economic Co-operation and Development
PARC	(Xerox's) Palo Alto Research Center
R&D	Research and Development
USMC	United States Marine Corps

Introduction

For the military, innovation promises to deliver a competitive advantage over its rivals. For example, the US Army's core purpose is "to fight and win our nation's wars,"¹ making success the ultimate measure of performance. In an era of great power competition, one of the focal points of the United States National Security Strategy,² the desire to secure a competitive advantage takes on an even greater significance. Yet evidence suggests that large organizations often struggle with innovation: the more established an organization becomes, the harder it appears to be for it to bring innovative ideas to the fore. It can be doubly problematic for the military as a uniformed and hierarchical organization, where alternative approaches run counter to the prevailing organizational culture. Can the military replicate the success of innovative organizations in other sectors?

This paper will examine the role of four determinants of innovation that organizations deemed to be successful possess and whether they may be transferrable to a military context. This research will use a literature review to establish the factors that determine successful innovation (determinants), trace the evidence of their validity through two case studies, and then suggest how they may be transferable to a military context. This final step is rare in the existing literature and where this work seeks to add value. The case studies have been chosen from the available literature and they both come from the same business sector. Sufficient material for a contrasting study, such as one from the not-for-profit or government sector was not available. The chosen case studies, Google and Apple, both lie within the technology sector. The evidence has been further constrained, as many sources focus on the role of the mercurial Steve Jobs, rather than a dispassionate analysis of the firm's success.

¹ The US Army, "Organization | The United States Army," last modified 2018, accessed December 28, 2018, <https://www.army.mil/info/organization>.

² President Donald J. Trump, *A New National Security Strategy for a New Era* (Washington DC: The White House, 2018).

There is no unitary theory of the determinants of innovation in the existing literature, but a number of theories intersect. This paper's thesis is that implementing these determinants found in successful organizations elsewhere is challenging in a military culture and is one possible reason why replicating the innovation found elsewhere has proved to be so elusive.

This paper will present a literature review that examines where existing academic analyses of the determinants of innovation intersect. The chosen determinants are: organizational culture, use of knowledge, experimentation, and an acceptance of risk combined with the absence of constraints. These determinants are then analyzed against case studies of two technology firms, Google and Apple, to show ways in which the determinants are present and affect their ability to innovate. Bringing the evidence from the case studies together allows implications to be drawn for each determinant and then consideration is given to the barriers that might exist in transferring these determinants to the military. There evidence does not allow a causal determination between the presence of determinants of innovation and success to be made. The conclusion suggests areas for further study, in particular the possibility that a focus on case studies of innovative military organisations may yield more applicable recommendations.

Definition of Innovation

Innovation has had a wide variety of definitions, such as Schumpeter's "simply the doing of new things or the doing of things that are already being done in a new way,"³ whereas more modern views suggest that "in future, the most successful innovators may be those who simply happen upon the right combination of other people's technologies."⁴ The Organization for Economic Co-operation and Development's (OECD) definition is "the implementation of a new or significantly improved product (good or service) or process or a new marketing method or a

³ Joseph A. Schumpeter, Redvers Opie, and John E. Elliott, *The Theory of Economic Development*, 16th ed. (New Brunswick, NJ: Transaction Publishing, 2012), 65-69.

⁴ Larry Downes and Paul Nunes, *Big Bang Disruption: Strategy in the Age of Devastating Innovation* (New York: Portfolio / Penguin, 2014), 40.

new organizational method in business practices, workplace organization or external relations.”⁵

Fagerberg et al. highlighted the difference between invention and innovation: “invention is the first occurrence of an idea for a new product or process while innovation is the first attempt to carry it out in practice.”⁶ Sundbo’s suggestions started with Schumpeter as a basis (“provisionally, we can define innovation as the production of new elements or a new combination of old elements in industrial organizations (after Schumpeter 1934)”) but also widened the definition: “Innovation refers to the process of bringing any new problem solving idea into use (after Kanter 1983).” Innovations do not have to be new; they can combine previously existing elements: “an innovation can consist of the use of a known element, but in a way which is new for a specific market.”⁷

The key elements across the many definitions are creating something that is either new, or creating a new combination of existing elements and putting it into practice. Yet, the striking thing in all these definitions is that there is an absence of any value judgement. New things appear all the time, or new combinations of things appear, but they would not *all* be viewed by “the man on the Clapham omnibus”⁸ as innovations. This absence will be explored through the literature review and case studies. This paper will therefore use a wide definition, absent of any value judgement, and that avoids specifics or a litany of types:

Innovation is the doing of new things or a new combination of existing things.

⁵ OECD Directorate, “OECD Glossary of Statistical Terms - Innovation Definition,” Stats.Oecd.Org, last modified 2019, accessed April 12, 2019, <https://stats.oecd.org/glossary/detail.asp?ID=6865> and Jan Fagerberg, David C. Mowery and Richard R. Nelson, *The Oxford Handbook of Innovation* (Oxford: Oxford University Press, 2013), quoted in Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 24.

⁶ From Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 24.

⁷ Jon Sundbo, *The Theory of Innovation* (Cheltenham: Edward Elgar, 1998), 1, 3, 22.

⁸ A phrase used in English law to personify a hypothetical “reasonable man.”

Literature Review

There is no single, agreed theory of innovation, or even obvious schools of thought. This literature review will trace innovation theory from its origins through to the modern day in an attempt to identify agreement between scholars on the determinants of innovation. One author, Jon Sundbo, a Danish academic, suggested in his 1998 work *The Theory of Innovation* that there are three broad stages in the development of innovation theory, the emergence of which can be linked to economic cycles. Many of the determinants suggested by scholars have been disproved or challenged as inconclusive owing to later evidence, but there are four determinants on which a number of studies agree: organizational culture, effective use of knowledge, experimentation, and the acceptance of risk and absence of constraints.

Innovation theory originated as a field of study after Joseph Schumpeter's 1934 work, *The Theory of Economic Development*. He saw innovation as being responsible for new growth in the economy and linked to entrepreneurship.⁹ Sundbo highlighted that early work was based on economics. One possible inference is that the value of an innovation is interpreted in a monetary sense, but this paper will return to this topic later.

Sundbo provided one of the widest treatments of innovation as a field of study and one in which his stated aim was to contribute to "the structuring of innovation theory." He took as his origin that the "innovation theory of the economy is usually attributed to Joseph Schumpeter (1934, 1939, 1943), although certain elements are much older." He moved on to show the explosion of literature, mainly in the business arena, that occurred from the 1980s onwards and he attempted to categorize the many theories. He identified a "variety of views of the process of innovation and the factor that creates innovation," suggesting that theoretical studies either approach the subject from a technological development viewpoint, or from a focus on the

⁹ See Schumpeter et al., *The Theory of Economic Development*, Chapter IV.

individuals (entrepreneurs) that create or develop new elements, or from a view that innovation is driven by market forces.¹⁰

Sundbo defined these schools of thought as “paradigms,” based on Thomas Kuhn’s theory of the way in which dominant ideas (paradigms) take hold until they are subsequently revised. Each of Sundbo’s three paradigms claims that a different factor determines innovation: which led him to the concept of “determinants” of innovation. He called the 19th century into the early 20th century the “entrepreneur paradigm,” the 1930s to 1960s the “technology-economics paradigm” and the period of his writing in the 1990s as the “strategic paradigm.” He linked his paradigms to economic cycles, 50 year “long waves” identified by economist Nikolai Kondratiev in 1935. The cycles of the economy cover prosperity, recession, depression, and recovery. Sundbo admits that his tracking of the third paradigm is in part predictive, but sees the evidence of innovations clustering together as being linked to recovery periods of the economic cycle, when paradigm shifts occur and new determinants arise. He postulated that innovations cluster together in these recovery periods, in support of Schumpeter’s original hypothesis.¹¹

So, while there is no dominant theory of innovation, there are multiple and varying explanations of the determinants of innovation and, during this literature review, some common themes eventually emerge. Professors Jerald Hage and Marius Meeus, in their study of the determinants of innovation, took a multi-disciplinary approach in their work, incorporating the work of economists, sociologists, management specialists, political scientists, and historians of science. In their view, work to date has suffered from too narrow a focus. It might be suggested that, just as innovation combines new elements from elsewhere, the best hope of understanding it is to draw widely from outside one’s own discipline.

¹⁰ Sundbo, *The Theory of Innovation*, 3-4.

¹¹ Sundbo, *The Theory of Innovation*, 16-18, 40; Jerald Hage and Marius T. H Meeus, *Innovation, Science, and Institutional Change* (Oxford: Oxford University Press, 2009), 28.

Organizational culture and structure emerge as the most commonly discussed determinants, but hard evidence is elusive. Sundbo's analysis of the available scholarship concluded: "[s]tudies have been so few and the development of theoretical understanding so inadequate" as to leave him dissatisfied, but agreed with the first major empirical study by Burns and Stalker in 1961, which showed: "[t]he dimension that made the difference in innovation capability was the overall organizational arrangement and management philosophy . . . It is the company's whole attitude that decides its innovative capability."¹²

Sundbo explained the difference between a "mechanical" culture, which inhibits innovation, and an "organic" one, which promotes innovation. A democratic management structure, professionalization, and a vision that focuses the whole organization are what he viewed as the three essential elements for innovation. Military professionals should be aware that if culture is changed to a point where it undermines professionalism, it can have a negative impact on the organization. The development of paradigms tracked by Sundbo sees the fourth Kondriatev wave leading to a "focus on informal social systems" that harnesses the creative potential of the workforce, where culture creates the conditions for innovation by building a fertile ecosystem. Innovation management is, therefore, "[l]ess a question of leading a company towards the right technical inventions and more a question of creating the right social organization to generate innovations . . . every employee is a potential innovation source."¹³

Organizational culture as a determinant raises questions about Schumpeter's entrepreneur theory, where the entrepreneur is the agent creating innovation and thereby economic value. Schumpeter's hypothesis is hard to reconcile with *organizations* that successfully innovate (the focus of this study) and Sundbo claims this led to the development of the concept of the "intrapreneur" in Kanter and Pinchot's work: someone with entrepreneurial characteristics who

¹² Sundbo, *The Theory of Innovation*, 82.

¹³ Sundbo, *The Theory of Innovation*, 92.

exists within an organization. “Intrapreneurs” are uncomfortable in structure, with success within an organization (as opposed to individual success) arising from the use of ad hoc groups where “the members are recruited because of their entrepreneurial talents” as the most effective way to harness their ideas and individual talent.¹⁴

Garza-Reyes et al. saw organizational culture as an important part of what they refer to as the “internal context,” agreeing with Sundbo and others that it “plays a significant role in innovation.” They distinguish between the two most common cultures: a “role culture,” where the culture is based on rules and knowing what your role and responsibilities are, and a “power culture,” where a central individual wields the power in a company. They believe that “the evidence reported [in their study] will show role culture is not normally supportive of innovation, since the procedures and rules often act as barriers.” Yet “power culture,” fares no better, although there are “fewer rules and regulations; however, there is no evidence to suggest that these are more innovative.”¹⁵ Whilst evidence exposes potential assumptions about the effect of culture and suggests the two main types of culture are not effective in promoting innovation, there are other culture types that do. Culture is an important factor, but the evidence shows not always in the way in which people might assume.

Hage and Meeus’ work analysed a range of possible organizational determinants, but in comparing eighteen separate studies, there are few definitive conclusions from the evidence available to them. Capital intensity, diversification, exports, and technical knowledge are all unproven, with evidence that supports and disproves their link to innovation. Hage and Meeus are more convinced that there is some evidence for the notion that external ownership negatively impacts innovation. Importantly, they stated that the evidence that firm size is a determinant of

¹⁴ Sundbo, *The Theory of Innovation*, 83, 92, 120, 172. See also Rosabeth Moss Kanter, *The Change Masters* (London: Allen & Unwin, 1984), and Gifford III Pinchot, *Intrapreneuring* (New York: Harper & Row, 1985).

¹⁵ Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 82

innovation is inconclusive, despite it being the determinant that was “by far the most researched variable in our sample.” Their analysis points to factors that benefit smaller companies (new products and new markets), but which are offset by the generic advantages of large companies (investment in R&D, reserves of knowledge, capital, resources and the ability to take risks), thus proposing an explanation for the neutral effect. This position is supported by Sundbo’s analysis: “we cannot conclude one way or the other” regarding the effect of firm size.¹⁶

In addition, Hage and Meeus examined the role of profit, concluding that it “does not significantly influence product innovation,” where one might expect it to be the determinant that has the most effect in an economics-based field of study. They are supported by Sundbo, who stated that whilst entrepreneurs are profit creators, it does not empirically follow that wealth creation is their motivation. Sundbo highlighted that later studies show entrepreneurs are driven by motives other than profit.¹⁷

There is agreement that knowledge is an important part of innovation. Hage and Meeus’ collection identified “the greater influence of knowledge as both a resource and a powerful agent for change,” going on to refer to the “knowledge dynamic,” before outlining that the study has “identified three consistent findings about the determinants of organizational innovation: the complexity of the division of labour, the organic structure and the adoption of high risk strategies.” From their work, knowledge is seen as foundational but it is also hard to define exactly how it contributes to success, moreover, they added to it the concept that collective learning, when added to the existing stocks of tacit knowledge, leads to new knowledge or innovation.¹⁸ Garza-Reyes, Kumar, Martinez-Covarrubias and Kim in their work, *Managing Innovation and Operations in the 21st Century*, agree that knowledge is a determinant:

¹⁶ Sundbo, *The Theory of Innovation*, 86.

¹⁷ Hage and Meeus, *Innovation, Science, and Institutional Change*, 41, 45, 46; Sundbo, *The Theory of Innovation*, 87, 76.

¹⁸ Hage and Meeus, *Innovation, Science, and Institutional Change*, 3-13.

“knowledge plays a significant role in innovation activity.”¹⁹ Knowledge is necessary then, but it is not sufficient.

Experimentation is the next determinant over which some agreement exists. Bettina Von Stamm’s 2008 work, *Managing Innovation, Design, and Creativity* highlights experimentation as one of four focus areas to promote an innovation culture, the others being “collaboration and competition”, “fun and focus,” and a commitment to innovation.²⁰ Within the topic of experimentation, Garza-Reyes et al. cite the need for an acceptance of failure, the willingness to terminate a project when it is unsuccessful, and a “can do” attitude. From their characterization, it is easy to see the lines blurring between determinants: is a “can do” attitude a facet of experimentation, or is it organizational culture? Arguably, attitude is a cultural component, but one which contributes to the acceptance of the need for experimentation, despite Garza-Reyes et al.’s classification to the contrary.²¹

Downes and Nunes support experimentation as a marker for success, but without using the term “determinant.” “The innovators get it wrong, wrong, wrong – and then unbelievably right.” This idea of constant experimentation and failure is embodied in a quote attributed to Thomas J. Watson, president of IBM: “if you want to succeed, double your failure rate.”²² According to Downes and Nunes, “when cost is low and expectations are modest, entrepreneurs can just launch their ideas and see what happens.”

Experimentation is closely linked to two other determinants common across the studies, those of accepting risk and a lack of constraints. Downes and Nunes entwine the ideas of experimentation and absence of constraints: “Twitter still practices innovation based on

¹⁹ Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 25.

²⁰ B. von Stamm, *Managing Innovation, Design and Creativity* (Hoboken, NJ: John Wiley & Sons Inc., 2008), 474-480.

²¹ Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 84.

²² Quoted in David Mayle, *Managing Innovation and Change* (London: Sage Publications, 2006), 249.

experimentation. According to (Twitter) CEO Dick Costolo, Twitter development teams can release experimental features to one percent of users whenever they want. ‘No legal, communications or CEO approval needed’, he says.”²³ Downes and Nunes are probably the strongest supporters for the removal of constraints, and, if they cannot be removed, they identified that there is always someone who can: “your new competition operates without any of your constraints and doesn’t play by the old rules.”²⁴ Hage and Meeus’ three determinants of organizational innovation cited previously included the adoption of high risk strategies, a factor highlighted by Hill et al. in *Collective Genius: The Art and Practice of Leading Innovation*, where they showed examples of leaders willing to be openly vulnerable in front of their organization, “so that others are willing to take the risk.”²⁵

Finally, the review of existing literature has established context as an important factor. In their findings, Hage and Meeus’s work concluded that there may be contextual conditions (external factors) under which the determinants of innovation vary and that the context is shaped by the type of industry, stages in the lifecycle, and the role that the firm plays in encouraging innovation (also a facet of organizational culture). They concluded that further, single-industry studies are required to determine the extent context plays in the determinants of innovation. The environmental determinants they listed are also part of this context: competition, concentration, technology opportunity, appropriability conditions, and the growth of demand.²⁶

Garza-Reyes et al. called this the external context, with the internal context being primarily organizational culture and structure. Geography influences innovation, with innovative activity unevenly distributed across each landscape. “Silicon Valley” is an example of this

²³ Downes and Nunes, *Big Bang Disruption: Strategy in the Age of Devastating Innovation*, 37-39.

²⁴ *Ibid.*, 7.

²⁵ Linda A. Hill et al., *Collective Genius: The Art and Practice of Leading Innovation* (Boston, MA: Harvard Business Press, 2014), 221.

²⁶ Hage and Meeus, *Innovation, Science, and Institutional Change*, 47-51.

concentration, but studies do not examine how the momentum gained from successful companies in that location reinforces this geographical concentration. They highlighted the external aspects that affect the capacity to innovate: “[t]hese range from patterns of learning and innovation in different economic sectors, the degree of competition and market structures in inputs and outputs . . . and agglomeration effects emerging due to proximity to a spatial concentration of businesses, to name a few.”²⁷

The determinants selected for study from this review, owing to an agreement of their importance across a number of studies in the available literature, therefore, are: organizational culture, effective use of knowledge, experimentation, and the acceptance of risk and absence of constraints. As the case studies available for this research are from the same sector, context as a determinant will be placed to one side and re-examined later.

Case Study One – Google

The Google case study provides evidence of the chosen determinants in action. The founders of Google have invested in Google’s organizational culture. This includes designing the facilities and layout of its main headquarters, building a meritocracy in the organization, and using small teams and allocating time for engineers to develop their own projects that are then subject to peer review. Google’s founding idea of internet search is based on the effective use of knowledge, which is expanded both through acquisitions and through hiring those with a desire to learn and to increase Google’s stock of knowledge. Experimentation is a vital part of Google’s strategy, releasing software so it can be improved in an iterative, experimental process. When experimenting, employees are urged to use their failures to improve or morph failed concepts into successful ones. Google actively tries to free its employees from constraints and presses them to take risk, one consequence of which is to force employees to rely on each other when things

²⁷ Garza-Reyes et al., *Managing Innovation and Operations in the 21st Century*, 37, 38.

become uncomfortable. Google's approach allows the determinants of innovation to reinforce one or more of the others, creating a virtuous circle.

Google has built a reputation on innovation. Google could be the poster child for the new market entrant and grew out of the creative wave at Stanford University in the late '90s. Much of the environment created by founders Larry Page and Sergei Brin at Google reflects that atmosphere, or what Eric Schmidt, the latecomer as Google's CEO, referred to as "the primordial ooze" that allows innovation to flourish so consistently. "The soul of the Google machine is rapid innovation," observed Vise and Maseed in their study *The Google Story*.

Google has actively tried to protect the "secret" to its success and relies heavily on non-disclosure agreements to protect its insights, but, much like the quirky questions posed to interviewees in the "Google Lab Aptitude Test" (GLAT), details eventually seep out.²⁸ Insiders also profit from selling their experience, which allows an understanding of life on the inside of the company, as is the case in Eric Schmidt and Jonathan Rosenberg's book *How Google Works*. The key question of Google's rise is posed by Bernard Girard at the outset of his book: "Can it be used as a model, or did Page and Brin just come along at the right time and understand how to take advantage of the entrepreneurial climate in Silicon Valley?"²⁹

Organizational Culture

Google's organizational culture sets it apart. In its battle with rival Microsoft, Google deliberately points to a contrast between Microsoft's corporate culture and its own, which Google feels it wins hands down. While there are many facets of this culture, all of which combine to influence the other determinants, it is culture that enables Google to take its raw material, people, and produce the conditions for rapid and continued innovation.

²⁸ For details of the GLAT, see Vise and Malseed, *The Google Story*, Appendix II.

²⁹ Eric Schmidt and Jonathan Rosenberg, *Google: How Google Works* (New York, NY: Grand Central Publishing, 2014), 201; David A Vise and Mark Malseed, *The Google Story* (New York, NY: Bantam Dell, 2006), 6; Bernard Girard, *The Google Way* (San Francisco, CA: No Starch Press, 2009), 24.

Brin and Page set out to recreate the campus atmosphere they enjoyed together at Stanford. “The Googleplex,” their headquarters, is renowned for its facilities for leisure and relaxation. Knowing that engineers often keep odd hours, staying in their labs until the early hours of the morning, they set out to create a business from which workers would have no need to go home, where everything would be on-site, from dining to leisure to laundry facilities. Evans notes that “they try to structure the working environment so that creative people feel comfortable and have to interact.” This “coerced” interaction is done with the intention of creating a serendipity to which the analysis will return later. Vise devotes a chapter to Charlie Ayers, the chef hired to create healthy and inspiring menus that are free to employees. He has entered into Google folklore. Brin and Page knew that free food throughout the complex was not just a neat gimmick to entice post-student engineers, but also a way to ensure both the health and nutrition of their best asset and keep people on-site and eating together – once again, this interaction contributes to creating the “primordial ooze” ecosystem in which innovation can flourish. In Vise’s view, from facilities to food, “it was all part of making work fun and fostering a creative, playful mindset.”³⁰

One of the features of the Googleplex is the apparent lack of office space, a quite deliberate tactic to ensure that employees “work, eat and live together.” This is supported by a flat hierarchy which brings proximity: “in the Internet Century, a product manager’s job is to work together with the people who design, engineer, and develop things.” Schmidt recalls “the place was always a zoo,” with engineers freely moving in to share his office (as CEO) simply because there was more space in there than in the office next door. Former CEO Eric Schmidt and Senior Vice President of Products Jonathan Rosenberg eventually embraced the logic of this chaos, pointing out a study that concluded “orderliness seemed to encourage a general mindset for

³⁰ Harold Evans, *They Made America: From the Steam Engine to the Search Engine: Two Centuries of Innovators* (New York, NY: Back Bay Books, 2006), 464; Vise and Malseed, *The Google Story*, 94, 192.

conservatism and tradition,” and declaring, “Messiness is a virtue. When offices get crowded, they tend to get messy too. Let them. Messiness is not an objective in itself, but since it is a frequent by-product of self-expression and innovation, it’s usually a good sign.”³¹

Another feature of the organizational culture is what Schmidt and Rosenberg referred to as “meritocracy, not tenurocracy,” where value does not rest on time served, but on impact. In their chapter entitled “Organize the Company around the People Whose Impact Is the Highest,” they further placed valuing people at the center of Google’s organizational culture, not just rewarding people, but structuring around them to get the most out of the exceptional people they employ.³² Page’s view on how to treat people includes extending trust to those on the inside, and sharing “confidential” performance data as openly with employees as they do with the board. “I believe if you give people a lot of responsibility and respect, then the company gets that back.”³³

One element of structure to which Google adheres wherever it can is using small teams. The founders felt that it is key to maintaining the pace of both new innovations and projects that are underway. Brin and Page called it the “Bezos Two Pizza Rule” after Amazon founder Jeff Bezos, who said that if you cannot feed a team on two pizzas, then the team is too large. For Google, small teams are more effective, more productive, and more innovative.³⁴

Google allows its engineers (and only its engineers) to devote twenty percent of their scheduled time to their own projects, which, aside from the pool tables and lava lamps, is perhaps the most well-known aspect of Google’s culture. The policy is often misconstrued to apply to all employees. Critics suggest that this restriction to engineers only, which implies that other employees are not innovative, may in time create a “two-tier” human resources (HR) policy.

³¹ Schmidt and Rosenberg, *Google: How Google Works*, 38, 39; Vise and Malseed, *The Google Story*, 110.

³² Schmidt and Rosenberg, *Google: How Google Works*, 42-47.

³³ Evans, *They Made America: From the Steam Engine to the Search Engine: Two Centuries of Innovators*, 464.

³⁴ Schmidt and Rosenberg, *Google: How Google Works*, 46.

Certainly, it appears from the available evidence that Google's HR effort is invested in its "smart creatives,"³⁵ but evidence of a split in its workforce has not emerged. Indeed, while the perk may not be given to all, insiders and observers support the fact that "Google's culture values ideas from any employee"³⁶ and that "ideas come from anywhere."³⁷ This notion seems obvious and must surely be employed by every organization, but in Girard's analysis "this concept may be simple and obvious, but its implementation is limited."³⁸

The twenty percent time idea is borrowed both from 3M's "fifteen percent time," which is credited with the development of the "Post-It" note and Scotchgard among many other innovations, and also from universities, where academics are given time to devote to their own research, away from teaching, as witnessed by Brin and Page during their formative time at Stanford. At 3M, former chairman of the board William McNight called it "experimental doodling." Supporters of the policy point to Steve Wosniak's development of the personal computer that would go on to be the Apple I while he was at Hewlett-Packard, where he was told it was not a priority and that he should not "waste time on it."³⁹ Krishna Bharat, head of Google's research division highlighted the benefit of this bottom-up approach, saying that "[t]here is only so much that top management can specify or ordain." This point was supported by Google engineer Joe Beda in an online forum, where a Microsoft technologist's response, while loyal, rather proved their point: "I'm already working on what I want to work on," said the Microsoft employee. It is easy to picture how a "boss knows best" mindset that specifies what is needed can limit innovation.⁴⁰

³⁵ Schmidt and Rosenberg, *Google: How Google Works*, 16.

³⁶ Girard, *The Google Way*, 79.

³⁷ Schmidt and Rosenberg, *Google: How Google Works*, 231.

³⁸ Girard, *The Google Way*, 80.

³⁹ Girard, *The Google Way*, 64-65.

⁴⁰ Wise and Malseed, *The Google Story*, 131-132, 140.

The next step in the Google process is just as important: personal projects are subject to peer review before the best are selected and taken forward as Google projects. In Girard's view "the peer review policy is just as important (as the 20 percent rule) in filtering out the best projects for development." This stage serves several purposes, filtering, as already mentioned, but also attracting others to the project and generating a sense of peer approval and reputation building, what Girard refers to as a "competition for honor." This peer approval reinforces meritocracy: ". . . better yet, the outcome depends not on seniority, but on brainpower, qualifications and fluency in the language of technology." The policy also has fringe benefits, as it provides a way of making engineers feel valued and respected among their peers, part of solving the problem Schmidt identified in an article to which he contributed while at Novell called *How to Manage Geeks*: he identified the key challenge faced by employers was to "find a way to give them promotions [or other recognition] without turning them into managers."⁴¹ This article will be returned to later, as it may provide lessons for cyber organizations in a military context.⁴²

Knowledge

Google's origins are in internet search, which is the codification, classification, and organization of knowledge and making that knowledge accurate and accessible as efficiently as possible. Schmidt and Rosenberg pointed to the benefits of "establishing a culture of 'yes'" because "[s]aying yes is how things grow . . . [and] . . . will lead you to new knowledge and wisdom."⁴³

⁴¹ R. Mitchell, "How to Manage Geeks," *Fast Company*, last modified 1999, accessed February 7, 2019, <https://www.fastcompany.com/37145/how-manage-geeks>.

⁴² Girard, *The Google Way*, 69,70-71.

⁴³ Schmidt and Rosenberg, *Google: How Google Works*, 53.

Google is not beyond buying knowledge, for if, as was noted earlier, it believes that “ideas come from anywhere,”⁴⁴ then it stands to reason that Google is not the sole locus of knowledge. Part of the strategy for accessing knowledge is demonstrated by its partnership with academic institutions, but Google also “excels at buying ideas.” From 2001-2008 Google acquired more than 50 companies, but an analysis of “why” is important: “Google acquires for innovation, not consolidation.”⁴⁵

Learning is an important factor in expanding knowledge. Schmidt and Rosenberg “hire learning animals . . . not for the knowledge they possess, but for the things they don’t yet know.” Google values the desire to expand and learn and values those who make it a priority, much as the military does:

[O]ne of the best, easiest ways to get ahead in a field is to know more about it. The best way to do that is to read. People always say they don’t have the time to read, but what they are really saying is that they aren’t making it a priority to learn as much as they can.⁴⁶

Experimentation

Schmidt and Rosenberg asserted that “the cost of experimentation and failure has dropped significantly,” including for manufactured goods, which allows Google to keep so many projects running. They reinforced the points, “Experimentation and the cost of failure – if done well – is much lower than it used to be.”⁴⁷

Once projects are underway, part of “the Google Way” highlighted by Girard is to “release early and release often.”⁴⁸ Releases are often not heralded by announcements and released to a pool of privileged users (early adopters), which shortens development time and

⁴⁴ Ibid., 231.

⁴⁵ Girard, *The Google Way*, 84.

⁴⁶ Schmidt and Rosenberg, *Google: How Google Works*, 102, 139.

⁴⁷ Ibid., 15, 16.

⁴⁸ Girard, *The Google Way*, 83.

keeps the tempo of innovation high, unencumbered by a schedule. The aim is for the feedback to allow early fixes without a significant volume of complaints. Vise points out the dangers of Google's purely in-house testing in the early days, creating a Googleplex "echo chamber." When users discovered Google's Gmail scanned private messages to target advertisements to users, a furor arose over privacy concerns that could not be ridden out and needed to be addressed. To the logical technologist, this invasion of privacy was really nothing new, but perceptions matter as Vise explained: "the illusion of privacy was being replaced by the appearance of surveillance." It was a learning experience, with Page and Brin taking away the difference it would have made if opinion formers actually had their hands on the product prior to an announcement. From this, the policy of selected early release and no announcements at this stage was put into place.⁴⁹

Brin subscribes to Thomas Watson's model of experimentation mentioned earlier: "the only way you are going to have success is to have lots of failures first," he said to an audience of students.⁵⁰ Experimentation and failure go hand in hand, as noted in the literature review, and Google certainly recognizes that fact, but encourages its people to "fail well." Failing well means to "[l]earn from your mistakes. . . morph ideas, don't kill them." And if all else fails, "a good failure is a fast one," so recognizing when to pull the plug is all part of the skill: ". . .when failures mount and there is no apparent path to success, it is probably time to call it a day."⁵¹

Risk and Constraint

In the introduction to Schmidt and Rosenberg's *How Google Works*, Larry Page railed against what he called "the prevailing wisdom" and its tendency to hamper the goal of autonomy of thinking. He said, "Over time, I've learned, surprisingly, that it is tremendously hard to get teams to be super ambitious. They tend to assume that things are impossible." Page learned a

⁴⁹ Vise and Malseed, *The Google Story*, 152-163.

⁵⁰ *Ibid.*, 16.

⁵¹ Schmidt and Rosenberg, *Google: How Google Works*, 237-240.

phrase in college, “a healthy disregard for the impossible,”⁵² which spurs him on to break ground others will not risk breaking. Google works to free its quality people from these constraints and promote autonomy. Schmidt describes it thus: “[T]heir plan was simple: hire as many talented software engineers as possible and give them freedom.” He goes on to say that Google was run “differently than most any other place, with employees who were uniquely empowered.”⁵³ The Google philosophy can be summarized as follows:

They are not confined to specific tasks. They are not limited . . . They are not averse to taking risks, nor are they punished or held back in any way when those risky initiatives fail. They are not hemmed in by role definitions or organizational structures; in fact they are encouraged to exercise their own ideas.⁵⁴

Google engineer Udi Manber, reflecting on his time at Yahoo, described the effect of constraints on innovation: “[I]nnovative people do not need to be told to do it, they need to be allowed to do it . . . in other words, innovation needs to be allowed to evolve organically.” The twenty percent time policy feeds into this freedom from constraint, described by Schmidt and Rosenberg as “a way to give people permission to work on stuff they aren’t supposed to work on.” They feel both that the results speak for themselves and that the purpose of it is not recognized: “twenty percent time has spawned a host of great products . . . but it is generally misunderstood. It is not about time, it’s about freedom [to follow your ideas and therefore to innovate].”⁵⁵

Schmidt and Rosenberg described bringing a master’s of business administration-standard “textbook” business plan to Page and being given short shrift. Page asked if anyone had ever beaten a schedule or delivered a better product based on the charts in a business plan. The answer was “no,” to which he concluded, “then the plan is holding us back.” It took them both

⁵² Ibid., 10.

⁵³ Ibid., xvii, 5-8

⁵⁴ Ibid., 16.

⁵⁵ Ibid., 209.

time to adjust to the Google culture, which appeared to be very much living on the edge, embodied by racing driver Mario Andretti's quote: "if everything seems under control, you're not going fast enough,"⁵⁶ and this spirit of pace, tempo and pressing on that has kept Google ahead of the competition so far. Schmidt admitted he was conservative, coming as he did from a corporate culture, and having already experienced being in a business that had run out of money. So when Google's deal with America Online put the business in a position where it could run out of money, Schmidt had deep reservations.

Yet the risk that Page and Brin took paid off, leading Schmidt to admit, "they were more willing to take risk than me. They turned out to be right."⁵⁷ Girard judged that they were unconstrained in finding their own path: "they succeeded because they had the self-assurance to buck the trends, to not conform." Yet he also pointed out that, personally, "they took few risks . . . they didn't have good jobs . . . they had little to lose."⁵⁸ His analysis is a harsh one, formed by his own values; the care Page and Brin take to enhance the reputation of their successful engineers suggests that staking their reputations on something is as, if not more, important to them than money. They risked their reputations amongst their fellow students to pursue the idea that was Google (search) and they can be said to have taken a good deal of reputational risk. As Schmidt's commentary suggested, they continue to do so.

This approach to risk and to doing the seemingly impossible, is one example of not being in full control (c.f. Andretti); a consequence of which, according to Schmidt and Rosenberg, is that employees fall back on each other, on their relationships, and on their interconnectedness in that "primordial ooze," "The business should always be outrunning process, so chaos is right

⁵⁶ Ibid., 7, 199.

⁵⁷ Wise and Malseed, *The Google Story*, 113.

⁵⁸ Girard, *The Google Way*, 25.

where you want to be. And when you are there, the only way to get things done is through relationships.”⁵⁹

Linked to the determinant of knowledge (and, by extension, learning), Schmidt and Rosenberg asserted that a desire to expand your knowledge “drives you to take risks.” This shows how in Google’s approach, each determinant mutually reinforces the others, and together they contribute to the ecosystem of innovation, and make the whole greater than the sum of its parts. ⁶⁰

Case Study Two – Apple

Apple Inc., formerly Apple Computer, is a company formed by Steve Wozniak and Steve Jobs in 1976 that has a reputation for continued innovation. In its 43-year life it has carved a ground-breaking path and the cult-like nature of its following has even been likened to a messianic movement. Separating the corporate image so successfully created and reinforced by Apple from the reality and separating the celebrity status of Jobs himself from the characteristics of the organization is difficult, but not impossible. Those who strip away the layers of hype and study Apple first find a very secretive organisation and then one which is “a giant jumble of contradictions, a company whose methods go against decades of well-established management culture.”⁶¹

Study of Apple suggests there are four phases to its development. The first phase is characterised by the unconstrained energy typical of a start-up company and summarized in a joke told to one-time Chief Executive Officer (CEO) John Sculley, that, unlike the Boy Scouts, Apple was “lacking adult supervision.”⁶² The second phase saw the introduction of expertise

⁵⁹ Schmidt and Rosenberg, *Google: How Google Works*, 200-202.

⁶⁰ Schmidt and Rosenberg, *Google: How Google Works*, 102.

⁶¹ Scott F. Mickey, “Constructing The Prophet: Steve Jobs and the Messianic Myth of Apple” (Bachelor of Arts, Bates College, 2013); Adam Lashinsky, *Inside Apple* (New York, NY: Hachette Book Group, 2012), 6-7.

⁶² Jeffrey L. Cruikshank, *The Apple Way: 12 Management Lessons from the World's Most Innovative Company* (New York, NY: McGraw-Hill, 2006), 142.

from the business world, with the aim of providing the hitherto-suggested adult supervision. Ultimately, the company was unable to achieve its aim in this period, as CEOs John Sculley, Michael Spindler, and Gil Amelio all struggled to bring control to the company and set it on a profitable basis. The third phase, and arguably most famous, was referred to by Alan Deutschman in the title of his book as the *Second Coming of Steve Jobs*, where Jobs returned to save the company and with Deutschman's title making reference to the messianic image previously mentioned. Jobs was able to bring a laser-like focus to reducing Apple's product line, refocusing on design and on the origins of Apple's success. The company, under his control and guidance, took risk and moved into new product areas, such as music players, tablets, and smartphones, which subsequently led to Apple designing an interconnected ecosystem of hardware and software that offers the integration of users' profiles and information across multiple platforms. The fourth and current phase is Apple after Steve Jobs, following his death from cancer in 2011. He was replaced as CEO by Tim Cook. The open debate is whether Apple as an organization can continue to innovate and be successful, following the death of its iconic founder.

Organizational Culture

Organizational culture at Apple is a key element of its success: it enabled Jobs' greatest successes and frustrated the best efforts of CEOs Sculley and Amelio. Apple is a centralized organic organization that eschews formal organizational charts and which, in its current form, flattens its structure to remove bureaucratic layers.⁶³ An organic organization is loosely organized, where all employees' views are acceptable, whereas a mechanistic one has layers of hierarchy and fixed roles and responsibilities. Johnson et al. suggested that "Apple treats innovation as the source of the survival and development of a business . . . and Apple has

⁶³ For a description of mechanistic versus organic organization at Apple see Mayesha Tasnim, "An Organizational Analysis of Apple," *European Journal of Business and Management* 10, no. 11 (2018), 35-40.

successfully penetrated this idea into the corporate culture.”⁶⁴ Lashinsky’s verdict after having long been a skeptic is that “I have decided I was wrong. Corporate culture is real. After a year of speaking about Apple . . . I’ve come to realize that corporate culture is critical to Apple’s success. That means culture is critical to any organization’s success.”⁶⁵

As with Google, creating the environment is also an important facet of Apple’s organizational culture, which stimulates creativity. Certainly, in its current phase, the new headquarters at the Apple II campus echoes Google’s facilities. It brings the outside inside and provides miles of walks in a natural environment, and promotes the health and wellbeing of the employees. Even Apple’s first campus at One Infinite Loop intentionally tried to encourage informal discussions at lunch, or in the corridors, where serendipitous meetings could occur.⁶⁶

Jobs’ view was influenced by Marissa Mayer, CEO of Yahoo!, who said “people are more innovative and collaborative when they are together.”⁶⁷ There is evidence that Jobs understood the need for the working environment to stimulate innovation, just as Google does. Jobs was also influenced by the environment at Bell Labs, where “the corridors were extremely long . . . designed to promote random meetings among people with different talents and specialties, a strategy Steve Jobs replicated in designing Apple’s new headquarters seventy years later.”⁶⁸ New employees to Apple are given a Mac but no details for the server, so in order to

⁶⁴ Katherine Johnson et al., “The Innovative Success That Is Apple Inc.,” *Masters of Business Administration*, Marshall University, 2012, 14.

⁶⁵ Adam Lashinsky, *Inside Apple*, 223.

⁶⁶ Adam Lashinsky, *Inside Apple*, 33; Mikhail Turilin, “Radical Innovation of User Experience: How High Tech Companies Create New Categories of Products,” *Master of Science*, Massachusetts Institute of Technology, 2010, 17.

⁶⁷ Walter Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution* (New York, NY: Simon & Schuster Paperbacks, 2015), 480.

⁶⁸ Walter Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*, 139.

connect to the network they have to find someone to talk to on their first day, an example of deliberately-forced interaction.⁶⁹

Small teams of high quality people are one cornerstone of innovation at Apple. The design team, currently headed by Johnathan Ive, is kept small, at around twelve people.⁷⁰ Whilst there are departments (such as design, marketing, etc.), all development work is project based, bringing together multi-disciplinary teams, which fosters independence and keeps the “startup” mentality.⁷¹ These teams ensure that the type of collaboration that leads to creativity and innovation is central to how they function. As Rob Schoeben, a former vice president said: “Everyone knows that seamless integration between the various parts is key to making the magic happen.”⁷²

Apple has marketed itself, at least in the third and fourth phases of its existence, as a values-based company, and whilst it has publicly stated values, the values that impact its ability to innovate can be derived by analysis of the way in which Apple operates. Apple’s stated values are posted on their website: accessibility, education, environment, inclusion and diversity, privacy and supplier responsibility. These admirable values are part of the image Apple creates and are important in varying degrees to Apple’s customer base. The majority are outward-facing values and say nothing of the values that frame Apple’s operating culture. Analysts suggest a very different set of values exists, derived from how Apple acts. For Lashinsky, they are clear direction, individual accountability, a sense of urgency, constant feedback, and clarity of mission, whereas for Tasnim they are motivated teams working together, responsible employees,

⁶⁹ Mayesha Tasnim, “An Organizational Analysis of Apple,” 38.

⁷⁰ Mikhail Turilin, “Radical Innovation of User Experience,” 47.

⁷¹ David Milan Pinzon, Inga Pauliukeviciute and Marta Nowotarska, “Employer Branding in the IT Sector: GAN Integrity Solutions Case,” Masters, Roskilde University, 2015, 58; Mikhail Turilin, “Radical Innovation of User Experience,” 65.

⁷² Adam Lashinsky, *Inside Apple*, 44, 67, 73, 81.

innovation, excellence, and secrecy. These internal values are at the heart of the way Apple creates innovation, rather than the values that frame the external image it uses to market itself.⁷³

Focus and simplicity are two contributors to Apples success. For Steve Jobs, focus was necessary to create the space to innovate. When he took over as CEO, he applied his focus to Apple’s product line and narrowed it significantly, eschewing successful ventures like the Laserwriter printer and the hand-held Newton organiser, in order to refocus on the Mac and laptops, with two variants of each. In Lashinsky’s view, simplicity is in Apple’s DNA, and Tim Cook, now CEO, boasts that the product line can fit on a conference room table. Where Google is about saying yes, Apple is about saying no. In Steve Jobs’ words, “[f]ocus is not saying yes. It is saying no to really good ideas,” and in the words of one former executive, “the minute you are doing a hundred things, you can’t possibly do things the Apple Way.”⁷⁴ The focus that comes from control enables simplicity in design, allowing an end-to-end focus, a tactic which Jobs referred to as “controlling the whole widget.” He and his design team would obsess over what others saw as the smallest details, or irrelevant criteria, such as the aesthetics of the components inside an outer cover no one was meant to look inside. End-to-end included the order in which a consumer would unbox their product, with the most important and aesthetic items being presented first. “[T]o some critics, this level of control – which they claim to reflect Jobs’ personality – is a fault.”⁷⁵

For the current phase of Apple’s journey, the question is whether the culture so painstakingly fashioned by Jobs will outlive him. Will Tim Cook and the remaining Apple leadership retain enough of the culture that made them so innovative in order to keep innovating? It is entirely possible that a new culture will also stimulate similar levels of innovation.

⁷³ Adam Lashinsky, *Inside Apple*. 74; Mayesha Tasnim, “An Organizational Analysis of Apple,” 37.

⁷⁴ Adam Lashinsky, *Inside Apple*, 60-61.

⁷⁵ Gini and Green, *10 Virtues of Outstanding Leaders*, 162, 169.

Lashinsky offers that Jobs created many of the Vice Presidents in Apple in his own image, each with a facet of his character, but none has all of them. Jonathan Ive has his love for design and aesthetics, but with none of his aptitude for business. Tim Cook has the vision, values and focus to make Apple's operations a success. Not all of Jobs' handpicked Vice Presidents survive, Scott Forstall being fired in the wake of a failed release of mapping software. Critics claim that Apple is now only delivering incremental innovation, but this is, in part at least, part of the strategy of delivering frequent product updates and designing in obsolescence, thus encouraging sales of the latest model.⁷⁶ Lashinsky reflected that Tim Cook is well practiced in reciting Apple mantras (simple not complex, great products, saying no, and collaboration) easily in interviews, so is maintaining the same core culture. The contrary view is that "Apple needs a brilliant product guy and Tim isn't that guy." It is too early to have definitive evidence, but the signs are that Apple has enough of the skills Jobs embedded in the company to give it the best chance of continuing its successful innovations.⁷⁷

Knowledge

Acquiring, sharing, and building knowledge are important parts of Apple's story. In a version of Apple's values posted on its website in 2012, owning and controlling its primary technologies was one of the seven Apple values.⁷⁸ For Apple, the focus on knowledge includes acquiring it from others and using its structure to spread knowledge between individuals. The creation of Apple University is one recent example of its attempt to improve the knowledge base from inside the company. Above all this, Steve Jobs was information-gatherer-in-chief, open to learning from a diverse range of sources and encouraging others to do the same.

⁷⁶ "Is Apple Losing its Innovation Edge?" Knowledge@Wharton, Oct 30 2018, accessed March 19, 2019, <http://knowledge.wharton.upenn.edu/article/apple-innovation-edge/>.

⁷⁷ Adam Lashinsky, *Inside Apple*, 88, 122, 160.

⁷⁸ Katherine Johnson et al., "The Innovative Success That Is Apple, Inc." (Paper 418, Marshall University, 2012), 3.

Apple's use of small teams has previously been examined, but the multidisciplinary nature of its teams improves the spread of knowledge. Former senior designer Mark Kawano pointed to knowledge and ideas spreading in an organic way, "There wasn't a formalized library [of these ideas], it was more having a small team and knowing what people had worked on, and the culture of being comfortable sharing."⁷⁹

Like Google, Apple takes a focused approach to its acquisitions, acquiring companies for their ideas and knowledge in key areas. Many technical companies complete acquisitions to achieve growth of their market share by removing competition. Not so for Apple, which grows its market share through the excellence of its products and acquires companies in order to buy ideas. In a ten-year period, Apple bought only twelve companies and through its acquisitions, sought to buy the ideas and knowledge needed to innovate.⁸⁰

Apple secured financial investment from Xerox, for example, in exchange for access to Xerox's Palo Alto Research Center (PARC), which led to the graphical user interface (GUI) used in the Macintosh. "The creativity of the PARC team, combined with the design and marketing genius of Jobs would make the GUI the next great leap . . ."⁸¹ Here we see the combination of preexisting elements that delivers innovation: Apple certainly was not the first to see the GUI, the team had given hundreds of presentations, but Jobs could see its application, whereas the "copier heads" at Xerox could not. In Isaacson's view: "[O]nce again the greatest innovation would not come from the people who created the breakthroughs, but from the people who applied them usefully."⁸² Jobs had an insight that gave him a good feel for the future and called it "one of those

⁷⁹ Mark Wilson, "Four Myths about Apple Design," *Fast Company*, 2014, 32.

⁸⁰ Adam Lashinsky, *Inside Apple*, 25.

⁸¹ Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*, 363.

⁸² Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*, 364.

sort of apocalyptic moments.”⁸³ “I thought it was the best thing I’d seen in my life. It was obvious to me that all computers would work like this one day. It was so obvious once you saw it.”⁸⁴

Apple acquired SoundJam to kickstart its iTunes offering on the back of the smaller company’s knowledge and acquired the company Siri whose technology and name would become Siri, the iPhone’s personal assistant.⁸⁵

The creation of Apple University as one of Steve Jobs’ final acts is seen as a way to infuse his values and approach in a new generation of Apple executives. Apple has employed a number of senior professors of business studies to create a curriculum surrounded by secrecy. What can be gleaned indicates that both successes and failures of Apple are used as case studies, alongside those from other businesses, with the aim of spreading knowledge to the next generation of Apple executives. Classes are delivered by Apple executives, supported by professors. Through the creation of Apple University, Apple is signaling the importance it places on acquiring and spreading knowledge, the Apple way.⁸⁶

Finally with regards to knowledge as a determinant, Steve Jobs led by example as Apple’s information gatherer-in-chief, a role that now falls to others to perform. The cult of personality often suggests that Jobs had an innate sense of design and style. Although he was not born with a perfect eye for design, he sought to expand his knowledge. He would examine the aesthetic of other sectors, such as car design or plastic kitchen appliances, to inspire the plastic moldings for the Macintosh. Alan Deutschman, in the Sony sales office with which Apple shared a building in the early days, recalled, “Steve would come over and look with great interest at Sony’s marketing materials . . . He would feel the paper stock to get a sense of its weight and

⁸³Karen Blumenthal, *Steve Jobs: The Man Who Thought Different* (Harrisonburg, VA: R.R. Donnelly & Sons Company, 2012), 91.

⁸⁴ Gini and Green, *10 Virtues of Outstanding Leaders*, 161.

⁸⁵ Blumenthal, *Steve Jobs: The Man Who Thought Different*, 212; Adam Lashinsky, *Inside Apple*, 1-3, 193-5.

⁸⁶ Adam Lashinsky, *Inside Apple*, 160.

quality...but his judgment was not yet highly developed.”⁸⁷ Of the current executives, Jonathan Ive, at the very least, demonstrates a similar thirst for knowledge, seeking out a samurai sword maker to broaden his knowledge of working with metal. There is likely to be some showmanship and image forming in publicizing such a trip, but it did push forward his knowledge in an important area.⁸⁸

Experimentation

Experimentation permeates Apple’s approach to product development, with iterative design that experiments as much with the manufacturing process as it does with the design process. Not all of the projects put forward by designers and engineers become official projects, but those that do go through an iterative process of development, with significant research and development (R&D) investment leading to both success and failure. Finally, there is an indication of change in the current phase of Apple’s existence, with the start of early releases of software applications, a tactic that has not been used previously.

Not all concepts at Apple become official projects, but, of those that do (after an employee has first convinced a vice president to champion the concept), Mikhail Turilin’s master’s research estimates that 90 percent of those that are approved make it to market.⁸⁹ Michael Moritz, in his 1984 study of Apple, was clear that there was no master plan: “There was no plan of Napoleonic proportions. False starts, diversions, mistakes, experiments, rebellion and competition formed the stuff of the machine.”⁹⁰ Turilin’s study goes on to outline Apple’s iterative design process and wide use of prototyping, which means not only is the design process iterative, but manufacture is also. Many companies will perfect a design in-house first, before outsourcing manufacturing, but Apple does both simultaneously, building, testing and

⁸⁷ Jeffrey L. Cruikshank, *The Apple Way*, 32.

⁸⁸ Adam Lashinsky, *Inside Apple*, 102.

⁸⁹ Mikhail Turilin, “Radical Innovation of User Experience,” 19.

⁹⁰ Michael Moritz, *The Little Kingdom* (New York: W. Morrow, 1984), 129.

rebuilding.⁹¹ In pursuing innovation, Apple places pressure on itself through designed-in obsolescence. The benefit is that customers replace products, but the corollary is that Apple has to innovate successfully to meet demand and user expectations, which it does through the use of small teams. Indeed, the small-team dynamic that arises from Apple's approach has been referred to as "group mania" by one of the members of the original Mac team, whereby designers can be stuck in an analytic cycle of new problems, followed by solutions, which lead to new problems, in a continuously experimenting cycle.⁹²

Apple has always been happy to allocate resources to getting things right . . . and wrong. Spending on R&D has been a focus for CEOs John Sculley, Gil Amelio, and Steve Jobs, even when Amelio and Jobs successively tried to establish a positive balance sheet. Apple's R&D investment has been steadily rising since 2010, quoted in financial e-news site Motley Fool as \$15 billion this year: "Apple is one of the biggest spenders on research and development (R&D) in the world of technology."⁹³ Examples of this willingness to experiment are a packaging designer opening 100 packaging boxes just to find the one which gave the best user experience and, in the realm of marketing, sending a professional film team to Hawaii to reshoot a promotional video designed to publicise video editing software for the Mac.⁹⁴

There are signs of change in this current phase of Apple's journey. For the first time, under CEO Tim Cook, Apple released a product in a *beta* (not yet finished) version. This is common practice for Google, as this paper has shown, but was a departure for Apple, albeit one sanctioned by Jobs at his final board meeting before taking a permanent leave of absence.

⁹¹ Adam Lashinsky, *Inside Apple*, 57.

⁹² Ikujiro Nonaka and Martin Kenney, "Towards a New Theory of Innovation Management: A Case Study Comparing Canon, Inc. and Apple Computer, Inc.," *Journal of Engineering and Technology Management* 8, no. 1 (1991), 76.

⁹³ Ashraf Eassa, "Should Apple Investors Believe Tim Cook's Promise of Innovation? - The Motley Fool," *The Motley Fool*, last modified 2019, accessed March 21, 2019, <https://www.fool.com/investing/2019/03/05/should-apple-investors-believe-tim-cooks-promise-o.aspx>.

⁹⁴ Adam Lashinsky, *Inside Apple*, 49.

Perhaps, in order to keep the pace of innovation high, Apple will adopt this common tactic, but the loss of Scott Forstall following the release of a mapping application that was immature, shows that both success (Siri, now widely copied) and failure (Apple maps) await.

Risk and Constraint

In the words of Lashinsky, “Apple institutionalized a culture of playing by its own rules.” From its origins, Apple has taken risk and acted on opportunity. It has cultivated an approach as a renegade that removes constraints and encourages its workers to think big. This lack of constraint does not apply to all its employees, however, only those who prove themselves and in particular areas. This might lead to a belief that Apple is unstructured, which is far from the case. There is a strict product playbook, but one which aims to formalize the science, so teams can focus on the art. Finally, Apple accepts risk by moving into new markets and in doing so, has transformed the company from a hardware and software company into one that offers a family of products that support an ecosystem of digital life.⁹⁵

Apple’s first order, for fifty computers from Paul Terrell at the Byte Shop, was made at a stage when “the tiny company had no parts, no money and no place to put the computers together,” a move not many entrepreneurs can pull off. Yet Jobs had a way of taking the risk, without any “mitigation strategy” and still managing to deliver. Bud Tribble on the Macintosh team referred to this trait as the Steve Jobs “Reality Distortion Field,” borrowing a concept from the television series *Star Trek*: “he can convince anyone of practically anything. It wears off when he’s not around.”⁹⁶ Not only this, but he also “set impossibly high goals,” but for good reason, because he, like Page and Brin, knew that “because he pushed so hard, he sometimes made the impossible come true.” A concrete example of this was urging glass firm Corning Inc., which made the toughened glass for the iPhone, to improve their design, to build and establish a new

⁹⁵ Adam Lashinsky, *Inside Apple*, 143.

⁹⁶ Ibid., 107 and Isaacson, *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*, 150.

production facilities and for it to be active within six months: “get your mind around it, you can do it,” Jobs said. They did.⁹⁷

“Apple fashioned itself early as a renegade” according to Lashinsky, citing Jobs flying a pirate flag over the building of the first Mac team.⁹⁸ Examples abound of ways in which Apple is unconstrained by things others assume to be sacrosanct. In its early phase, R&D spending was unlimited.⁹⁹ Design teams were never encouraged to think about profit and loss or feel constrained by budgets. Their job was to design great products and, on Jobs’ return, the CEO and chief financial officer would be the only ones to worry about the balance sheet: “they [the employees] have access to unlimited resources to do interesting things.”¹⁰⁰ Nor was the company that interested in Wall Street investors, certainly neglecting to provide returns to shareholders: “Apple shows relatively little interest in Wall Street. . .It consistently leaves money on the table [i.e. its balance sheet, for re-investment] at a moment when profits are king.”¹⁰¹ Nor does it play by the rules of the industry, leading Intel to complain that “Apple’s power management is terrific, but then it doesn’t have to play by the Advanced Configuration and Power Interface rules [an industry standard].”¹⁰² In its public relations, Apple again “goes its own way . . . operates on . . . a you-will-not-know-basis [i.e. secrecy] . . . nobody else does that.”¹⁰³ The remarkable thing is that Apple holds its nerve, seemingly more than any other company, or at least more than any other that prevails, even in its toughest moments in the late 1990s, for example, when “Apple ran apart from the rest of Silicon Valley.”¹⁰⁴ These examples show that Apple is not constrained by the

⁹⁷ Blumenthal, *Steve Jobs: The Man Who Thought Different*, 108, 240.

⁹⁸ Adam Lashinsky, *Inside Apple*, 53.

⁹⁹ Jeffrey L. Cruikshank, *The Apple Way*, 20-21.

¹⁰⁰ Adam Lashinsky, *Inside Apple*, 69.

¹⁰¹ Adam Lashinsky, *Inside Apple*, 7.

¹⁰² Jeffrey L. Cruikshank, *The Apple Way*, 6.

¹⁰³ Adam Lashinsky, *Inside Apple*, 122, 130.

¹⁰⁴ Adam Lashinsky, *Inside Apple*, 142.

expectations of others and removes constraints such as budget or meeting industry standards from its employees an encouraging those who take risks.

This absence of constraints is not shared by every employee. As with Google, certain teams or sections of designers and engineers benefit from this unconstrained environment. In Mayesha Tasnim’s organizational analysis of Apple, in departments like retail, operations, and sales, the structure is much more mechanistic and “employees can’t make their own decisions.”¹⁰⁵ Yet, those that are empowered are encouraged “to think big thoughts,”¹⁰⁶ which was referred to by former CEO John Sculley as encouraging “unconstrained dreaming.”¹⁰⁷ Again, Steve Jobs led by example and his example has infused Apple in the latest two phases of its existence. “His unwillingness to follow other people’s rules gave Apple employees license to ignore the rules of the people with whom they do business.”¹⁰⁸ Indeed, in his address to the Stanford graduating class of 2005, Jobs appealed to them not to get “trapped by what others expect, or succumb to their opinions.”¹⁰⁹

It may be a surprise to learn that Apple has a product playbook and that product development is tightly controlled. Here is one of the contradictions, where designers and product teams are empowered, yet held to a tight schedule to keep the pace of innovations high. There is method in the process, because the goal of the Apple New Product Process, as explained by one designer, “is to automate the science part so you can focus on the art.”¹¹⁰

Apple has shown that it is prepared to accept risk by moving into new markets, what Jeffrey Cruikshank in his book *The Apple Way* called “risks inherent in the move to the

¹⁰⁵ Mayesha Tasnim, “An Organizational Analysis of Apple,” 36.

¹⁰⁶ Adam Lashinsky, *Inside Apple*, 67.

¹⁰⁷ Jeffrey L. Cruikshank, *The Apple Way*, 161.

¹⁰⁸ Adam Lashinsky, *Inside Apple*, 23.

¹⁰⁹ Blumenthal, *Steve Jobs: The Man Who Thought Different*, 232.

¹¹⁰ Adam Lashinsky, *Inside Apple*, 56.

unfamiliar.”¹¹¹ Although Apple cancelled Newton (a personal organizer), its move into the smartphone, tablet and music-download markets are three examples of the new markets that have changed Apple from a computer company that produces both hardware and software into a company that has products that support its ecosystem for digital life, stimulating the move from Apple Computer, to Apple, Inc.

Implications

While there were a limited number of available case studies, those chosen still provide evidence of the determinants of innovation that the military might wish to examine. Both cases indicate the organic elements of creating an ecosystem to encourage innovation: nothing can be forced, but the conditions can be optimized. Each determinant is present in both case studies, although with different emphasis or sub-elements. Presence of the selected determinants in no way implies totality: these are not the only possible determinants of innovation, but it can be said that each of those examined has been a demonstrable part of the case studies’ success. In Google’s case, there is evidence to suggest that the determinants “stack,” in that one determinant reinforces the effectiveness of another, creating a whole greater than the sum of its parts. Each determinant will now be examined in turn.

Organizational Culture

The culture of each organization is distinct, but there are areas of similarity. Schmidt and Rosenberg noted that the Android smartphone operating system promoted by Google and Apple’s operating system iOS are “two very different ways to achieve innovation” and that Google’s view of its culture is that “our approaches are different, primarily when it comes to control.”¹¹² In terms of similarity, both Google and Apple have taken steps to ensure that the design of their workspace enhances the chances of innovation, by taking care of their employees’ wellbeing and by creating

¹¹¹ Jeffrey L. Cruikshank, *The Apple Way*, 55.

¹¹² Schmidt and Rosenberg, *Google: How Google Works*, 203.

communal areas where chance meetings can occur. Both companies look for quality employees and employ small teams to take ideas forward. As to their differences, Google's twenty percent time stands apart, but it is a model that has previously had success in 3M and academia, so it does offer the hope of some benefit as a means to stimulate innovation. Peer review does occur in each case study, hinting that the commercial sector is motivated by more than pure profit, motivation that may be equally shared by employees and employers. The notions of reputation and peer approval may prove a useful motivation in a military context and one that nests with military values.

Knowledge

Both case studies show the importance of organizational knowledge as the bedrock of the innovation ecosystem. They also show that acquiring knowledge from outside the organization is beneficial to stimulate new ideas, and neither company is averse to buying that knowledge through acquisitions. In addition, each company works with academia to further widen its knowledge base. Each of these avenues opens new possibilities and aims to maximize the knowledge gained. Google goes one step further in its interview process, deliberately designing it to find employees who are knowledge hungry. This is more than just simply a "knowledge economy," where employees are hired for what they know.¹¹³ For Google, it is not what the employee knows, but the eagerness to find out more that distinguishes an ideal employee from the pack. The military could benefit from using a similar process to find its most innovative members.

Experimentation

Both case studies show a willingness to experiment and to fail. Failure is to be embraced. Sergei Brin channels Thomas Watson's acceptance of failure as the path to success and both

¹¹³ For an explanation of this concept, see Walter W Powell and Kaisa Snellman, "The Knowledge Economy," *Annual Review of Sociology* 2004, no. 30 (2004): 199-220, accessed March 23, 2019, <http://www.arjournals.annualreviews.org>.

companies have been able to use failed experiments, by morphing them to become an intrinsic part of their successes.

Risk and Constraint

Both case studies support the need to accept risk in order to innovate and the absence of constraints creates higher chances for innovation to flourish. Whether it be because of Jobs' Reality Distortion Field or Larry Page's healthy disregard for the impossible, each company manages to empower its employees to achieve more than they thought possible. Neither case is mired in bureaucracy, yet neither do they have a complete absence of controlling structures. Daring to be different and to surpass the expectations of conventional wisdom leads to innovation, especially where employees are freed of constraints and allowed to dream big.

Barriers to Transfer into the Military Environment

Ori Brafman's *The Chaos Imperative* outlines one attempt to bring a different approach to innovating to the military.¹¹⁴ Brafman is a specialist in organizational culture, change and inclusivity, who has worked with all branches of the military and the White House. His account is helpful to illustrate some of the problems encountered when transferring two of the determinants examined by this paper to a military context. Brafman recounted the story of being asked to advise General Martin Dempsey just before he assumed the role of chairman of the Joint Chiefs of Staff. General Dempsey stated the problem as "the Army suffered from a lack of imagination, a lack of innovation," or in Brafman's words, "the institutional Army was a place where good ideas went to die." He claims that a positive impact of the chaos felt in the aftermath of the plague was to create the space that allowed the Enlightenment to flourish in Europe, and he encouraged Dempsey to bring a little chaos into his organization.¹¹⁵ Brafman's approach was to stimulate the

¹¹⁴ Ori Brafman and Judah Pollack, *The Chaos Imperative*, 1st ed. (New York, NY: Crown Business, 2013).

¹¹⁵ For further explanation, see *ibid.*, Chapter 2, 31-44.

three elements he felt an organization needed to increase innovation: first, “white space” to grow (“a time or a place or a system unfettered by an established structure”), second, what he referred to as “an openness to bringing in unusual suspects, outsiders who are not part of the system” (similar to Google’s “smart creatives,” catalysts), and third, “organized serendipity” to allow innovations to flourish, by setting the conditions for them to flourish. He was given approval to test these ideas with a group that eventually went on to become the Army’s Red Team University at Fort Leavenworth, Kansas. Brafman concluded with his rules for innovation and pointed out that hundreds had been through the program he designed by that point in 2013. He asked Dempsey if it was a useful exercise, a question Dempsey avoided answering, merely saying “we don’t have any choice.” As it stands in 2019, Red Team University’s name has been changed to the “University of Foreign Military and Cultural Studies”, diluting the founding concept.¹¹⁶

An analysis of Brafman’s ideas suggest some reasons why the seed did not take hold. For a start, his “unusual suspects” were found from inside the organization, so they failed to meet his second criteria that they should not be part of the system. They may have been outsiders within their organizational context, but they were still members of the Army, who had all been through basic training and served with the field force. It could be that this tension between embedded conformity and newly encouraged nonconformity diminished the effectiveness of his program. Indeed, Brafman used an example where hospital support staff are included in decision making and it is found that they have a unique insight into managerial problems. This technique of listening to previously unheard parts of the in-group is much more akin to the program he ran at the Red Team University than his second principle of bringing in outsiders. So, in blending two principles of “outsiders” and “previously unheard” parts *within* an organization; he may have set the conditions for failure. Another possibility is that they generated many innovative ideas, but the circumstances were just not right to achieve the serendipity he sought and for the ideas to

¹¹⁶ Ibid., 5, 15-38, 194-210.

spread across the whole organization. Brafman admits that “organizational silos are the enemy of serendipity”¹¹⁷ and perhaps there were just too many for the ideas to overcome.

Finally, it must be admitted that the possibility exists that the ideas Brafman brought, so many of them based on the success of Silicon Valley, are simply not applicable to the military context. Or at least, that by attempting to recreate the elements of success found in the technology sector into a hierarchical and structured organization, the two could prove to be incompatible. In discussing Google’s twenty percent time policy in an online forum (c.f. Brafman’s “white space”), Google engineer Joe Beda felt all the conditions had to be present. “Can twenty percent time work at other companies? . . . I think it is important to realize that it is a result of an environment and a philosophy; I don’t think that it is something that can be imposed in an independent way.”¹¹⁸

Brafman’s example shows that introducing some of the determinants is not a guarantee of success: he used elements of the organizational cultures examined here, but not all of them. He removed constraints, but made no mention of acceptance of risk (outside of acceptance of “chaos”), nor knowledge, experimentation, or failure. Moreover, the hypothesis may be developed from initiatives such as the Red Team University or other innovation concepts that small cells of innovation are not successful in translating to innovations that impact across the whole organization.

Organizational culture is the largest obstacle to recreating the conditions present in the case studies. Brafman’s characterization of the military above and Schmidt and Rosenberg’s observations about management processes that were developed over a century ago point to serious obstacles to cultivating an innovation “ecosystem.” Sundbo’s description of a mechanical organizational culture closely fits the hierarchical military one and will actively inhibit

¹¹⁷ Ibid., 164.

¹¹⁸ Vise and Malseed, *The Google Story*, 140.

innovation, with the added challenge that, in Sundbo's view, professionalization can create norms that are in conflict with the democratization of management structures and the management's vision for the organization. For the military, as a professional organization, this could have serious consequences. Sundbo was clear: "[T]he dimension that made the difference in innovation capability was the overall organizational arrangement and management philosophy. . . It is the company's whole attitude that decides its innovative capability."¹¹⁹

All is not lost, however. The military does have advantages when it comes to its culture. Teamwork is second nature to the military. Google chef Charlie Ayers conjured up that spirit, recalling: "[E]veryone was so focused and into it, and they all had one goal: to make this company successful. It was 'look at what we did,' not 'look at me.' It was a total team effort."¹²⁰ This is a characterization that chimes with military culture. The military also has a history of being a learning organization, one that recognizes the value of knowledge. These are both strengths that can be enhanced.

The case studies suggest that small teams of high quality individuals in a custom-designed workspace, empowered and freed from constraints, with a high risk tolerance and access to a wide knowledge base in industry and academia, and who are able to experiment, stand a good chance of successfully innovating. Can every unit in the military be based on these principles? Is it necessary that every unit be based on these determinants in order to generate the number of innovations sought? It would certainly be a bold and risky move to do so, but one which Schmidt and Rosenberg suggested is too big a step for an organization that tends towards the conservative.¹²¹

¹¹⁹ Sundbo, *The Theory of Innovation*, 82.

¹²⁰ Vise and Malseed, *The Google Story*, 209.

¹²¹ "[O]rderliness seemed to encourage a general mindset for conservatism and tradition." Schmidt and Rosenberg, *Google: How Google Works*, 39.

Yet there are sound reasons for the military's structure and hierarchy, reasons that have served for millennia and which guide unit size and structure. Soldiers follow orders; they are trained to react to commands in barracks so that they will not hesitate to react in the stress of combat. Structure and order enable maneuver, command, and control. The challenge for the military is to make the choice: do these practices still serve the organization well and are they preferable to innovation? Is a century-old paradigm developed during the period of mass armies still applicable today? It would take a radical shift to move to a new paradigm.

Furthermore, the raw material may not even be present to deliver continuous innovation. The quality of the employees in Google and Apple is demonstrably high. These high-achieving "smart creatives" are the fuel to the fire of innovation. It may be that the military is condemned to fall between the two stools of attempting to innovate on too small a scale, within a group that cannot reach out to change the whole organization, or of hoping an entire organization, not recruited for their "smart creative" qualities, will be able to produce the hoped-for innovations. Schmidt is convinced Google's success rests on quality: "[T]he secret here is not the way we manage, but in our selection of the people. This model works when you have the right people."¹²²

There is one area where the results of this research may be uniquely applicable: the field of military cyber operations. These operations will involve just the type of "smart creatives" that have been examined, and the ways in which their potential is unlocked by Google and Apple may provide guidance for enhancing their potential creativity and innovation. Certainly, the military needs to improve its offering to this cohort, if recent reporting is to be believed.¹²³

¹²² Vise and Malseed, *The Google Story*, 256.

¹²³ Mark Pomerleau, "It Wasn't a Fun Place to Work': DoD's Cultural Hurdles in Attracting Tech Talent," *Defense News*, January 27, 2019, accessed January 29, 2019, <https://www.defensenews.com/smr/cultural-clash/2019/01/28/it-wasnt-a-fun-place-to-work-dods-cultural-hurdles-in-attracting-tech-talent>.

Conclusion

The literature review has shown that there is no single dominant theory or paradigm to explain innovation. Instead, a number of theories (paradigms) develop and emerge as conditions change. Born in the field of economics, theories initially focused on the creation of value by the entrepreneur, before expanding through the technology paradigm and into the strategy paradigm. Arguably, the computer and internet age have ushered in the greatest disruption, leading to exponential innovation, occurring under its own conditions. Sundbo ties these paradigms to Kondratiev waves, or cycles in the economy that create the conditions in which innovations appear to cluster together over time. Of all the studies, a number of common determinants emerge: organizational culture, effective use of knowledge, experimentation and acceptance of risk coupled with absence of constraints.

In both case studies the determinants identified from the literature review are present and suggest those cited believe they contribute to innovation. Knowledge, experimentation, acceptance of risk, and absence of constraints are conditions that enhance the ecosystem that stimulates innovation. The chosen determinants are present, but the difference in organizational approaches suggests that there is more than one way to create favorable conditions for innovation.

For the military, changing organizational culture is the hardest obstacle to overcome. A choice exists between current structures that serve the logic of command and control of mass formations in industrial-age warfare, or small, unconstrained, and empowered teams from which innovative ideas may flow. Industrial-age structures are appropriate for a mass organization that recruits everyone it can, without the high bar of talent that can be set by Google and Apple. Can the “smart creative” soldiers, sailors, airmen, and marines be found to power military innovation? Are there enough of them to spread that innovation across the whole enterprise, or will the sheer

size and inertia of the organization mean it will always be “the place where good ideas come to die?”¹²⁴

One limitation identified by the literature review prompts an avenue of further research: not enough is known about the transferability of the theories examined between sectors. Indications from the evidence in the literature are that context can play a significant role, so whereas this study aims to examine a sector distinct from the military, this evidence would suggest that a study of *military* innovation would be a profitable endeavour. The hypothesis would be that successful military innovation of the past has found ways to overcome all the constraints of the organizational culture and been successful *in spite of* them.

Military cyber is certainly one field that would benefit from the results of this research. This research may prove uniquely applicable to this cohort and close attention to the determinants listed here and their impact on behaviors of engineers and “smart creatives” is recommended. In addition, Eric Schmidt’s article *How to Manage Geeks* may provide additional insight into how to attract and retain those with the skills needed by this specialization.¹²⁵

Finally, perhaps innovation is not what the military requires. Radical restructuring of the organization to enable innovation may be made at too high a cost to structures that serve a valid purpose, namely taking volunteers and turning them into soldiers, sailors, airmen, and marines. An alternative approach would be to train and structure the military for adaptation. Forgo the lure of innovation, and instead build a force that is flexible enough to react quickly to its opponents’ innovations, one that can adapt to changing conditions quickly enough to neutralize its opponents’ competitive advantage. Perhaps “adapt or die” is a valid mantra after all?

¹²⁴ Brafman and Pollack, *The Chaos Imperative*, 5.

¹²⁵ R. Mitchell, “How to Manage Geeks,” *Fast Company*, last modified 1999, accessed February 7, 2019, <https://www.fastcompany.com/37145/how-manage-geeks>.

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