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Physical Space Drives Innovation: How the Environment Can Increase an Organization's Productivity, Creativity, and Innovation

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Abstract

The modern corporate world is a globalized one. With increasing levels of outsourcing, offshoring, and importing, organizations competing globally can no longer distinguish themselves solely through efficient performance and low cost (Friedman, 2006). In a 2010 IBM survey of over 1,500 CEOs from various fields and nations, researchers found that the majority of CEOs considered creativity an essential feature of an organization. In fact, 60% of CEOs reported that creativity was the most important leadership quality, a higher level than integrity (52%) and global thinking (35%) (IBM, 2010). Thus, it seems as though the solution for a staggering organization is "innovation." However, there is little concurrence on what innovation *is*. It has been called "fresh thinking," a "specific instrument," a "process," a "new technology," the "introduction of something new," or even "significant positive change" (Dance, 2008; Berkun, 2013). Clearly, organizations, academics, and experts are confused. Innovation is a buzzword without meaning.

This paper breaks down the concept of innovation and focuses on the situational influences rather than its definition or implementation debate. Part I offers a theoretical approach to innovation and introduces the environment as a modular mediator of innovation. Specific argumentation is provided for the privileging of environment over process. Part II defines the various facets of environment: people, culture, and physical space. Part III presents a few generalized case studies, demonstrating various means of applying this knowledge. While this paper is intended primarily for a non-design audience, I hope to provide a synthesis of knowledge and a language that can appeal and add nuance to the understanding of individuals more familiar with design methodology.

Part I: Theory

To begin with, it is important to distinguish between creativity and

innovation. As Negus and Pickering assert, creativity "is one of the most used, and abused, terms in the modern lexicon. It comes laden with a host of meanings, connotations, and applications, which are regularly imported into a range of varying discourses, institutions, and settings" (2000). The same could be said of innovation. The primary complication is that creativity and innovation can be utilized within many different disciplines' lexicons, from organizational behavior to sociology. Though it would be impossible to catalogue the distinctions among all disciplines, as an example, let us consider the different terms within psychology. Creativity is defined as the ability or act of creating a novel idea (Barron & Harrington, 1981). In contrast, innovation is the process or final product that develops from a novel idea, leading to a new creation (Shalley *et al.*, 2004). Psychology further dissects innovation into two forms: incremental and radical. Incremental innovation refers to adaptations of an existing product or procedure and is low-risk, while radical innovation comes from revolutionary ideas and carries high risk (Gilson *et al.*, 2012). Thus, within psychology, creativity is an ability or act while innovation is the process or product of the creative act. Creativity is a step towards innovation.

The most well known and research driven descriptions of creativity and innovation are presented by Teresa Amabile in her theoretical creative componential model (Amabile 1988, 1996, 1997). She claims that creativity is accessible to all individuals and is dependent on one's social environment (e.g. organizational support), domain relevant skills, creativity relevant processes, and intrinsic task motivation (e.g. finding the task enjoyable). Extrinsic motivation or reward (e.g. monetary compensation) is detrimental to creativity and lowers intrinsic interest.[1] This basic model is applied to individual creativity; however, Amabile notes that a parallel componential theory applies to organizational innovation.

More interesting than the mirrored organizational and personal paths to creative output is the relationship between the two: development from the individual to the organization. If an individual has a great idea but it is not recognized or fostered, that idea does not turn into an innovation (or go through the process of innovation). Thus, given a certain creative input, innovation is mediated by various environmental factors, such as managerial support. In other words, the innovative output of an organization is dependent on its environment. This theory implies that it is not sufficient to have a genius in the room, yet we cannot disregard the individual, who generates the ideas. A *process* ignores the crucial individual. Indeed, to focus on innovation as process means that

[1] Those familiar with Daniel Pink's famed presentations on motivation will recognize these ideas, though they were posited by Teresa Amabile, who presented them over a decade before him (starting in the early 1990s).

innovative production can only be increased by *doing the process better*. This theory offers a more optimistic standpoint, and an opportunity to modify the environment itself. When one approaches innovation from an individualistic standpoint, with a situational rather than a procedural approach, one creates a human-centric approach to increasing innovative output.

Finally, it is important to note that each individual is, and can be, an innovator. Every individual lies on the adaptor-innovator spectrum; an adaptor is defined as having a low number of revolutionary ideas but has high attention to detail and an innovator has a high number of ideas and thinks in terms of the big picture (Puccio *et al.*, 2000). As Kelley and Littman note in *Ten Faces of Innovation* (2005), there are many different factors that make innovation possible, but it is impossible to innovate without a team. With the requisite factors, regardless of each team member's position or work style, every person has the ability to contribute to the organization and be innovative. All the team requires is a constructive environment.

Part II: The Environment

Imagine that you run an organization, and want to be more innovative. How would you go about achieving that? By the theory presented above, innovation is driven by individual creativity mediated by the environment. Therefore, your options are to either change the people or the environment. Attempting to hire a totally new set of people who satisfy the job requirement and are "creative" (try to measure that in an interview!) seems rather unrealistic. The environment appears more malleable and manageable. For this reason, this paper has chosen to focus on that aspect of the framework, looking at ways to modify environmental factors in order to better mediate the creative input. The "environment" can be broken down into three broad areas of influence: people, culture, and physical space.

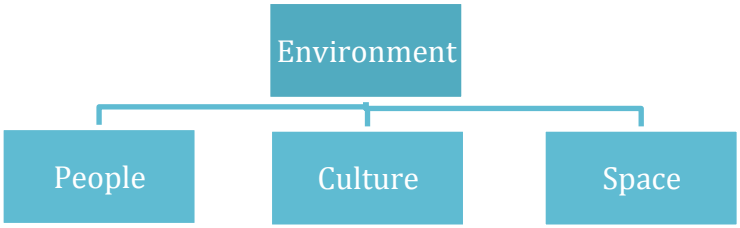

FIGURE 1. Breaking down the environment.

"People" refers to the aspects and processes that affect individuals and attempt to increase their output. "Culture" refers to means to changing the intangible "feel" of a place. Finally, "space" is exactly as it sounds: how

can you modulate the physical aspects of an office in order to increase innovation? Each of these sections will be covered in turn.

People

Beginning our investigation with the employee, we note that there are four major ways to increase individual creativity and innovation: internal motivators, creativity training, problem solving frameworks, and knowledge development. As mentioned in the introduction about creativity, intrinsic motivation is critical to creativity. This is especially true for organizations that rely on knowledge workers, for whom employment is often not merely a means of capital and monetary gain: rather, they are driven by the challenging level of the work, the community in the organization and the perceived value of their work (Basadur, 1997). For these individuals, creativity can be predicted most by the level of "internalization of an activity, making it part of one's identity and thus creating a sense of personal enjoyment and free choice about pursing the activity" (Amabile & Pullemer, 2012). In general, the more satisfied, comfortable, challenged, valued, autonomous, and supported (through resources) a worker is, the more creative she will be (Mumford *et al*., 1997; Young, 2012; Michael *et al.*, 2011; Carmeli & Spreitzer, 2009). This paper's sections on culture and space will primarily focus on methods to adapt intrinsic motivators.

Though it may seem simplistic, training individuals to be creative actually increases creativity. For example, several studies have shown that creativity training can be effective in not only increasing idea generation but also selecting the most creative or promising ideas (Birdi, 2007; Mumford *et al.*, 2012). Moreover, when individuals are instructed to be creative, their creativity actually increases and is reflected in their performance (Chua & Iyengar, 2008).

Similarly, management can support different problem solving frameworks in order to influence an individual's creativity. For example, in design, there is a tendency to have design fixation: when primed with a possible solution to a problem, an individual is likely to "fixate" and reuse various features of the design, both positive and negative (Baer *et al.*, 2008). However, taking breaks from a project and walking around ("forgetting fixation") may drop the negative fixation points while maintaining the positive ones (Kohn & Smith, 2009). Design fixation can also be overcome by working with other people, either directly in a team or indirectly by merely being in the presence of others (collocating) (Youmans, 2011). Surprising as it may be, another possible framework for problem solving requires an individual to inhabit a frame of mind or physically act out creativity truisms, such as thinking outside the box (Kim

et al., 2012). Such embodied cognition, encouraging a state of mind, bars against negative design fixation.

Another major method of increasing individual output is knowledge development. This involves not only opportunities for professional development within the organization but also granting employees the time to explore and increase their knowledge base (Mumford, 2000). As noted in the creative component theory, knowledge contributes to creative problem solving (Mumford *et al.*, 2012). Knowledge should be both horizontal and vertical; breadth allows one to make connections between various subjects, while depth gives one sufficient technical background to determine the specific mechanisms (Kelley & Littman, 2005). Moreover, the amount of knowledge required for innovation is often so high that organizations create teams: if an organization allows for professional development, they increase both the value of each individual employee and the amount of information the group is able to synthesize (Friedman, 2006).

Culture

The encouragement of innovation from management comes in several forms, all of which can be contained under the broad term culture. A culture is the beliefs and values held by management and communicated through norms, socialization, and managerial behaviors (Tesluk *et al.*, 1997). If the culture of an organization reflects creativity and innovation as values, individuals are more likely to take risks and pursue new ideas: in fact, one study found that having an environment that seemed to expect creativity actually increased creative output (Puccio *et al.*, 2000). If the management does not explicitly display (through norms and behaviors) that it values innovation (and is willing to take on the associated risk), employees are going to be hesitate about taking such risks: the majority of employees consider creative behavior as risky and associate it with possible negative consequences (Dewett, 2006). In order to have a successful R&D unit, an organization must have a general willingness to take risks, and must explicitly show that its valuation of creativity is high. Therefore, if an organization wishes to increase innovation, it must first create a culture that encourages it.

One way to display such corporate values is to imbue them into social norms. As Geoffrey Miller notes in his book about human behavior, *Spent*, "the social norms and trait display tactics most favored by the local community heavily influence our behavior" (2009). Therefore, in order to influence individuals to be creative, the social norms and the means by which one displays those norms (the "trait display tactics") must reflect the organization's empowering of employees as well as the value of innovation. An organization could do this by: decreasing the formality and

rigidity in meetings; having fair treatment of all employees and thus valuing organizational justice; publicly encouraging (such as in the handbook) creativity; accepting the failures inevitable to trying new things; encouraging learning from failures and rewarding creative attempts; permitting questions from a member of any rank; shifting work expectations to that of accomplishment and results rather than hours; and, most importantly, providing resources and time for experimentation (Agypt *et al.*, 2012; Young, 2012; Birdi, 2007; Tesluk, 1997; Gertner, 2012; "Set them free," 2013). By communicating the value of creativity through norms and socialization, an organization can increase the probability of innovation and imbue the culture with positive approaches to problem solving.

Another way to display values is the management structure and behavior. The greater the hierarchies and their formality, the focus on efficiency, and the rewarding of status over merit, the less likely that innovation will occur (Stempfle, 2011). Instead, increase employee autonomy, and one will be rewarded with increased creativity (Mumford *et al.*, 1997). Increase empowerment and encourage individuals to speak up and share their ideas, and creativity will increase (Arad et al, 1997). Often, individuals have ideas, but the very structure of the management hinders their ability to turn those potentially revolutionary ideas into innovations. IBM's 2012 CEO study noted the value of empowering employees, saying, “[W]e need to mobilize our collective brain power for innovation" (IBM, 2012). When individuals are freed from strict hierarchies, they are more likely to be willing to take risks and bend the rules: these are the foundational principles of innovation (Kelley & Littman, 2001).

Finally, a well-defined organizational vision (stated and imbued in the culture) can guide employees and lead to greater collective growth and success. A vision can increase performance because it aligns individuals with the goals of the organization; in fact, companies driven by a vision perform fifty five times better than the general market ("Imagine That," n.d.). A good vision is compelling, has long term goals that are almost (but not completely) impossible, is easily understood, incorporates core values of the company, and is created by a diverse group of people. IBM's 2012 CEO Study also found "purpose and mission" as one of the key factors to success (IBM, 2012). Such vision helps craft intent and drives the utilization of space and resources (Moultrie *et al.*, 2007). Without a strong vision, an organization moves forward without purpose and cannot imbue overarching value to any individual member or process.

Space

As the corporate structure can reflect an organization's view on hierarchy, the physical workspace is the "body language," clearly influencing how an employee can use a space (Doorley & Witthoft, 2012). As Allen and Henn wrote (2007) in one study, "a formal organizational structure may dictate what is supposed to happen, but whether it actually does is, in large part, an issue of space." Unfortunately, the importance of intentionally designing and using space has only recently been recognized. Physical office space is, usually, a company's second largest expense and is often under-utilized (McCoy, 2005). Despite great increases in portability of technical devices and the fact that, on average, 40% of an employee's time is spent in collaborative or interactive tasks, offices are often still designed in the cube farms that developed in the 1980s in response to a desire for efficiency (Davis *et al.*, 2011; "Forward thinking," n.d.). Moreover, Leaman and Bordass (2005) found that offices can positively impact an individual's productivity by up to 20%.

An organization looking to increase its innovation should design its architecture with the intent of attempting to maximize encounters between employees because innovation most often requires teams, with each member specializing in their[2] own field (Gertner, 2012). The more interaction, the more collaboration is likely to result. These encounters can take various forms: meals, organizational community events, running into each other in the hallway, meeting at the coffee machine, etc. Though employees are unlikely to be aware of their utility, these encounters allow for knowledge exchange as well as the formation of connections with other departments and specialties. A simple way to increase community and promote creativity is to put individuals closer together: it has been shown that proximity increases the chance of collaboration, especially between disciplines ("Making room," n.d.). Furthermore, the same study found that if individual A is more than thirty meters away from individual B, they might as well be in different buildings in terms of how often they'll spontaneously see each other or work together. Innovation is often built on such spontaneous interactions: there is an 81% positive correlation between collaboration and innovation ("Making room," n.d.; Davis, "Google," n.d.).

Since spontaneous encounters with peers or managers lead to information exchanges and innovation, one would want to increase the number of such interactions; however, about 80% of these encounters are unplanned and cannot be increased simply by institutionalizing meetings (Moultrie *et al.*, 2007). Rather, an organization must increase the probability of spontaneous interactions. One might accomplish this by having clearly defined social zones (e.g. coffee machine or break room)

[2] "Their" here is used as a singular gender-neutral pronoun (they/them) in order to be inclusive of individuals who do not self-identify within her/his.

separate from workplaces so that people congregate in that area (which increases encounter rate) and feel as though they are able to socialize (Hua *et al.*, 2011). This idea goes back to the culture: individuals must feel as though they have permission to linger in informal collaborative spaces. Another option is to include small conference rooms, for two or three people, in highly trafficked areas, such that two people who meet and want to work on a small project for a moment have the space to do so: this facilitates impromptu collaborations (McCoy, 2005; Hua *et al.*, 2011). These small spaces need to be centrally located and outfitted with all the right tools and technologies in order to be useable; it also helps if employees see others using the space, so partially glass walls or doors are a good idea ("What it takes," n.d.). These small conference rooms also reduce the possibility of disturbing others because the most distracting aspect of a workspace is hearing a human voice: if these encounters have their own space, they are less likely to disturb others. Furthermore, some individuals who want more seclusion or privacy could utilize these spaces for intense work.

It is important to note that not every employee works best in the same area. No matter how great an organization's intent or planning, having only one type of work area option will hinder some individuals' productivity and creativity. Therefore, the best office spaces are flexible and allow for encounters, secluded workspaces, larger meetings, team meeting rooms (such as war rooms, which can double productivity), and more open plan offices ("Why and how," n.d.; McCoy, 2005). Each person is most efficient when a space matches their preferences and expectations of a creative space (Puccio *et al.*, 2000). Instead of attempting to craft a space, it is more efficient and cost effective to allow employees to personalize their own spaces and to move about the office to whatever space is allowing them to be most productive on a given day. For some people, this means working outside the office: even this option actually increases productivity and creativity ("On the move," n.d.). The Buffalo Organization for Social and Technical Innovation provide the following top four factors for encouraging creativity: shared spaces for "conceptual playground," multiple forms of representation and communication, formal and informal environments for random meetings, and easy access so individual can casually stop by (McCoy, 2005).

Beyond zoning, organizations should also consider the structure of employee workstations. A higher density of workers leads to lower job satisfaction because there is more noise, less privacy, more visual distraction, and lower perceived efficiency (Davis *et al.*, 2011). While open-plan offices claim to allow for greater collaboration, they limit an individual's ability to work with greater concentration (Hua *et al.*, 2011). This could be acceptable for lower complexity tasks, but higher

complexity tasks require more concentration and privacy. In fact, in order to increase collaboration, one should decrease the distance between workers, decrease the general density, increase the percentage of the floor space dedicated to meeting spaces and increase the percentage dedicated to shared services (Hua *et al.*, 2011). Finally, in order to further increase each individual's creativity, organizations should allow for personalization of workspaces. Adjustability of desk height, chair height, monitor placement, and lighting gives people a greater sense of control and increases work satisfaction (O'Neill, 1994). Even allowing employees to display their work and hobbies increases ownership, loyalty, and their general satisfaction (Kelley & Littman, 2001). Increased control leads to increased job satisfaction, which in turn increases performance and innovation (Lee & Brand, 2005).

Once the space is divided, the organization should encourage employees to display artifacts, physical features that add aesthetic details meant to embellish and personalize. These artifacts are relevant to those who inhabit the space, and reflect the values of a group (McCoy, 2005). Furthermore, they guide the interpretation of the social setting and define who lives in that area, allowing individuals to claim ownership of an area (Davis, 1985). This ownership increases the team's autonomy and the overall desire to contribute to the group, which increases productivity and innovation (Kelley & Littman, 2011). Therefore, encourage teams to change an office space as they see fit or, at the very least, include them in the process (Davis *et al.*, 2011). That way, they can add artifacts that have value to them, which connect the team to the organization to the vision. In a sense, the artifacts help brand a space and give an individual worker an experience unique to that space: it is not merely a workspace but a home, a place to call their own ("Three-dimensional," n.d.). In this way, the physical space and the artifacts and experiences in the space are the most critical of all, because the space is conveying a brand, a vision, and frame of mind. The space defines, drives, and encourages innovation.

Full Environment Tree

In the above sections, the paper synthesized the various means by which to increase innovation in an organization. This figure summarizes these findings in one tree for an easy visual reference:

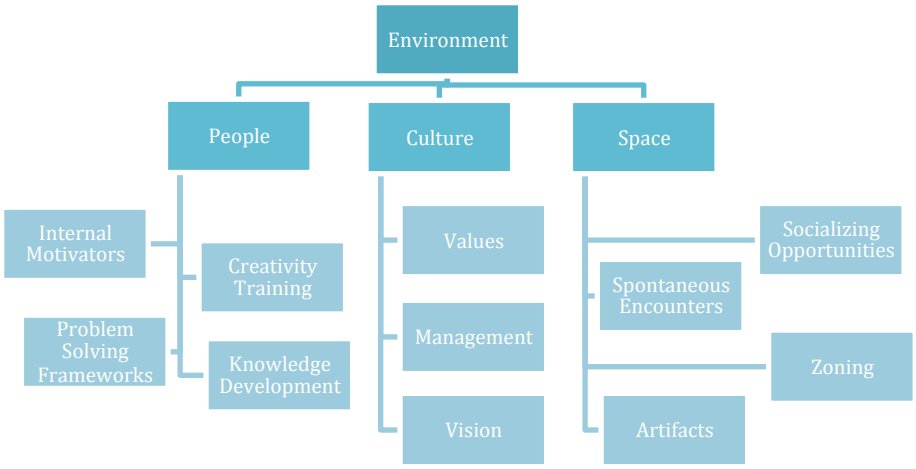

FIGURE 2. Full breakdown of individual levers within the environment.

Part III: Case Studies

In order to provide some concrete examples of levers within the environment, we will present three mini-case studies of workplaces.[3] The first will be a growth stage start-up company, the second a large corporation with a sprawling campus, and the third a local branch of an international company. These case studies are meant not so much as teaching tools, but rather explorations of the stereotypes of for-profit companies. After presenting the scenario, a few recommendations will be given.

The Start-Up

Arranged on two floors of an open loft, this organization had an open office floor layout, where there was the kitchen and large open space (used for company meetings) right by the entrance. The engineers were all in one cluster of computers with standing desks, while the marketing and administrators were on the upper level in their clusters. In each cluster the manager tended to have the corner computer or, occasionally, a glass door office adjacent to the cluster. There were only a few war rooms, and no individual workspaces. Though people could go work on the couches in the big room or in the kitchen, no one ever did. Within the engineering cluster, there was a good deal of chatter. People were social and collegiate in nature. Almost everyone not conversing was wearing headphones.

[3] For confidentiality, names of the companies have been redacted. All locations are within the United States.

Individual desks, though small, were customized, with add-ons (such as a wooden keyboard stand) and decorations. The walls were white, with a few seemingly random decals up.

Recommendations

- In this start-up, there were very few quiet places to work, so much so that people were using headphones to drown out the noise. Alternative working spaces, such as the kitchen or big couch room, were underutilized. Individuals should be motivated to use those spaces by classifying one of them as quiet zones during certain times (e.g. 9-11am and 2-4pm).
- Individuals were creating their own additions to their workplaces anyway: streamline those into company competitions, and make the winning additions accessible to all. A similar idea could be applied to decals: since this company used a lot of data, it would be helpful to have data visualizations present on the walls. This would make the artifacts public, which would lead to a greater sense of ownership.
- The manager's integration may feel stifling: consider providing more separation so that individuals feel free to experiment and try new things without fear that their manager will immediately notice.

The Big Corporation

This organization was spread out into almost twenty buildings on a large campus. The buildings were not connected, and most people stayed within their one or two buildings. Buildings were separated by department, so the business branch was completely separate from the science branch. Within each building, individual use of the conference rooms for 10+ people was not encouraged. Most individuals were in cubicles or glass offices, and there were no major social gathering spaces except for the three cafeterias located throughout the campus. These cafeterias were rather expensive, so most individuals brought food and ate at the small kitchens located on each floor of each building. The walls were bare except for the few posters hanging outside individuals' offices, and other than the welcome center, there were no centralized trophies or displayed values. During employee training, there was neither discussion of creativity nor a presentation on the company's long-term vision.

Recommendations

- Segregation of individuals by type of work restricts cross-discipline connections. The company should encourage social mixers or company happy hours in a centralized space for all employees.
- The company should have a stronger statement of vision as well as more public ownership and congratulating of work. Though these statements do

not need to be visible, they need to be ubiquitous so that people are constantly engaging with the values and artifacts.
- Often, those "on the ground" (i.e. not in management) are more able to speak to improvements than those in a different building working on operations and strategy. When making company-wide decisions, strive to include individuals from all types of works and all locations on campus. For example, consider having an open forum so that all employees have the opportunity to speak their minds.

The Multi-national Local Branch

Set in a vibrant city, this branch tried to incorporate the location by naming all the conference rooms after major neighborhoods in the city. Employees could choose between a variety of spaces within the office: large conference rooms that can be closed off and made private through modular walls, several small war rooms (also used by individuals), and larger conference rooms used for group meetings or client calls. The organization's moderate turnover rate made it possible for employees to alter workspace preference (a group office with a door or an open office plan), both periodically and daily. The office's one hundred employees established community through Friday office happy hours in the kitchen. There was minimal division between administrators and knowledge workers. Organization victories (such as client success stories) became part of an internal folklore, so people constantly reference previous scenarios as ways to understand the current situation.

Recommendations

- In many ways, this branch is already achieving an environment conducive to innovation, and merely needs optimizing. Leaders could consider placing artifacts in the space in order to increase community outside of Friday social gatherings. If client privacy is a concern, more references to the city itself would give the office personality.

Conclusion

As the above case studies detail, regardless of the type of organization one leads, there are ways to increase innovation by altering environmental factors. This is not to say that the start-up should include individual offices, nor that the large corporation should increase the public display of victories. However, they are options to consider if innovation is the goal. In this deliberation, organizations should consider their values, how they function, and what space is available to them. Rather than jumping in and attempting to implement every possibility, they should create a plan that balances privacy needs, spatial constraints, corporate culture, goals, brand, and financial barriers.

Design consulting today is often focused on innovation as process, concerning itself with methodology or design thinking. Innovation is purportedly something to be learned. However, innovation must instead be *implemented* through environmental changes. By providing a synthesis of various disciplines, this paper casts a broad net, attempting to gather as many types of environmental variables as possible. By considering creativity and innovation through a situational lens, one can discover means to increase innovation within their own organizations through the construction of human-centric spaces. Understanding how space can influence creative production has the power to drive innovation.

However, we must return to the original claim: innovation as a panacea for a flailing organization. Innovation, at its core, solves *a problem*. If an organization does not realize what its problem is, the exact handful of reasons that it is faltering, then innovating will not ultimately be helpful. Instead, to innovate effectively, one needs have three skills: the ability to ask good questions, the ability to identify solvable problems, and the ability to prioritize issues appropriately. This side of innovation—the act of identifying pertinent problems—gets less press, and is arguably more important. One hopes that, in the process of recognizing possible optimizations, an organization begins to be comfortable talking about its flaws and is able to focus its new innovative prowess to the bigger questions, such as: who is the right type of leader? How do you plan for an organization to outlive you? When does innovation become not enough?

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