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Practicing What We Teach: Iterative Design Methods for Innovation Education

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Abstract

There can be little dispute that the past two decades have seen an accelerated change in the hyper-connected parts of both developing and developed worlds. The term VUCA-environment (Volatile, Uncertain, Complex and Ambiguous) describes our new social, political, economic and environmental landscape, and may itself provide some clues about how future generations might be educated, what they may be expected to learn and know, and ultimately how they may be prepared to survive and thrive. We propose that design-led entrepreneurship and innovation are both essential skill-and-mindsets that stand at the core of how future generations will successfully navigate VUCA (Volatile, Uncertain, Complex, Ambiguous) environments. Despite the rise of design-entrepreneurship and a broader acceptance of "design thinking" in business, we contend that entrepreneurship's connection with design education remains marginalized in today's mainstream pedagogy. We describe here the VUCA conditions and the emergent values and priorities of the post-recession generations of consumer, employee and learner (millennial-and-beyond). We examine the manner in which these (Gen-Z and Alpha) generations learn, and contrast this with current pedagogical priorities and modalities. We then conclude with the case for Parsons' *Entrepreneurs Lab* (*ELab*): a design-driven business incubator and academic research lab which seeks to develop a 'design intelligent' pedagogical approach. We argue that the ELab model and methods address the pivotal role of design in developing that most intangible quality, the entrepreneurial mindset. We further assert that teaching and using design principles and methods for innovation and entrepreneurship will better prepare future generations to better respond to the unknown.

Key Words: VUCA, Innovation, Entrepreneurial Education, ELab

The Problem and its Context: VUCA and Today's Stakeholders

The VUCA Environment

Initially developed as a concept in the post-Cold War era at the U.S. Army War College, the term VUCA (Volatile, Uncertain, Complex, Ambiguous) was first applied, as an acronym, in late 1990s before gaining wider currency in the wake of the attacks of September 11, 2001 (Kinsinger and Walch, 2012). VUCA frameworks began to be adopted by businesses following the 2008-09 financial crisis as many companies and organizations found themselves confronting volatility in their business environments and stress on business models they had developed under more stable conditions (Deloitte, Fit 4 VUCA, 2015). The crisis' highest-profile bankruptcies in the U.S. occurred in the financial and automotive sectors, however, between 2008-10 a disproportionate number (over 170,000) small businesses in the U.S. closed (Thomas, 2012), Guo's analysis reveals that a majority of these were businesses which were heavily reliant on credit (Guo, 2014), exposing cash-flow vulnerabilities. Although the financial crisis has bottomed out and global growth has slowly and unevenly returned, many organizations are now experiencing a 'new normal' in business environments that have been profoundly "affected by digitization, connectivity, trade liberalization, global competition, and business model innovation" (Lawrence, 2013: 5). The pre-recession world—as well as its old paradigms—now no longer hold.

Bennett and Lemoine (2014) argue that VUCA conditions are not necessarily negative. While representing clear risks they also give rise to numerous opportunities, particularly for those who are sensitive and responsive to the distinctiveness between and nuances of each of VUCA's four attributes. They are critical of generic management prescriptions that respond to VUCA with such calls as to be "creative," "flexible" or to "innovate," without first defining the expected implications of each VUCA characteristic. As they state "we contend that the term VUCA offers a mélange that is dangerous in its consequences. The four components of the VUCA acronym have unique meanings that should be instructive to leaders; instead, useful differences between the terms are glossed over and their value lost." (Bennett and Lemoine, 2014: 2). To this end, they present a table (Figure 1) which provides examples of, and responses to, each VUCA condition. In comparison with their framework, the authors of this article present a graphic they developed for a presentation at the fifth-annual *21st Century Academic Forum* in Boston (Figure 2). Our graphic describes how educators can teach mindsets and skillsets to better prepare students for VUCA environments. Although each framework has a different purpose (management vs. pedagogy) and each adopts a slightly different nomenclature, the conclusions in both frameworks are broadly similar in terms of the attributes of resourcefulness and experimentation they demand.

Table 1. Distinctions within the VUCA framework

	What it is	An example	How to effectively address it
Volatility	Relatively unstable change; information is available and the situation is understandable, but change is frequent and sometimes unpredictable.	Commodity pricing is often quite volatile; jet fuel costs, for instance, have been quite volatile in the 21st century.	***Agility*** is key to coping with volatility. Resources should be aggressively directed toward building slack and creating the potential for future flexibility.
Uncertainty	A lack of knowledge as to whether an event will have meaningful ramifications; cause and effect are understood, but it is unknown if an event will create significant change.	Anti-terrorism initiatives are generally plagued with uncertainty; we understand many causes of terrorism, but not exactly when and how they could spur attacks.	***Information*** is critical to reducing uncertainty. Firms should move beyond existing information sources to both gather new data and consider it from new perspectives.
Complexity	Many interconnected parts forming an elaborate network of information and procedures; often multiform and convoluted, but not necessarily involving change.	Moving into foreign markets is frequently complex; doing business in new countries often involves navigating a complex web of tariffs, laws, regulations, and logistics issues.	***Restructuring*** internal company operations to match the external complexity is the most effective and efficient way to address it. Firms should attempt to 'match' their own operations and processes to mirror environmental complexities.
Ambiguity	A lack of knowledge as to 'the basic rules of the game'; cause and effect are not understood and there is no precedent for making predictions as to what to expect.	The transition from print to digital media has been very ambiguous; companies are still learning how customers will access and experience data and entertainment given new technologies.	***Experimentation*** is necessary for reducing ambiguity. Only through intelligent experimentation can firm leaders determine what strategies are and are not beneficial in situations where the former rules of business no longer apply.

Figure 1. Bennett and Lemoine's managerially-oriented framework describing VUCA, with sample prescriptions for each (Bennett and Lemoine, 2014: 3)

Figure 2. Alexander and Fry's pedagogically-oriented framework for design-business experiences aimed toward preparing students for VUCA conditions

An organizational and managerial theory focused on VUCA conditions will tend to emphasize the capabilities and resources that a firm should make to 'VUCA-proof' its operation. In contrast, a design-business theory may borrow from Freeman in seeking to holistically engage the requirements of *stakeholders*, each with their own capacity to support or disrupt a firm's business plan (Freeman, 1984). In addition, this latter theory may combine stakeholder insights with a design-intelligent approach to help businesses imagine and re-imagine their ideas; iteratively developing their business plans and organizational models by building VUCA into the core of the development process. We contend that educating students to produce business plans which account for VUCA attributes, combine stakeholder insights and continually re-iterate using design-intelligent approaches will help to enhance future entrepreneurs and business leader's capacities in building "antifragility," in the face of VUCA, into their enterprises (Taleb, 2014).

The values of today's stakeholders

The values and priorities of today's consumers, employees and learners are not radically different from those of previous generations. However, we argue that the varying generations are different in particular ways: these (early 21st century generations) are distinguished by the ways in which they are influenced by new environmental pressures (i.e., demands for response to global warming) and by the "Great Recession" of 2008-9. We examine these influences through the lens of 21st century consumers, employees, and learners.

Consumers

The new spenders in the economy: millennial consumers, expect businesses to manifest responsibility to their communities, internally and externally; not only with their shareholders, but also with their suppliers and employees (The 2016 Deloitte Millennial Survey):

> No longer seen as monolithic, companies can now build or destroy social (and therefore actual) capital very easily and quickly. Social trends have likewise affected many businesses, bringing about more robust commitments to corporate, social, and environmental responsibility, not as a choice but as a requirement of doing business.
>
> - Fry and Alexander, 2016: 180

The ability to build and grow a business through platforms that bring various stakeholders together is evident in such companies as *Airbnb* (accommodation, founded 2008) and *Uber* (transportation, founded 2009). These are currently the two largest American entities in the new "sharing," (or collaborative-consumption) economy, both being examples of digital platform businesses. According to Benkler (2006) and Sundararajan (2016), a platform's key to survival is stakeholder trust, confidence in the network, smooth facilitation of transactions and accountability mechanisms. These highly profitable and fast-growing sharing platforms exemplify how explosive growth and high profitability can result from a well-designed business that engages the values and priorities of a new generation that views sharing of resources as both an ethos and a practical, cost-effective solution.

Employees

Economist Robert Reich has long been a critic of what has become known as the "gig economy" or what he's referred to as the "scraps economy" (Reich, 2015), consisting of workers whose roles have been disaggregated from traditional careers to ad-hoc tasks that are then purchased—as needed—via sharing-platform services. Examples of such services are *Taskrabbit, Instacart* and *Uber,* none of which offer retirement benefits or health insurance, and many of which place employees into a race-to-the-bottom as they compete against each other for increasingly lower wages. Contributing to a trend that has seen workers move from single-role careers to more fluid and collaborative ways of working, workflow tools such as *Basecamp* and *Slack*, and communication and conferencing platforms such as *Skype*, *Facetime* and *Zoom*, have enabled many workers to forego their commute in favor of remote, asynchronous, and sometimes piecemeal collaboration on projects. Motivated by factors that may include combinations of economic necessity, schedule flexibility and lifestyle motivation, many of today's employees also carry what are called "hyphenated" job descriptions, fulfilling two or more work roles, often within a single work day: a bartender may also work as a part-time account executive, or an *Uber* driver may also work as dog-sitter, perhaps using several 'sharing' platforms to match them with gigs.

Learners

The early years of the current century saw many companies experiment with various methodologies to disrupt traditional classroom-based teaching, and the credentialing process that accompanies it. Today, broad faith in the intrinsic value offered by traditional institutions of higher learning is under pressure (Bass, 2012). University attendance in the United States is associated with high costs (The Economist, 2012); according to the Federal Reserve the cumulative student debt burden in the U.S. currently stands at around $1.3 trillion (Bricker, Brown et al., 2015). This pressure on traditional university education, however, may be mitigated by a recognition that in a slow-growth, yet technologically-sophisticated economy, only the most highly educated will continue to reap relatively high rewards for their labor in an already saturated and exclusive environment (Murphy, Topel, Becker et al., 1999). Additionally, as Arrow (1973) on Spence (1973) has asserted—in certain cases—obtaining an education from a high-profile university may serve as a signal to employers of a candidate's success in a selective admissions process in which factors such as financial commitment and degree of difficulty of coursework may indicate that the graduate is prepared for post-university life. The authors speculate too that diminished employment opportunities may act as a countervailing force toward the adoption of alternate forms of learning, as young people may be encouraged by diminished employment options into selecting more conventionally-recognized career paths and participating in commonly accepted ways of attaining these.

Education and Business

The complexity of education as a business venture has led a number of digital technology-enabled education ventures to fail. MOOCs (Massive Open Online Courses), such as *Udacity* (2012), *Stanford Online* (2006), *Coursera* (2012) and *Kahn Academy* (2006), have had documented problems retaining students (Alrainmia, Zoa, et al. 2015). These efforts however, have helped to challenge classroom-based learning modalities, even if only used as a supplement to traditional teaching and learning. The influence of *YouTube* and the ubiquity of the internet in the classroom may better presage more profound shifts. As exemplified in the PBS documentary

Digital Media: New Learners of the 21st Century (*Digital Media…,* 2012), many educators observe that the 21st century American learner is much less dependent on received information and more apt to self-instruction in non-linear, "as-needed" ways, utilizing networks (Siemens, 2012). This trend will continue to apply pressure on the traditional academy to make a stronger case for how the value it offers is commensurate with its cost of attendance. In this environment, we assert that a design-oriented pedagogy continues to retain and add value though involving students in inductive, heuristic processes which are refined and iterated through successive feedback loops using methods such as critique and user-testing.

What can we broadly infer from the values and priorities of today's latest generation of consumers, learners and employees; the Millennial generation? First, the 21st century American consumer and employee is attracted to companies whose values align with their own; that sharing is perceived as having both a pragmatic and an ethical value; and that a company's story is important; so brand needs to align with values (Faw, 2014). Second, the 21st century employee expects not only to have multiple careers in a lifetime, but to have multiple simultaneous roles in the workplace; adaptability, flexibility and ability to reinvent one's working life are expected norms in the 21st Century workplace. Third, the 21st century learner is less patient about received wisdom. This ensures that a pedagogy that does not allow flexible modes of personal investigation and does not leverage the non-linearity and ubiquity of the internet is unlikely to succeed. The immediacy of relevance in material and new classroom approaches must ultimately counter the high costs associated with a higher education.

Why is this a Problem?

Traditional practices conflict with the values and priorities of future learners. Rapid escalation in the pace of change leading up to the 2008-9 crisis, with its subsequent downturns has led policy-makers, journalists and educators to speculate about gaps in the skills that the U.S. population is acquiring (Cappelli, 2014). Certain organizations such as *Turnaround: Arts*, *The Gordon Commission* and others have been responsive in understanding more dynamic learning environments (as opposed to skills per-se) recommending that the education sector help to develop graduates who can adapt rapidly to new circumstances and opportunities (for more information on *Turnaround: Arts*: https://turnaroundarts.pcah.gov/ and *The Gordon Commission*: http://www.gordoncommission.org). A focus on the pros-and-cons of standardized testing and the debates over Common Core Standards (Bleiberg, West, 2014), however, have led many experts to overlook how they might begin to develop adaptable, change-capable students, or recognizing that these are capacities that need to be taught explicitly. Future preparedness has tended to place great emphasis on the importance of STEM (Science, Technology, Engineering, Math) education (U.S. Department of Education, 2016) at least partly in order to enable Americans to compete worldwide with other highly educated citizens. Global benchmarking projects such as OECD's PISA rankings (OECD, 2015) have helped to fuel this educational arms race. In the midst of its ascendancy, STEM education risks overlooking two important facts in its pursuit of global competitiveness.

First, in the 19th and 20th centuries, the American economy created things that had never been seen before—either inventions or innovations, from the electric light to the passenger airplane. Granted, STEM skills were absolutely necessary for a majority of these breakthroughs. Economist Robert Gordon asserts that America's age of significant, life-altering innovation is slowing down (Gordon, 2012). If he is correct, then it follows that a "what-if?" or "future-directed" creative thinking might be productively incorporated to STEM's essential framework in order to advance global competitiveness and to reframe what constitutes a 'life-altering

breakthrough' in terms of sustainable survival of humans. (This incorporation is called STEM plus Art, or "STEAM;" further defined in http://stemtosteam.org/about/).

Second, in the 21st century, it is probable that we may come to see that winning an economic growth race against China or the European Union as less important than collective human survival in the face of severe global challenges—global warming amongst them. But with today's business goal-posts constantly moving, how do we as educators best prepare students for the world's new challenges? And how can we take their values into consideration?

Success in VUCA environments, and meeting the needs of today's consumers, employees and learners, is an absolute necessity for any business, and building these elements into a business plan is a design task. Although this fact is being explicitly and seriously pursued by some business and business-design programs, only a small minority of educators consider STEAM to be a part of their core mission. Under the rubric of "Art" we consider design, haptic problem-solving, applied creativity, and integrated learning to be among STEAM's key attributes, to be taught in addition to codified (technological/scientific) curricula.

Some design pioneers have reimagined the education system in an attempt to predict where economic development, and the skills needed to support it, were heading. In 2003, Roger Martin (at that time Dean of the Rotman School of Management at the University of Toronto, Ontario) partnered with the Ontario College of Art and Design to offer a series of courses on collaboration. In 2006 the Illinois Institute of Technology (IIT)'s Institute of Design launched a nine-month executive master's program in Design Methods. At Parsons School of Design, a BBA program in Design and Management was reimagined in 2004 as a design thinking/business hybrid and in 2012 Parsons launched the graduate program of Strategic Design and Management. In 2008 California College of Art (CAA) launched its MBA in Design Strategy and New York's School of the Visual Arts (SVA) launched its MFA in Design for Social Innovation program.

Stanford University launched their 'D-School' in 2005 facilitated by professor David Kelley, also founder, chairman, and managing partner of the design firm *IDEO*. Kelley has declared, "We want to produce T-shaped thinkers" (Hansen, 2012). This concept was first described in an article by David Guest "[as] combining analytical thinking—the vertical leg of the T—with horizontal thinking: intuitive, experiential, and empathetic" (Guest, 1991).

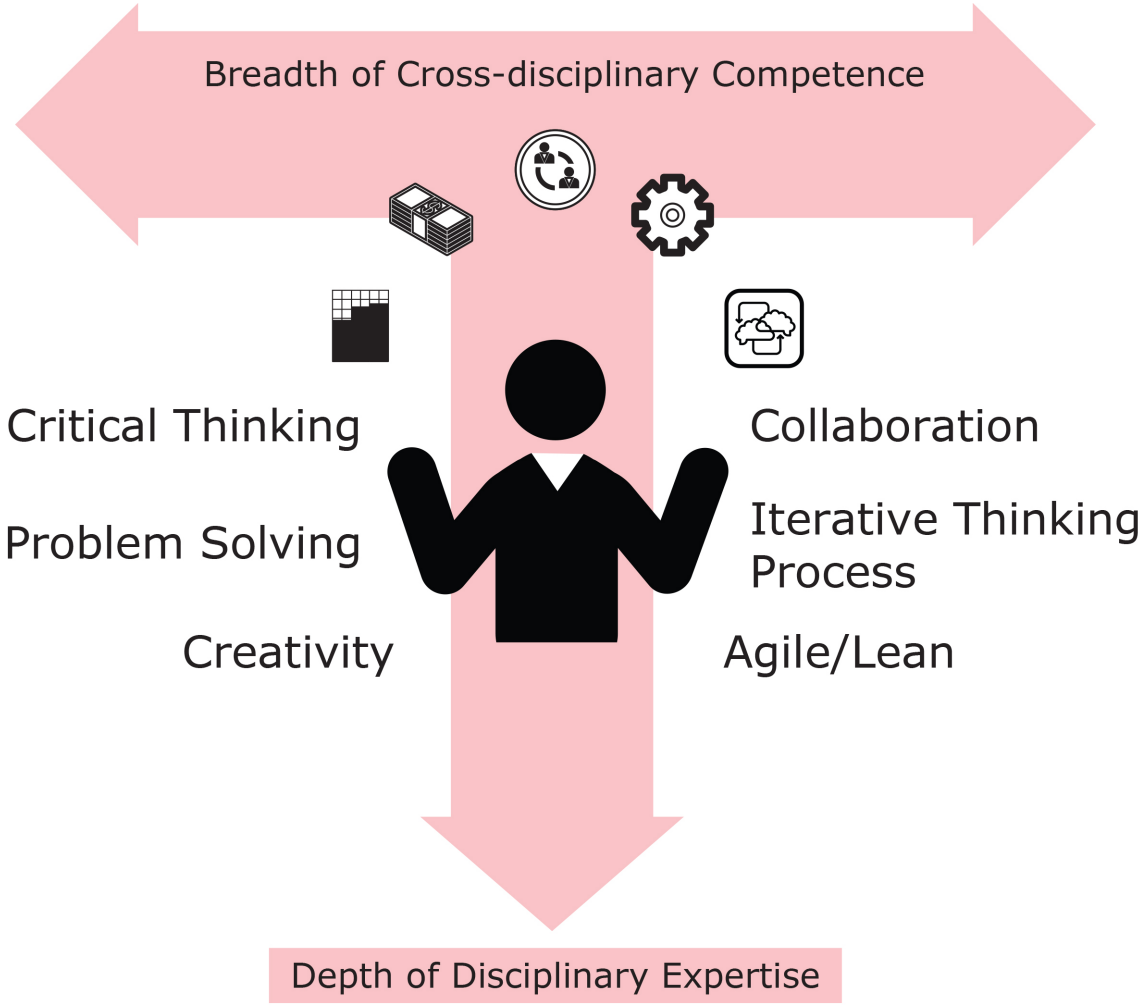

Figure 3. Our illustration of Guest's (1991) "T-shaped thinker," 2016

Despite recent and encouraging developments in the discourse of design-business education, design-business incubators at design schools are scarce. In the United States, currently, only Pratt Institute has an incubator (*BF+DA*), for fashion, and this does not test a distributed (networked) model which builds upon sharing-economy concepts. In contrast Parsons' *ELab* has created a model in which its fellows (those participating in the twelve-month version of the incubator) work on campus and in shared "hot-seat" spaces throughout NYC both in academia and within industry contexts. This model seeks to redress the deficit of entrepreneurial education generally, and design-oriented entrepreneurial education specifically.

ELab was formed in 2014 and is distinguished by Parsons' "design intelligent" approach, a practice we define internally as representing an integration of business logic, economic rationale, and organizational realities with the important capabilities of design thinking methodology and practice that we believe will lead to superior business results, enhanced sustainability and greater social value. *ELab* fuses design-intelligent iterative processes with the progressive values of *The New School,* (for more information see, http://www.newschool.edu/about/history/). *ELab* is sector-agnostic, advocates for '[high] impact entrepreneurship' (Acs, 2008), TBL (Triple Bottom Line) values and principles (Elkington, 1997) and promotes utilization of lean strategy (Collis, 2016). *ELab* aims to support and

strengthen the student evolution from academic-to-applied practice through extra-curricular programming, workshops and mentorship in a variety of practical business and design methodology contexts, supporting them to develop a minimum viable product and gain traction with it, thereby preparing their new ventures to compete and thrive in the post-recession landscape.

How Will We Address the Problem?

There are three factors that characterize Parsons' design intelligent pedagogy: i. new modalities of learning, ii. emphasis on innovation, and iii. redesigned models of educational frameworks.

In delivering an innovation-oriented pedagogy, we recognize that future learners (Gen-Z, Alpha, and beyond) have certain, fundamentally different learning orientations and that these in turn can be modeled and leveraged. For today's learners this means swiping, using social and learning apps, gamification, sharing, wiki, and using *Google* and *YouTube* and others as media and tools (Prensky, 2001). We assert that these capacities, however, need to be rooted in problem-solving skills, leadership and teambuilding practices, as well as iterative methods and approaches.

As with entrepreneurs, successful designers must also identify opportunities, observe phenomena to validate hunches, question existing assumptions and practices, envision a better future, work heuristically (through trial and error), and be willing to fail and to reinvent (McGrath, 2011). At the risk of being confused with "business intelligence" (enhanced organizational and decision-making driven by analytics tools and big data), design intelligence can be understood as somewhat connected with what Nigel Cross refers to as "designerly ways of knowing," which act upon non-verbal codes in the material culture (Cross, 2007). Cross regards these codes as facilitating the constructive, solution-focused thinking of the designer in the same way that the other (verbal and numerical) codes facilitate analytic, problem-focused thinking. Roger Martin elaborates on this distinction, stating that analytical, scientific, and deductive-reasoning-driven enterprises value reliability over validity. A "reliability bias" tends to focus on processes intended to eliminate uncertainty, whereas a "validity bias" tends to pursue valid answers to new questions—a process Martin, to paraphrase Charles Sanders Peirce, described as *abduction*: an informed wandering, or "inference to the best explanation" (Martin, 2009: 61).

Parsons' ELab; Testing New Educational Models and Frameworks

If Parsons' 'design intelligence' validates the pursuit of valid pragmatic business answers through both analysis and synthesis, a design hybrid education can offer students the skills that today's business leaders seek (Martin, 2009), especially for organizations aiming to create new value for their customers. Such skills include collaboration, empathy, practical problem solving, social responsibility, multidisciplinary approaches, inventive use of technologies, adaptability and design thinking coupled with business rationale. Today's design-inflected leader draws on the needs of people, combines these with the opportunities technology affords and posits the "what if?" question that is at the conceptual heart of the innovation inquiry. Design's iterative approach helps to create structures that promise to be more resilient to sudden changes of economic climate and technological disruption in a VUCA world.

We have argued that a design intelligent education which recasts design as an entrepreneurial activity with deeply practical implications for every facet of business is a competitive asset, particularly in a VUCA environment. However, uncertainty is… uncertain. Both design and business schools face their own VUCA conditions; perceiving shifting design-

business landscapes, confronted with the rapidity of change and the wicked problem of the multiple permutations of the design-business nexus. Most are in the process of considering how to respond to these uncertainties. In addressing how *ELab* may provide capacities toward addressing these issues we discuss *Lockheed Martin's* "Skunkworks" in its more contemporary iterations:

> Skunkworks (n): An experimental laboratory or department of a company or institution, typically smaller than and independent of its main research division.
> Oxford English Dictionary

The term Skunkworks was coined in the late 1950s in reference to the Advanced Development Projects laboratories of aerospace company *Lockheed Martin* which was established by famed aerospace engineer Clarence L. "Kelly" Johnson. Kelly wrote the "14 Rules and Practices" of Skunkworks (for more information on Kelly's 14 Rules and Practices: http://lockheedmartin.com/us/aeronautics/skunkworks/14rules.html).

Rule 1 states that, "The Skunkworks manager must be delegated practically complete control of his program in all aspects while rule 4 states, "A very simple drawing and drawing release system with great flexibility for making changes must be provided." Such guiding principles of creative autonomy and maximum design flexibility, share key characteristics with *ELab*'s design intelligent iterative approach. *Lockheed Martin*'s informal, or even "illicit," Skunkworks represented a necessary break from the hidebound management practices of 1950s corporate America (Gwynne, 1997), signifying a belief that the routines and reporting structures that it had itself developed would and could not produce rapid, breakthrough innovations (such as the Kelly team's enormously complex and ambitious, cold-war era, *SR-71* "Blackbird" of 1966 (still the world's fastest manned air breathing jet ever flown, with an official top speed of 2,193 mph)). Kelly's lab produced state-of-the-art engineering marvels using an alternate development-and-management paradigm (Rich, 1994). *ELab's* structure seeks to model the Skunkworks' in-between (or interstitial) status: *Lockheed Martin* sanctioned a laboratory with maximum autonomy sitting between corporation and independent contractor. Through the manner in which its fellows are distributed, *ELab* similarly inhabits an interstitial space between academia and the 21st Century work culture as it seeks to model today's workplace with its lean operating budgets, shared capacities and lack of a specific physical locale. Operating without a physical space, *ELab* is housed, conceptually, within *Parsons School of Design*, a division of *The New School*, featuring a distributed (rather than centralized) model which embeds its fellows within sector-specific co-working spaces or incubators in the greater NYC startup community. These features make *ELab* easily scalable and less expensive, in contrast to traditionally-conceived academic business incubators (e.g., NYU's *Leslie eLab* or NYU and UVA Darden's *iLab*), which are usually structured as centers within universities, often with a single-sector focus

(refer to Figure 4s' illustration of this organizational contrast):

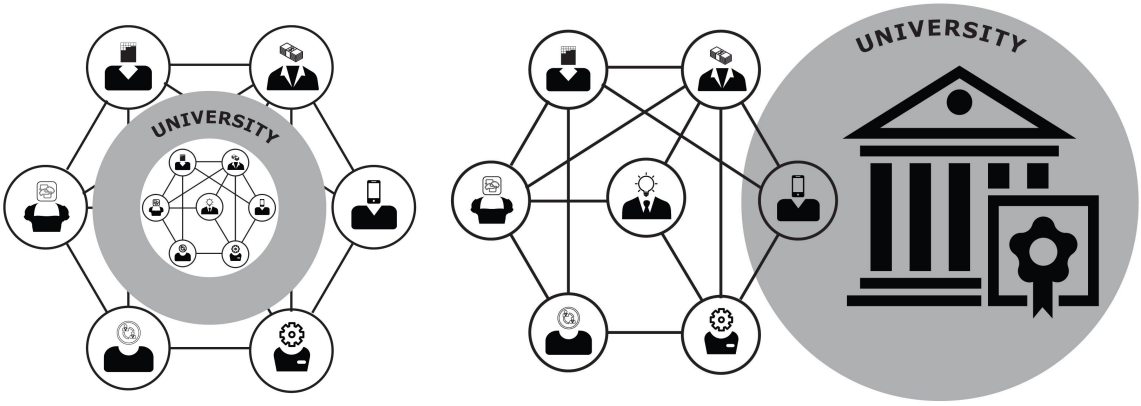

Figure. 4. A campus-based business incubator, or center (left) contrasted with *ELab*'s distributed model (right) in which there is no internal vs. external network. The various personae comprising each network represent financiers, innovators, engineers etc.).

ELab aims to support and strengthen the student transition from academic learning to applied practice, through extra-curricular programming, workshops, and mentorship in a variety of practical business and lean design process contexts. This helps fellows to develop a minimum viable product, gain traction, prepare their new ventures and learn how to thrive in the post-recession landscape. Our networked model is a system in which value is co-created and exchanged, in a distributed way, through a network of participants. An interesting example of creative autonomy and design flexibility at *ELab* is its support of design/innovation methods of collaborating and teaching which nurture faculty to become intrapreneurs. Our founding membership in a consortium of ten universities across New York City committed to impact entrepreneurship through design pedagogy. *ELab*'s network is agile, as well as highly collaborative and integrative—in other words, a contemporary Skunkworks. The Economist describes today's skunkworks as less about leaving employees "alone to think lofty scientific thoughts," and more about creating semi-autonomous networked units with a close communication between "marketing, design and accounting folk, to keep its feet firmly on commercial ground." (Skunkworks, 2008). ELab's close communication between various actors in the network is an intuitive outcome of distributing its fellows dynamically between academic and applied contexts (see Figure 4).

Due to the success of a high proportion of *ELab* fellows (see Figure 5), it has become a model for some new cross-university curricular programs. This is in response to the needs of current students in the new economy and a way of infusing the designer mindset and the T-shaped skills into programs that do not explicitly teach this content. In the same way that *ELab* embraces a distributed model, it has also pivoted from an 'Entrepreneurial Studies' idea (i.e., a program) toward an entrepreneurial *capacity*: one that is shared, like our contemporary economy.

The Impact of Our Methodology

The impact of *ELab*'s methodology is demonstrated in the way we administer and operate the lab. We teach our student researchers to run the lab and to measure the efficacy of our low-cost, easily scalable, networked model. In conducting our internal research. We use design research methods; a combination of mixed methods (both qualitative and quantitative) and we also use participatory research methods, discovering insights that inform and enable us to iterate on the program. Part of a longitudinal study of ELab (which is currently in progress), is the assessment of a design-driven mindset for future entrepreneurs and learners, its trial-and-error design, and measuring, the skills transferred and the impact of failure for intrapreneurship. We also hope to design best practices and guidelines for design-driven academic incubators focused on impact entrepreneurship. Our *Elab*'s twelve-month incubator around design-driven impact, for example, has been impressive, our fellows embodying what it means to be change-makers and purpose-driven. Below are outcomes from one of our prototype programs.

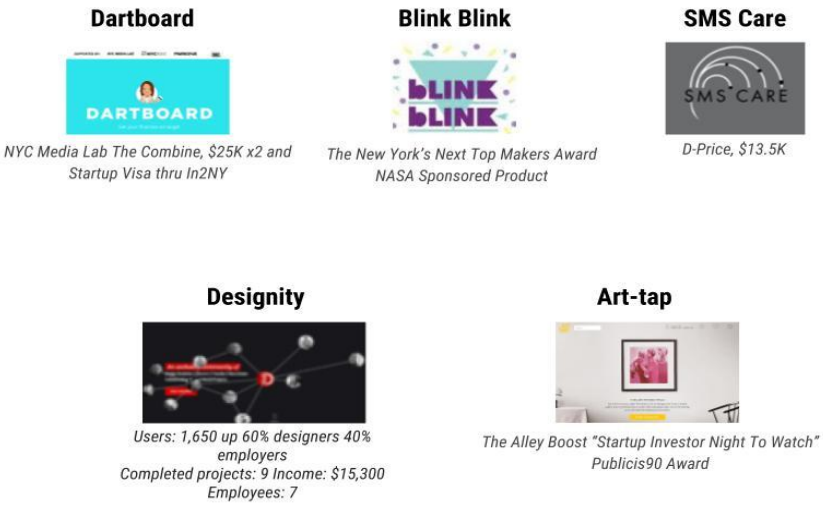

Figure 5. Five ELab-affiliated startups that either received external funding 2015-16 and/or are currently operational

Dartboard (above) tackles personal finance and college loan debt; *Blink Blink* tackles STEAM and technology education for young girls; *SMS Care* leverages SMS technology to alleviate preventable childhood diseases; while *ArtTapX* provides tools to democratize the fine art world. Of note, from last year's cohort of eleven startups, four won financial awards in less than six months and five out of the eleven are currently on their way to becoming financially sustainable.

The Next Step: Fostering an Inclusive Culture of Design-Focused Innovation in Business Across the Institution

While *ELab* provides faculty the opportunity to practice what they teach, it also gives them the ability to test and evolve new models. One of our next steps will be to develop an in-curricular, elective program: one that spans the university's graduate programs and is based on our existing twelve-month incubator model. Incorporating the *ELab* curriculum into a graduate elective course is a flexible way of infusing the mindsets and practices of design intelligent entrepreneurship into various majors while also testing its ability to scale across programs and colleges within our university. We also plan to map the many points of entry for different types of learners at different points in their development by flagging existing courses that would be equivalent to those of the *ELab* curriculum for startups. Finally, through the *Kauffman Inclusion Challenge*, a $420,000 grant that was conferred on our project in 2016, we intend to further our practice of inclusion by supporting more women and people of color in the design and technology businesses with scholarships and seed funding.

Conclusion

VUCA is not a corporate buzzword, rather it is a "new normal," set of conditions that we must account for when designing businesses that will sustain human life on this planet. Future learners can navigate VUCA using a "design intelligent" approach consisting of human-centered design, qualitative stakeholder research, rapid low-stakes prototyping, and the testing of new ideas (also known as iterative feedback loops with lots of experimentation) for new technologies and systems. The future-oriented, "what-if?" mindsets of the incoming generation of learners can be both be modeled and taught by today's innovative universities. We argue that the lean, networked, capacity-oriented methods we describe here put greater emphasis on *design-oriented* entrepreneurial inquiry, helping our future design entrepreneurs in preparing them to meet our collective future challenges.

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