MATURING OR WITHERING:
OPPORTUNITIES AND CHALLENGES FOR INDUSTRIAL DESIGN EDUCATION

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1. INTRODUCTION

In the early days of industrial design, the work was primarily focused upon physical products. Today, however, designers work on organizational structure and social problems, on interaction, service, and experience design. Many problems involve complex social and political issues. As a result, designers have become applied behavioral scientists, but they are woefully undereducated for the task." Don Norman

The reoccurring discussions held within the US industrial design education community about the opportunities and challenges of preparing industrial design undergraduates for industry practice is age old. Although some programs are still working to confront societal, industry and technological changes, arguments from some voices in industry seem to be anchored in a mindset where the sole purpose of industrial education is to serve industry in specific ways. While this may have been the focus of many industrial design programs in the past and some presently, like industry, more industrial design programs have evolved to respond to dynamic changes and are producing graduates with core industrial design skills while acknowledging diverse interests and desired education profiles. It is in these programs, where unique graduates are educated and not just trained, are more likely to flourish and offer broader value whether in industrial design practice or within different positions across business and social sectors. The latter is not surprising when you consider the small percentage of industrial design graduates that the industry is prepared to employ annually.

In the National Endowment for the Arts' (NEA) report on "Valuing the Art of Industrial Design Education", data and projections across 2010 – 2020 forecast that industry would be prepared to employ only about 1/3 of graduates from undergraduate industrial design programs. Though the NEA has for the first time produced a data driven report that describes a view of the landscape of industrial design, it is difficult to determine all the ways one might practice with an industrial design degree or define activities into categories that map back to the success of education programs. The Industrial Designers Society of America (IDSA) lists 68 ID programs across the United States; 25 are new as of 2006. These programs can offer distinctions based on geography and local industry, which historically has seen to influence curriculums; philosophical stances often contextualized by whether it is situated within an art school or university, or a combination. Of the 68 ID programs, Norman suggests that only a small subset is really addressing the needs of industry. Could it be that Norman and other critics are correct but focusing on a narrow aspect of the value of industrial design education? Whether industrial design education is maturing or withering today may depend on the stakeholder.

This paper seeks to advance the conversations on the future of industrial design education by raising questions and thoughts in three areas: 1) broader influences on industrial design education and its capacity 2) disruptions that are challenging core traditions, and 3) the value of graduate education.

2. INFLUENCES ON AND THE CAPACITY OF UNDERGRADUATE DESIGN EDUCATION

Norman's articles criticizing industrial design education, including "Why Design Education Must Change", are examples that yielded widespread agreement, at least judging by those commenting on blogs and sharing the articles. Though his passionate points and pleas were made several years ago, it was not the first or last time for such critiques and discussions about the state of industrial design education; it was however the most poignant in years. About the same time, in acknowledgement of the evolution of design practice and the varied outcomes by design schools across the United States – several who were seen as heavily influenced by art – the National Association of Schools of Art and Design (NASAD), constituted a special working group to explore the future of design education. (NASAD establishes and offers national standards and accreditation for undergraduate and graduate degrees for art and design schools.) This work group, representing design educators of industrial design, of which the author was a member, and communication design, analyzed current and expected future influences that were seen to impact design education. A report was produced titled "The Future of Design and Design Education: Strategies for assessing the responsiveness of design programs to the context of practice". It is available to the public through the NASAD website. The report recognized that there is no single path to address the challenges and opportunities facing industrial design education. Each program will define its own needs and development and learn from multiple sources. However it does identify and provided examples from leading curriculums on five major influences effecting design education, which were seen as useful guides for programs, particularly those desiring to move from a more vocational approach. Here is a high level snapshot from that document:

- Complexity: Today design is practiced in an interconnected world of unprecedented complexity. Designers have to be mindful of physical, behavioral, social, cultural, technological, and economic factors, in addition to traditional visual, functional, formal and human concerns.
- Innovation: Innovation demands more than creativity and involves payback, whether measured in economic or social terms.
- Technology: Rapid technological change redefines settings and relationships in the contemporary context for design and developed a report. It extends access to information, types of interaction, and means of fabrication.
- Globalization: The global flow of information, people, and goods encourages the free exchange of people and ideas. The employers of today's students have increased expectations of international awareness.
- Relationships: There is a shift from designing discrete objects to designing services and systems through which people create their own experiences. Design processes are increasingly organic and evolutionary with different goals than the finished perfection of modernism… Designers have to be mindful of physical, behavioral, social, cultural, technological, and economic factors, in addition to traditional visual, functional, formal and human concerns.

Broader discussions of the NASAD group were held around program approaches noting there were iterative approaches – representing current practice in most design programs where programs evolve existing curriculums in response to industry hiring needs and based upon resources of the program, and specialized approaches – where the broader complexity of design activities has seen some programs specialize in an area of focus such as transportation, medical device design, and an emerging focus on social innovation are examples.

The following year a more radical response to industrial design education was part of a presentation and discussion panel at the 2012 IDSA Education Symposium on "The Future of Design Education". The provocation by Joe Ballay, Emeritus Faculty of Carnegie Mellon's School of Design and co-founder of Maya Design, was that many undergraduate industrial design programs at best incrementally improve curriculums in response to industry needs. However rapid changes in design practice requires accelerated changes in education, yet curriculums are confined by structures that date back about 80 years and resources that are limited. This approach essentially argued for a liberal arts approach to undergraduate industrial design thereby eliminating the undergraduate degree, as we know it. "No more undergraduate degrees in ID. Industrial design has become so complex… so much is riding on good solutions to far reaching problems… that no ordinary undergraduate can really handle the job. This should not be surprising; there are examples of similar limitations, and a similar solution in medicine, law, and increasingly in engineering and architecture. Other disciplines may have reasons for maintaining four-year bachelor degrees. But not ID." Ballay further comments that the future for industrial designers is changing and it will be riskier to have it change organically rather than strategic or intentionally.

Intentional change requires awareness and actions in response to specific disruptions that are game changers and potentially have long-term effects in thinking and doing. The next section describes a few examples of disruptions that for various reasons are a challenge to embrace.

3. DISRUPTIONS THAT CHALLENGE CORE TRADITIONS AND INFORM NEW PRACTICES

No single disruption has been as significant as that of technology. The broad scale evolution and application of technology to nearly every aspect of human activity is shaking the foundations of traditions that are held dear in industrial design curriculums. Many technologies are too new to understand from a pedagogical perspective whether they are to complement or replace established approaches. Therefore in this state of transition (or constant change) programs are having to decide if and how to embrace these opportunities, and as they contemplate they risk the chance for greater student learning and preparedness. Following now familiar uses of technology represent only some of the areas of disruption.

3.1. EXPERIENCES VERSUS OBJECTS

Figure 1: GoPro: Soul Flyers (Designing for active experiences)

Figure 2: Nest (Designing for Internet of Things)

Apple, Nest, and GoPro (Figures 1,2) are just a few examples of the many rapidly emerging experience driven companies with products that are captivating lives. In a Fastcodesign.com article titled "25 Ideas Shaping the Future of Design" select designers were asked to shape a picture of the year 2020. Vijay Chakravarthy, Senior Product Designer, Michael Graves Architecture & Design commented, "Owing mostly to the sheer number of devices that require management and interaction, consumers are surrounded by objects that have resulted in new complexities. The future is going to consist of more automated objects, and designers will need to take a deep dive into the workings of the human mind using psychographic, ethnographic, and sociocultural research to develop products that provide meaningful engagement that will simplify our lives." In the same article Robert Brunner, Founder, Ammunition Group stated "As we build more connected smart things that observe and measure us and our world, the relationship that design, functionality, and experience have with real-time data analytics will grow. So designers will need to know how to play with data scientists, and work together to build new definitions of everyday objects as we make them smarter and more effective."

In a December 2014 article by McKinsey & Company they project that by 2025 there will be between 20 to 30 billion connected devices (some report higher numbers) with a global financial impact of about $6.2 trillion. Based on an estimated world population of 7.9 billion people, each person on the planet would have between 2.5 and 3.8 connected devices – higher if you back out those on the planet that won't actually be connected. The Internet of things is clearly a major disruptive force and the full impact on the public is not yet known. So how does industrial design education prepare students to design for this emerging world when many programs have struggled to manage existing curriculum pressures in such areas as manufacturing, sustainability, and material science? Functional digital technology seems scarcely part of many curriculums – though Arduino has merged as a platform for those able to give such attention and enables a level of thinking and prototyping that significantly moves beyond traditional speculations (Figure 4). Yet increased formal teaching will be necessary at some level if designers are expected to have a mind prepared to contribute to the creation of service solutions where physical objects are a mere platform for a broader experience.

Figure 3: By 2025 there will be between 20 to 30 billion connected devices (some report higher numbers) with a global financial impact of about $6.2 trillion (Shutterstock Image)

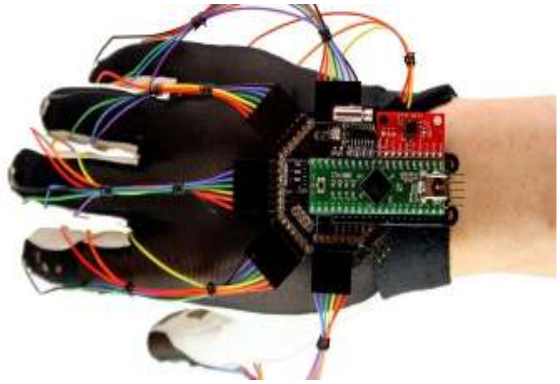

Figure 4: http://blog.grunick.com/tag/arduino/

3.2. SCALE AND CUSTOMIZATION

DIY and customization technology are expected to have notable, if not significant, impact on consumer purchasing preferences and product ownership. The notion of local manufacturing and design for customization are concepts yet to be introduced in many undergraduate industrial design curriculums. For Fastcodesign.com Ben Watson, Executive Creative Director, Herman Miller writes, “As everything becomes available everywhere—in the physical and virtual world—more and more people will respond to designs that offer a mutable framework for personalization, individual expression, and adaptability. In other words, design will increasingly become less about what you take out of the box, and more about what that design offers over time as you live with it.” And Maeda writes “there will be a well-defined divide between designers in tech for the bespoke economy (i.e., at the scale of tens of users) versus designers in tech for the global economy (i.e., at the scale of millions of users). Designers for ‘fewer people’ will deftly leverage technology that enables short-run advances like 3-D printing, as well as the many e-commerce front-end technologies that are now available. Designers for a ‘gazillion people’ will deftly leverage technologies for evaluating their solutions at scale to test and retest their assumptions in large sample populations. They are at the bleeding edge where social science meets big data meets leading hundreds of designers, researchers, and engineers.”

3.3. EVERYONE WILL BE VISUALLY CAPABLE

Industrial design undergraduate programs continue to see an increase in applicants that have limited training in visual arts education, if any at all. For programs accepting these applicants the challenge is to teach them 2D (drawing) and 3D (physical prototyping) thinking and communication skills in effective and efficient ways. However pedagogical structures some cases are fundamentally unchanged after many decades. With the advent of technologies, traditional ways of teaching visual literacy may now represent constraints that are self-imposed. While many applicants to industrial design programs are attracted in part by the traditional visual and prototyping skills that are reflective of some areas of practice, technological advancements are now capable of accelerating fundamental skill development for design students, or anyone with limited visual experiences, and enable them to be powerful story creators and tellers without having to be masterful in drawing or prototyping. Therefore, no need to outright exclude intellectual talent because of perceived weak visual and physical communication skills. Those who do so will miss opportunities to educate unique problem solvers, especially when the landscape of available and emerging support tools are growing plentiful and rapidly. One example is the advancement of the digital tablet. Tablet devices and software tools such as Sketchbook Pro (Figure 5), Autodesk Fusion 360 (Figure 6), Keyshot, and numerous others are challenging traditional pedagogies because of their accessibility, ease of use, and increasing affordability. Similarly affordable rapid prototyping tools such as laser scanners and cutters, 3D printing, and other machines are both supporting and challenging the need for physical prototyping. Programs now need to consider how to incorporate these technologies into curriculums and justify the need for traditional fabrication infrastructures because of them. Such necessary consideration is part of what slows the adoption of technology. The unintended consequences are the perceptions of students and professionals as to why? With regard to students, they now work around curriculums to develop the knowledge and skills they determine valuable. Maeda comments relative this point where he discusses the rise of the self-educated designer: “In programs of design tech will outpace offerings from the university, a reality that is already present.” One examples is industrial design programs are already seeing students independently learning and teaching each other visual representation and communication skills through devices and software tools not provided by their programs. This exchange happens in classes, across disciplines within colleges and universities, and via external social communities through the internet. Visualization tools are increasingly free or at a minimal cost and are available across smartphone, tablet and computer platforms. Students are naturally taking advantage of what Maeda refers to as “real-time learning” – learning beyond what a “college course can teach in a perfected, hermetically sealed form within the span of a semester or quarter”?

Figure 5: Digital Tablets and Sketching Software – Wacom.com Figure 6: www.autodesk/fusion360

Corporations like Autodesk are actively working to shift the communication workflow. Through tools like Fusion 360, Autodesk is exploring new paradigms and rapidly developing collaborative tools across the entire design process. This is but one example of a disrupting influence for design education in this space. Other less visible but related examples come from engineers who are working on various computational tools to develop visual language algorithms that can automate some aspects of form generation including product personality and visual brand language. For the past 15 years Levent Burak Kara, professor in the College of Engineering at Carnegie Mellon University, and his colleagues have developed research within the Visual Design and Engineering Laboratory. One area of his work focuses on computation design metrics where the user can manipulate sliders to change the personality of a physical form. In one of his examples he inputs data for mid-sized car sedan and then by adjusting the parameters via sliders can modify the sedan into the language of a sports car (Figure. 7). They are exploring this approach with various consumer objects. The work is too immature to be usable in formal design activities, however it is ongoing and there is likely to be a breakthrough at some point in the future whether with his group, with one of the many others working around the globe on such initiatives, or with a well-established corporation like Autodesk who is actively working to create collaborative tools to reimaging how people create and share work. In additional to the technological advancements that are being applied to traditional design skills, the emergence of augmented reality tools presents a new area for disruption (Figure 8). These software and hardware tools are now available offering crude representations for the moment but with the promise to provide tools for having dynamic visual experiences and the ability for the average person to be a creator.

While the development of virtual tools and language systems will benefit designers, it may also significantly impact the ability of others in the design process, those who are not trained in form creation and styling, to participate in design activities that have up to this point been exclusive to trained designers.

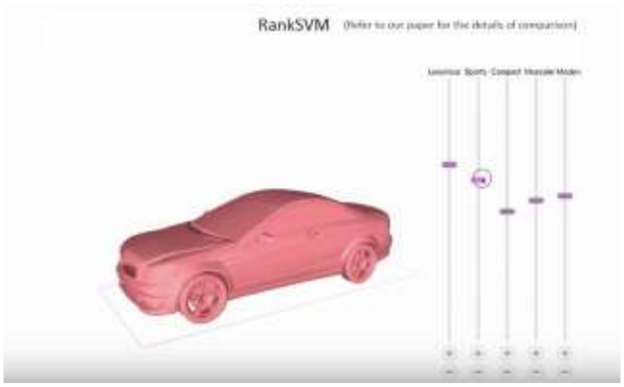

Figure. 7: Kara: Visual Design and Engineering Laboratory

Figure 8: Augementedrealitytrends.com

4. THE VALUE OF GRADUATE EDUCATION

“There will be an increase in the number of designers in tech that emerge from engineering majors. Back in the '90s, as an MIT Electrical Engineering and Computer Science grad, I always knew that designers with engineering backgrounds were rare because I was the odd duck. At the close of this decade, we will be seeing more designers with an engineering background” — John Maeda

With greater disruptive influences and the complexity of designing product experiences and related ecosystems, it seems all but impossible to layer additional knowledge requests onto already strained students and curriculums. There are some programs with strong curriculums and resource support that are able to keep a reasonable pace with industry demands, however others have an ongoing struggle. When you consider the capacities of an undergraduate program, and the broader needs of the profession, graduate education should be seen as a tremendous opportunity.

Historically industrial designs saw little value in graduate education, as many believed they could learn on the job what is needed to grow their career. While this may have been the case then, the complexity of the profession makes this seemingly still prevalent argument difficult to defend today. Aside from a few forward thinkers who are able to plan their ideal career path for gaining the knowledge and experience that makes them highly valuable, and with luck are able to execute the plan, the chances are low for the average designer to expect such a path to unfold. Additionally, in this time of rapid change, accurately predicting the right job path is little more than a gamble. The higher-level thinking, strategy and innovation methodologies needed to adapt to uncertainty cannot be guaranteed in the workplace but can be planned for and acquired through graduate education. Therefore the commentary that devalues graduate education, promulgated in social media channels, if embraced, can delay professional growth opportunities. Designers who make such statements often do not distinguish the role and opportunity for graduate education. What they seem to reject is the notion of returning to graduate school to study industrial design further. While there is nothing wrong with this reasoning for those who have such a desire, these numbers are likely low. Industrial designers who are considering graduate school are seemingly not seeking advanced education in industrial design. More the case those applicants are seeking advanced study in complementary knowledge areas such as business or engineering. Similarly, enrollments in design focused graduate programs are typically by those who do not have a design undergraduate degree in the same discipline, or a design degree at all. These students are layering design thinking, strategy, innovation, and in some cases form generation onto core skills in business, engineering, anthropology, architecture and others. As a result, it is more than conceivable that future leaders of design will be those who have a master degree in some form of design education (say industrial design) and an undergraduate degree from another discipline (say business or engineering). Robert Brunner, Founder, Ammunition Group comments, “more and more, individuals trained in design will hold leadership positions. But not all will be qualified. It will always take a broad understanding of a business and the vision and strength to take it somewhere. But strong business skills combined with design training and talent will become a potent combination.”

4.1. CREATING HYBRID THINKERS AND DOERS: A GRADUATE MODEL EXAMPLE

There are master programs that provide advanced education in business, engineering or other domain specific areas that are attractive to designers. The Master of Integrated Innovation for Products and Services program (MII-PS) at Carnegie Mellon University is one that brings together design, engineering, and business into one integrated program focused on innovation methodology. The program leverages its unique partnership between three colleges; engineering, fine arts (design), and business to bridge knowledge and cultural gaps in order to produce elite innovators who are hybrid thinkers and doers. Its philosophy is to cross train interdisciplinary teams, which means for example, design students are required to take a range of business and engineering courses as is similar for the other disciplines. The courses are designed to build higher value between disciplines, enhance diverse thinking and broaden perspectives on the challenges and opportunities of any given problem. Multiple team experiences in courses provide opportunities for new compositions and challenges where students build onto their strong discipline knowledge from prior experiences. Capstone requirements for each team include delivery of well-defined design specifications, engineering feasibility, and a business plan. Corporations have seen value in several ways including the generation of new research, product/service creation in whitespaces, numerous patents, and some have commercialized outcomes. Graduates have gone on to lead high-level strategic efforts within leading companies or to play valuable roles within product and service organizations. Graduates such as these are ones that are prepared for the complex industry and societal challenges now and into the future. This educational approach is a response to the new thinking and practicing needs at the “fuzzy front end” of new product development. It addresses new knowledge and experiences undergraduates are not ready for.

5. CONCLUSION

While industrial design education overall continues to produce quality undergraduates who have successful careers in industry, there remains age old concerns about the broader landscape of these programs and their development in response to current and emerging complexities of products, services and experiences practiced under the enormous umbrella that is industrial design. What is unfortunate about some of the critiques by industry of industrial design education is that they don't contribute to practical or collaborative solutions. Equally unfortunate is the lack of a cohesive response from the education community. Together this is a reflection of the long-standing limited relationship between academia and the profession and missed opportunities.

The increasing number of disruptive influences that challenge industrial design education cannot be underestimated. Though some programs are positioned well to respond, others have ongoing struggles. The fact that only about 1/3 of industrial design graduates, annually, are expected to find employment in the profession also cannot be dismissed. These conditions seem to point to the need for particular efforts between educators and professionals as partners to determine how to best approach industrial design education in the twenty-first century. What is missing is a vision, mission, and sustained collaborative leadership capable of bringing education and practitioners together to strengthen the profession for the long-term. Interestingly, Craig Vogel, notable industrial design professor and historian comments that in 1963 there was such a partnership (albeit temporary), prior to the merger of the Industrial Designers Institute (IDI) and the American Society of Industrial Design (ASID), the precursors to IDSA. Then distinguished professionals and educators from around the country unified for a common purpose, created a curriculum framework for industrial design education. While it was unfortunately buried shortly thereafter with the merger of the two organizations, it was an impressive union and outcome. “We have never come close to the vision that this group presented,” states Vogel.

Several possible outcomes could emerge from looking at industrial design education holistically and as a design problem, including: 1) some areas of industry will need to invest more in training entry level hires with the expectation that graduates will not be broadly knowledgeable in certain aspects of their practice 2) some undergraduate programs will need to become specialized using a narrower focus as an advantage because of the undergraduate timeline 3) advanced education through master degrees will become an increasing and necessary part of an industrial designer’s education and career success, whether or not master study is focused on some form of design, a complementing area such as business or engineering, or through new models such as the integrated innovation approach. To restate Ballay, “the future for industrial designers is changing and it will be riskier to have it change organically rather than strategic or intentionally”.

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