

GREAT DESIGN COMES GREAT RESPONSIBILITY

EXPLORATION INTO RESPONSIBLE INDUSTRIAL DESIGN (RID)

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ABSTRACT

This paper explores the inevitable change of Industrial design practices due to the decline of natural resources and the increasing necessity to focus on sustainable practices. Design methods like Design for Disassembly and Circular Economy will become common practice. The problem that arises is that current product design curricula places little emphasis on these tools and concepts. The result is setting students up with a competitive disadvantage within the future of their career. By implementing key concepts and theories in responsible product development within the current curriculum, design schools can help form a consciousness towards responsible product development and provide graduating students a competitive advantage within the paradigm change of industrial design. Training young designers in sustainability will also allow for innovation and continued relevance for the participating school.

1.1 THE PROBLEM WE ARE FACING

In order to understand why the current design curriculum needs to change, we need to fully understand the state of the world and what possible future we as designers will be facing.

We currently live in a world with around 7.6 billion people. It is predicted that by 2050 the population will grow to 9.7 billion. The main concern, however, is not the size of the population, but rather the rising number of middle class citizens. As of 2009, there were roughly 1.8 billion people with middle class status. It is estimated that by 2020, the number of middle class individuals will increase to possibly 4.9 billion; and nearly half of the population by 2030. The growing numbers of individuals rising out of poverty and into the middle class will naturally increase the demand for produced goods.

The growth of the middle class is a sign of economic improvement throughout the world, yet with this boom comes more demands for produced commodities and goods. We as a species need to be aware of how we use the finite resources of this planet. We currently use 50% more of the Earth's resources than it can naturally generate in a given year, meaning we are in a state of over-consumption called overshoot. With the ever-increasing demand on the planet, we are witnessing a decline in availability of vital resources such as arable soil, petroleum, and even clean, drinkable water. Many of these diminishing resources are not just requirements for life but also key requirements for manufacturing and transportation, and play a part in essentially every aspect of a product's lifecycle. The current linear system of "make, sell, and dispose" is irresponsible, and if left unchecked it will eventually create severe shortages of raw materials, which we need in order to produce the goods we use in our current lifestyles.

What's more, there is a rapidly growing problem in how we view obsolete products & goods. The societal norms of how we dispose of waste are often lacking, misinformed, or just ignored and not considered a priority. An excellent example of this is our reliance on plastic. Plastic in all its forms is a great resource and allows for the creation of unique designs. Yet many do not understand the correct methods for recycling plastic, how long it lasts, or don't realize how valuable resource it can be if reclaimed properly. Since the introduction of mass produced plastic, there has been 8.3 billion metric tons of plastic produced globally. Yet around 6.3 billion tons of the plastic has ended up either in a landfill, incinerator, or one of our precious natural ecosystems. Nearly 8 million metric tons of plastic ends up in the oceans every year. So much plastic has entered the ocean ecosystem, that it's predicted by 2050 there will be more plastic in the ocean than fish.

This awareness around natural resources and business isn't new. Non-profit organization The Natural Step has been helping visualize the correlation of long-term business success and environmental impacts since 1989. The Natural Step uses the metaphor of a funnel to help us visualize the economic, social, and environmental pressures that will inevitably impinge on society as natural resources continue to diminish and the population grows. By using the funnel metaphor (Figure 1), we can predict how an individual, a company, or even an educational institution performs within the limitations of resource decline and increase demands, based on their practices and responsible use of resources.



Figure 1. Funnel Metaphor, Natural Step

2.1 THE DESIGN AS USUAL APPROACH

Product design curriculum within the United States focuses on the fundamentals of design in order to prepare a student for a career within the field. Programs tend to focus on hard skills (fabrication, sketching, and ideation), soft skills (presentation, portfolio, and work ethics), ideologies (design thinking & human-centered design), and research & methodologies (contextual research, sprints, agile, etc). This is based primarily on my own experience within design school, and supported by professors and designers in the field. Though these courses are necessary for a prospective designer's success, there is a lack of long-term thinking and sustainable methodologies within the curriculum. This will eventually put the graduating student at a disadvantage when their company is faced with resource scarcity due to environmental, societal and or economic issues. Below is a map (Figure 2.) of the current product design student's (Designer A) career and the effects of the Natural Step funnel (Figure 1.) on the possible outcomes of employment and success.

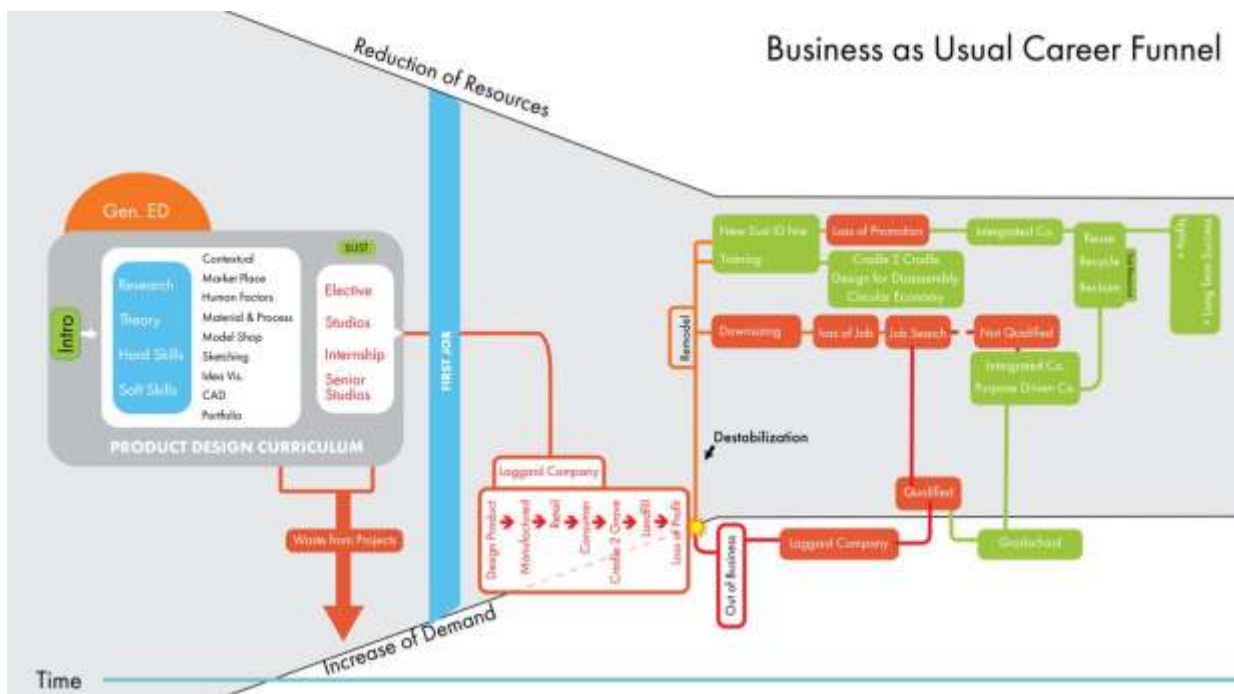


Figure 2. Business as Usual Career Funnel. By Christopher Beard

Within the current system, Designer A's first and only introduction to sustainable theories and methodologies are within an elective and or minor. However, with so many skillsets being demanded from the students in order for them to become a proficient industrial designer, the design student will most likely graduate from the program with a limited understanding of sustainable methods and how to apply them effectively within product design.

Following Designer A past graduation, due to the competitiveness of the field, there is a likely chance that Designer A's first company (Company A) will be what's called a Laggard Company. Laggard Companies have little to no concern about its environmental influence, limited foresight, limited adaptation in response to growing limitations, and is modeled after what's worked in the past for economic growth. This is also known as the Business As Usual model. Once the walls of consumer demand and natural resources narrow within the funnel, so does the opportunity for success. In Figure 2, Company A will have two options. First, continue with the Business As Usual model and become obsolete, resulting in eventual collapse and closure. Or, adapt a new business model that is more inclined for success and takes responsible product design practices into consideration to sustain profits and growth.

The first option will cause the designers to lose their jobs and, due to lack of experience with sustainable practices, either seek employment with another Laggard Company that would just perpetuate the cycle of insecurity within their career, or be forced to return to school for additional education within sustainability and responsible practices.

The second option, corporate restructure, might result in Company A providing further training within sustainable practices and methodologies. There is also a high probability that Company A will be looking for additional employees that are knowledgeable within sustainable practices to help transition the company from a Laggard Company to a Sustainably Integrated Company. With the adaptation towards a more sustainable business model, Designer A might have a difficult time gaining a promotion based on the introduction of other candidates with more knowledge and skill sets within the field.

In either scenario, the current curriculum will result in Designer A needing more time to adapt to sustainable practices, and having a harder time competing in the industry.

2.2 CASE STUDIES

As social trends have shifted, the incorporation of sustainable products has become more prevalent within the last decade. More companies have integrated a focus on sustainability within their corporate structure, which can be often found within their annual reports, and have been promoting their sustainable initiatives as selling points for their business and marketing plan. Some companies have even explored how using sustainable practices can fuel innovative design. Below are a few case studies in which implementing sustainable and responsible practices have resulted in innovation.

In April 2015, Parley announced a commercial partnership with Adidas to create the world's first running shoe made with yarn recycled from ocean plastic. Cyrill Gutsch of Parley stated that "trends have the power to shift thinking and behavior - sometimes overnight. Technology and fashion are perhaps the fastest change agents there are." Gutsch believes more immediate behavior change can only be achieved through the marriage of major brands and environmental challenges. Sustainability not being the usual marketing strategy of Adidas, the collaborative project with Parley was a great success. In 2017, Adidas and Parley sold over one million sneakers made from recycled ocean plastic.

In 2017, Ikea announced a corporate restructure plan based around Circular Economy. "We need to find alternatives for a circular system," said Anna Granath, Product Developer at IKEA of Sweden. IKEA aims to close the loop between harvesting materials, producing products, and lab testing, by incorporating circular design within every step of the design and production process. They are developing a circular supply chain and exploring innovative production techniques. In 2017, IKEA launched the KUNGSBACKA line, which was developed with materials made entirely out of recycled wood and recycled PET bottles.

Ever since Tom Szaky founded his company in 2001, packaging liquid fertilizer in used plastic bottles, TerraCycle has been a purpose driven company in the realm of sustainability. Now operating in over twenty countries, engaging over 80 million people, and recycling billions of pieces of waste through various innovative platforms, TerraCycle works with many of the world's best companies to provide up-

cycling solutions for many forms of waste. By volume, TerraCycle recycles over 97% of the waste that they collect. This year, TerraCycle is launching its LOOP program, which will partner with large product brands like P&G to create a subscription service incorporating reusable containers to ship household goods. It will be the first such service in the United States to embrace the circular design platform on such a scale.

2.3 PRIMARY RESEARCH

To further understand how sustainability can be applied to an industrial design program, research was needed to understand the opinions and viewpoints of professors, professionals, and programs in regards to the future of design, design curriculum, and how sustainability plays a role within the future of design. Additional input was also needed from design students to understand what they perceive as being important in designing products, and if current curriculum is aligned with their personal ethics regarding design.

Four professors at the Savannah College of Design (SCAD) were interviewed; Paul McGroary, Satyakam Sharma, Will Woods, and George Perez. Also, former professor and now chair to IDSA Southern District and founder of Shift Design Camp, John McCabe, took the time to be interviewed. The goal in interviewing professors was to understand their desired goals when educating young designers, their opinions on the future of design, and what they considered to be lacking in the academic design world. The consensus amongst them was that sustainability is going to play some role in the future of design. Exactly how varied from professor to professor. There was a shared opinion that there is a problem not with design education, but rather the communication between different design disciplines, and for effective change to happen within design there needs to be both a sharing of design language, and more crossover between different disciplines within the industrial design program.

To better understand the ideals, goals, and desires of the students, and what they were expecting from the design curriculum, an experiment was used. The experiment was the Triad Card Experiment, from the paper *The Development of Responsibility in Product Designers*, by Stacey Birkett, Peter Lloyd, and Steve Garner, from the Open University in Milton Keynes, England. This experiment allowed for a greater understanding of how design students value key subjects within design, and shows how the students made connections to different aspect of design through culturally recognizable images.

The Triad Card experiment was made up of two different parts. In the first test, the student was given three random images and asked to identify two that were similar and to describe what type of design the two images together related to. They were also asked to place the remaining image into its own design category. They repeated this six times. When describing what type of design the two like images were related to, the students were more inclined to identify an element of design with a positive moral association. They tended to identify the third, unrelated image with a more technical element of design. Examples would be social design (positive moral association) and design for wealth (technical or negative moral association).

In the second test of the experiment, the students were asked to filter 20 ambiguous words into three different categories; My Responsibility, Not My Responsibility, and Maybe My Responsibility. What this portion of the experiment revealed was that the students mostly considered their client and the design to be their main responsibility, but they considered elements of sustainability like society, supply chain, and economics to be out of their reach and therefore not their responsibility. The students only examined their role as designers at a surface level, and their thinking relied heavily on the constraints of the client. They didn't understand how long-term thinking could create better design by averting negative impact later down a product's lifecycle.

3.1 ELEMENTS OF RESPONSIBLE INDUSTRIAL DESIGN (RID).

Within the US, the current design curriculum does little to foster long-term thinking and sustainable practices. This is not entirely the fault of the current educational system, as they have a responsibility to prepare students for success in the current Business As Usual design world. Many, if not most, schools

do provide sustainability courses, but they usually are separate from the main curriculum and offered only as electives. This division of departments and disciplines creates a disconnect within the shared language of design. This results in Physical, Services, Sustainable, as well as other design fields not understanding the needs of one another, often lead to collaborations between the disciplines to fail. However, by understanding the rapidly approaching environmental, societal, and economic issues that not only modern industry, but the world as a whole, will have to face, it is imperative that design schools detach themselves from the model of the industry and become centers that foster the development of ethical, sustainable, and responsible design for the problems of tomorrow. This can only be achieved through a shared understanding of all the disciplines, as well as an integration of sustainability into all aspects design curriculum.

Though the fundamentals of industrial design should still be taught, an early introduction to key elements of sustainability theories, methodologies, and long-term thinking will help establish a responsible product development and design mindset. Some of the topics that need to be incorporated within the curriculum are Design for Disassembly, Circular Economy, Cradle to Cradle, and Life Cycle Analysis. The implementation of sustainable ideologies and practices in industrial design courses will foster a sense of responsibility within product development, and lead to a new era of product design called Responsible Industrial Design, or R.I.D.

Building off IDEO's Circular Design Guide, R.I.D. aims to instill the importance of resource stewardship into young designers' early in their academic career. By understanding the environmental and economic gains of resource sensitivity, designers can learn to design not just products, but also the entire lifecycle of their products. Instead of emphasizing established degrees like Sustainable Design, Design for Sustainability, or Green Design, R.I.D. repurposes the current product development curricula's mantra of "Design First" to thoroughly evaluate concepts on an environmental criterion. R.I.D. synthesizes the various design principles into a singular ideology for the future; Good design needs to be good for all. Plant, Animal, & Earth.

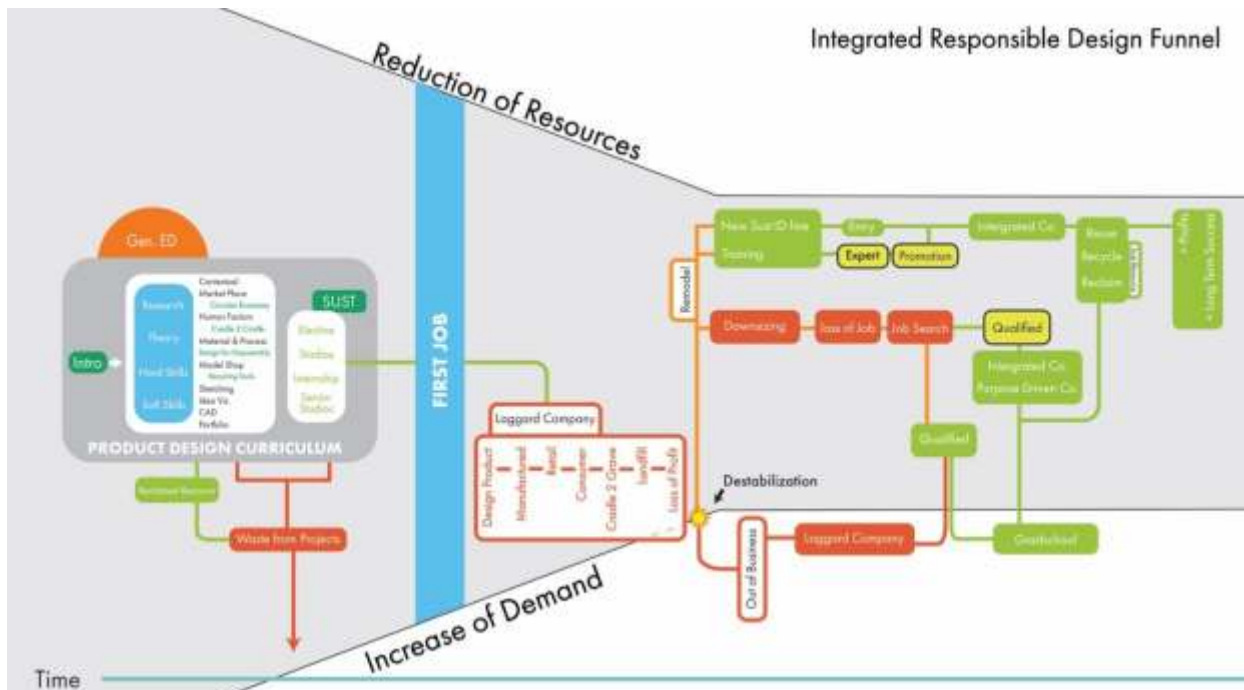


Figure 3. Integrated Responsible Industrial Design Funnel. By Christopher Beard

As shown in Figure 3, by integrating key elements of sustainability with the current product design curriculum, students can gain a greater understanding of the responsibilities inherent to product design, while also gaining a competitive advantage in their career, and preparing to deal with new limitations on

resources coupled with increased demand. A better understanding of Circular Economy can also help companies understand the economic value that Closed Loop systems can generate. The Ellen MacArthur Foundation report, *The New Plastic Economy*, states that “shifting to a circular model could generate a USD 706 billion economic opportunity,” Though this is in relation to the packaging industry, the economic opportunity for all aspects of the product industry is clear.

There is no single best way to integrate sustainable practices, theories and methodologies into a curriculum. Approaches should vary from school to school depending on their specific goals and needs, as well as those of their students. Based on the findings of this research, there are few suggestions that could help design institutions implement sustainable methodologies and practices within their program with little effort.

Integration Plan

- Teach Design for Disassembly and Material Lifecycle within Material & Industrial Manufacturing Process courses.
- Reinforce the concept of responsible product development with systems like on-campus DIY recycling and material reclamation for use in design fabrication.
- Teach Circular Economy within Human Factor, Market Analysis, Financial, and Entrepreneurship courses.
- Use current sustainability issues and/or sustainable design goals as a starting point for each project the student starts, thus enforcing a direct correlation between design and long-term impact.
- Incorporate an “Into Sustainable Theories & Practices” course into the main curriculum as a foundation class. This early introduction will help establish a mindset that can be reinforced throughout the students’ academic studies.
- Create shared elements of design language to assist different departments in understanding one another, i.e. Product Understanding Service, Service Understand Product, Design Understanding Sustainability.
- Implement a grading system that evaluates designs based on their sustainability. This will help students understand the long-term impacts of their design choices.

3.2 PROOF OF CONCEPT

With the system of Responsible Industrial Design defined, it remained to be seen to see if students were actually interested in learning about sustainability. The most direct method to showcase resource stewardship to students was finding waste from student fabrication within the program. Luckily, from working in the fabrication shop at SCAD as a shop technician, I had first-hand observations of fabrication waste by students. From this, I knew that the fabrication of physical prototypes often creates a significant amount of waste that could be reclaimed and reused. One such oft-wasted material is High Impact Polystyrene (HIPS), which is used for vacuum forming. Using the vacuum forming machines at SCAD, students were losing about 80% to 90% of the raw material, which was simply trimmed off the vacuumed part and thrown away.

Identifying a reusable material, I turned to the open source platform of Precious Plastic to create a plastic shredder and injection molder. A simple mold of a key fob was 3D printed to test the injection molder. Then, a manual was produced which explained how to operate the machines, and also provided a quick introduction to R.I.D. for students, which explained the value of the waste they produced during design fabrication. A workshop open to the entire student body was held with the SCAD IDSA Student Chapter. The initial response from the students was of general interest in resource stewardship, and in how they could better involve sustainability in their design process. One student even started making plans for how to use the reclaimed HIPS to make objects that the IDSA SCAD Student Chapter could use for fundraising the following academic year. This enthusiasm for access to these machines has ensured both their continued use and the spread of R.I.D. to more students, thus demonstrating that there is a need and desire among industrial design students to understand both resource sensitivity, and how

sustainability and Circular Economy can help benefit the future of design.

4.1 CONCLUSION

The current design curriculum teaches students to be designers, but not responsible designers. There is a growing trend of individual companies and whole industries taking an interest in sustainability. It is imperative that design schools detach themselves from the Business As Usual market paradigm and take the charge to lead product designers into a new era of responsible industrial design. Integrating sustainability within education is just one step toward ensuring the success of future product development. The future will require more accountability from designers, and the academic world has the opportunity to be at the center of this paradigm shift. By integrating sustainable concepts and methodologies into the foundations of product design education, and even design in general, we can provide students with a competitive advantage, and become the driving force of a better designed future.

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