IDSA

HOW SWIFT IS ACADEMIA TO ADAPT TO INDUSTRY?

A CASE-STUDY IN SEARCH OF A MORE ADAPTIVE METHOD FOR ACADEMIA-INDUSTRY COLLABORATION IN PERI-PANDEMIC & POST-PANDEMIC NORMS

Mekin Elçioğlu, PhD.
Asst. Professor - Kansas State University

ABSTRACT: This paper discusses the value of collaborations between academia and the industry to improve the design education and implementation of successful methodologies by identifying the changing sectoral and educational needs of the industrial designer. The effects of the pandemic as a setback are also being discussed with a case-study to offer a new model for more adaptable university-industry collaboration. This paper is intended to be an educational resource and to provide academic model to facilitate a new approach to industry collaboration by discussing how various collaboration practices and applied methods can support adaptive collaborative research and development when disrupted by the pandemic or other setbacks.

Keywords: Academia-Industry Collaboration, Multi-disciplinary Collaborative Design, Changing Paradigms, Industrial Design Education, Peri-Pandemic & Post-Pandemic Responses

INTRODUCTION

Adaptability to changing paradigms in design education and to the needs of industry should be one of the strong and progressive sides of the academia. There should also be a cultural background to adaptability. This background encompasses an area of new methodologies to adapt shifting paradigms, different pedagogies utilized, understanding the primary needs and the ways of the industry while trying to serve the behavioral aspects of user nature. While these factors are in effect, up-to-date issues such as sustainability, diversity, inclusivity, setbacks like peri-pandemic new norms and other factors that are impacting the end-user also take their toll on design, thus the design education. An industrial design (ID) program, in today's competitive environment, heavily rely on not just working with engineers but also require entrepreneurship and compliance to many different fields from technology to craftsmanship.

There has been an ever-increasing focus on user-centric design for the last couple of decades but when an unprecedented setback occurs - in this case the COVID19 pandemic - this focus has to be shifted towards the particularity of the situation and new norms need to be appropriated to make it safer for the very user that the design is centered on. One of the effective ways to establish these shifts is through the research into the social, cultural and economic realms of end users. In this regard, academia and the industry have their own strengths and resources respective to each other. Benefiting from both sides' experiences, research and resources could give the designers, engineers and everyone involved, an upper hand in the development of new solutions, generating added-value and tackle the issues brought up by global challenges. Evidence based research and the foresight capabilities of both academia and the industry creates a fusion to engage in various challenges throughout the collaboration processes. When a drastic change of circumstances, such as a pandemic, and potential changes in user behavior

occur, these two different approaches (of academia and the industry) help to change the vantage point to have a better grip of the situational awareness as well as delivering more to-the-point solutions.

This paper aims to shed some light on how a joint effort would benefit academia, industry and people in scenarios like pandemics or other types of local or global setbacks.

1. SCOPE - LITERATURE REVIEW

Design is a *problem-solving activity* (Archer, 1971). Solving a problem relates to *the learning of the problem*. In order to understand the nature of the *problem-solving* in design, information processing mechanisms applied to design must be examined. However, this term has some inadequacies; it doesn't really capture the purpose of tasks in the first phases of design. The first and most important phase of design is more appropriately called *problem finding* (Czikszentmihalyi, 1996) As a design methodology, design paradigms might begin with problem-finding or problem-solving. The basic problem-solving methodology involves 5 steps: *reduction, selection, application, integration* and *test*. Three additional steps, *paradigm superimposition, paradigm shifts* and *category shifts*, are essential to problem-finding tasks (Wake, 2000). Intuitiveness is also required tackle some of the unprecedented challenges as a part of the design process. Intuition, according to Ball and Naylor, is "a sense of the rightness of something ahead of the proof or verification." Research is useful before - *to identify the best of the past and improve upon it* - and afterwards, to test the effectiveness of your design, but in between, *intuition* must take its rightful place (Ball, R. and Naylor, M. 2005).

Conran (2007) has described the designer's job as *not repeating history but making it*. He has also stated that the capacity to see a new solution to an existing problem is what a designer does. The designer always needs a proper working relationship with the engineer, the materials technologist. This sort of collaboration is going to be ever more important in future (Bayley & Conran, 2007). But occasionally, an unprecedented challenge may arise that might not be relatable to the designer and may have global impacts that might require different type of undertaking. Communicating with the end user, their desires and needs in time of distress or happiness - that could be created by shifting paradigms or changing circumstances - never seemed to be an easy task as far as the design is concerned. In these times, how should the educational methods of academia be paired up with the experiences of the industry to generate deliverable solutions to the unprecedented scenarios and still kept being applicable, relatable and meaningful to the end user? How much can an ID program be pro-active when it comes to design thinking, problem solving while being attentive of the everchanging demands of the industry?

When a design problem surfaces, typically two approaches to solving the problem exist. The first is to *look for a solution to the problem*; the second is to *look for a replacement for the problem*. When solving problems, one might employ a paradigm whose application is obvious. Sometimes the paradigm might be fundamentally changed by superimposing another paradigm. (Wake, 2000, 264) The shift that is imposed by the pandemic to various applications manifested a behavioral change of the users (during the collaboration project that is analyzed in this paper) that required addressing certain user conventions. According to Norman, *conventions* are actually a form of cultural constraint, usually associated with how people behave. Some conventions determine what activities should be done; others prohibit or discourage actions. But in all cases, they provide those knowledgeable of the culture with powerful constraints in behavior (Norman, 2013) Design process is also *experiential*. Parsons discusses this by saying “if the design process is experiential rather than logical… then the way we are affected will in turn influence how we shape what we are designing. This will be mediated by all the kinds of expressions we

can make, including the rational. As much as we can try to plan a logical design process using tools to help us understand, iterate and improve the set of relations within the project, any number of other influences (*some of which may not be conscious*) may interject." Rather than devaluing a planned process, this awareness allows us to consciously set out to have a number of experiences that can complement typical design tools. However, what it must also do is to allow any useful insights, wherever they come from, to change the direction of both the design and the pre-planned process. (Parsons, 2009) On the other hand, those who can find new ways of becoming closer to and identifying the needs and demands of their customers will benefit the most. Developing better relations with all departments and end-users can offer greater understanding of product needs (Slack, 2006).

2. DESIGN METHODOLOGY – CASE STUDY

The academia-industry collaboration that is analyzed in this paper as a case study was conducted in two main year levels, Junior and Grad due to the curricular system that the ID program offers. The junior level group was comprised of seventeen students and the grad-level group (of a 5-year program) was a team of two masters' thesis candidates. The focus of this paper is going to be on the latter.

Collaborators: Kansas State University Dept. of Int. Arch & Ind. Design (IAID) and Sloan Valve Company
The project was sponsored by Sloan, an industry leader in plumbing and bathroom fixtures including touchless faucets, soap dispensers, hand-dryers, gray-water reclamation systems and other related innovative technologies and products. Sloan sponsored K-State's Interior Architecture & Industrial Design Department with a three year contract after a successful sponsored studio on the previous academic year; provided a budget for students' out-of-pocket design related expenses including on both year levels; also provided a fully sponsored field trip for grad-level project with the participation of their professor to one of their product development facilities to exchange ideas about materials, novel manufacturing methods and show CAD-CAM capabilities with rapid prototyping; provided sample products from their product line; and provided engineering expertise during the project to help with ideation and design development. The collaboration with the industry partner was organized around a series of research and design assignments conducted over two semesters due to the nature and the intensity of the project.

Background: Kansas State University began discussions with Sloan about setting up a strategic agreement addressing key issues of importance to both sides, including (IP) rights.

In the first phase of the project during the fall semester, Sloan expected a market research, trend analysis and ideation throughout the first phase of the project during the fall semester and took the project onwards to the second phase with the design development in the spring semester. The scope of the initial research was to investigate how restrooms would evolve with society and to predict how to respond accordingly when designing public and private bathroom spaces. Through looking at where bathroom trends were headed and cultural shifts, new design solutions planned to be explored. Lack of current emphasis on social anxieties of using public bathrooms and restrooms enabled the research to focus on novel opportunities. The research also incorporated the need for strong inclusive design that becomes supportive in easing people's daily lives. As the research progressed the narrowed down focus of the research were shifted to explore the needs of future restroom design for educational environments. Changes in the educational environment and teaching pedagogies were considered to be leading the need for new design solutions for the restroom environments. Mental and physical health; academic development; identity development; social emotional and cognitive development were the identified objectives of the future restroom design that would continue to play a role as the project progresses on to

developing the design. These objectives focused on both approaching the project with children's needs at the center and looking at design elements that have overall importance to future restroom design. The students were tasked to identify shortcomings of the current applications regarding this newly defined concept and sought out potential opportunities while trying to create new application for mostly non-described specifications. Integration of the newer technologies such as touchless applications for faucets, soap dispensers, hand-dryers and three-in-one sinks became also the part of the effort to provide a more comprehensive user environment for inclusivity. The research and these new areas of study were completely new to the collaborator company since COVID19 and many of the findings raised a lot of attention from different departments of the company, starting from the CEO level all the way to the marketing. Sloan, throughout the research phase, provided feedback but never intervened with the direction that the research was taking. Multiple meetings were organized with the engineering department with the attendance of two CEOs which also was a boost of morale for the students; not just to be able to work and develop a project with a company of this size, but also exchanging ideas with all the different administrative levels. The team was also tasked with performing literature research, conducted field observations, background research on the design history and different trends that influenced the commercial and specified bathroom environments as well as benchmarking of related products and documenting patents. Various interviews were conducted with LGBTQ community within the campus as well as the experts in the related fields comprised of architects, interior designers, engineers, custodial staff, students and faculty.

Implementation of proposed solutions were communicated and consulted with Sloan's engineering department. All other requirements for behavioral models were defined and offered by the students themselves. Students also specified some of the design requirements that proposed solutions meet such as identifying key issues with relatable precedents (due to the lack of clear precedents in the gender-neutral applications) with potential design opportunities; documented the related regulations that were in effect or the applicability of proposed features; did feasibility analysis; studied relevant ergonomic/anthropometric dimensions; examined and determined way-finding solutions with new required graphical elements and signage; strode through the new norms of flow patterns within the proposed bathroom environment; examined available materials and technologies that might be implemented or integrated into potential design solutions either as novel or retrofit.

The student team then started preparing digital presentations featuring an overview of the research methods employed with major take-aways from their market research and trend analysis; a general foresight on specific problems and opportunities that were identified with the concept; and other design objectives that are relevant with interiors and products. These research presentations took place online with the industry collaborator using teleconferencing technology for a seamless collaborative environment with the staff and the administrative officials. After these presentations and getting approved for two alternative design directions, an iterative conceptualization process was employed before moving on to the next phase. The two separate conceptual ideas were examined in the form of mindmaps, mood boards, material adaptations, usage-flowcharts, refined sketches accompanied with computerized study models. At the end of the first phase (the end of fall semester), the findings from iterative studies and conceptual boards were presented to Sloan with the attendance of the administrative board (two of the CEOs), the director and the representatives of the engineering department of the company in a meeting organized in the campus (name of the design department will be shown here).

Staffing: The collaboration occurs at all levels of both organizations with different departments of the industry collaborator. Involvement and support by senior executives from the industry collaborator have

been crucial to the success of this effort, as have been the involvement of the Dean's office and the department head joining the advisor for the team (professor) and students on occasions.

Budget: Sloan has provided a significant multi-year (3 - $25000) sponsorship in research and developing new projects as well as providing technological expertise for ID department of the university collaborator. The selected projects by Sloan are also rewarded with a cash payment, differentiating for different year level studios as well as royalties for the further developed and patented projects. The success of this Studio in the previous year secured the Kansas State University and the Department of IAID for a sponsorship contract for another three years with the option for extension.

Keys to the Success of the Collaboration: An understanding between the two sides is the key about the facts that universities need to *publish research* and companies need to protect their *intellectual property rights*. Collaboration should be brought into a framework of a mid to long-term partnership that continues to support the missions of both parties and encourages knowledge-sharing across the industry-academia boundary with a frequency in communication. Academia and the industry collaborator should be committed to support not only the engineering and other aspects of the business model implemented, sharing tech know-how, design education and research, but also the scientific process of exploring inter-disciplinary crossovers with various fields; testing, confirming and disseminating ideas. The industry collaborator needs to be willing to provide research projects and share commercially confidential information for the advancement of the project when needed; to work with the ID department to secure grant applications; to encourage and facilitate company staff to engage in R&D projects; whereas the University contributions should be about establishing contacts with industry to strengthen ID program through skills, knowledge and technological expertise increasing research profile; providing expertise and intellectual capital towards facilitations of research projects; consulting with industry and government to acquire grants; providing research programs and encouraging uptake by the industry professionals.

Outcomes: As a result of a successful process, the collaboration could continue to expand. Potential opportunities include providing a wide-array of market and tech research conducted by the students (grad and senior levels) led by their professor to the industry; ideation, conceptualization and developing designs for different product ranges and areas within the industry collaborator's field as well as potential fields. The industry collaborator would benefit from ideas that are coming from their prospective user base (the students); participating in collaborative and interdisciplinary R&D with the inclusion of ID department and other departments of the university; receiving incentives to incorporate ID into its product design and development processes (e.g. through grants from government or tax-related benefits); acknowledging that ID inputs can increase global competitiveness and access to various markets; using the university's expertise in ID research methodology. A successful outcome of these projects could easily lead to recognized and prestigious design awards nationally and internationally (more recognition in the market, free advertising, endorsement of quality and boosting of sales)

3. A TWIST IN THE PLOT

Almost two thirds of the way, this project faced to be canceled or postponed due to the unexpected developments of COVID19 pandemic. One of the most valuable lessons learned through this collaborative effort is that the strategical design-thinking and applications have to look beyond the immediate tactical activities to foster long term engagements with rapid and unprecedented setbacks.

The unbiased approach by the student team to this kind of shift (caused by the pandemic) free from the confines of private sector, helped the project to morph into a very applicable and intriguing solution.

Academical design thinking and its reflection to the industry have to be more methodically analyzed to improve on implementing morphing solutions of this type into a brand new concept without losing the essence of the preceding efforts and take-aways. With the full approval of this project, another case study will be published to show the details and the methodologies adopted throughout the design development.

What happened with this turn was, the project that has been researched for and developed so far, with the coming of the pandemic and its unexpected behavioral impact on the industry and the people, had to morph into a public bathroom scenario where the users had to be kept from each other with the social distancing norms; regenerate a usage scenario by re-organizing the components of the space where every fixture became touchless and finally accommodating lesser number of patrons using the space by spatial organization with the implementation of staggered slat privacy walls and tiered all-in-one sink units. In doing so, the project wouldn't have gone against the grain in terms of functionality, targeted audience and innovation. Strengthening the applicational ideas has become a key component of learning to turn negative experiences into adaptable design opportunities. Some of these potential features were already addressed during ideation but the proportions of the change in certain areas were immense. The shift happened by the virtues of preparedness, adaptability and imagination by turning cons into pros. This outcome is partly due to the team often working within a design strategy for diversification and adaptability and partly due to team being the next generation of users the industry is basing its research and analysis on. Also, another emphasis has put on touchless products, touch-free user experiences and how those might be implemented in different spaces while creating new semantic outcomes.

"…Perhaps imagination is only intelligence having fun." George Scialabba (Harvard Magazine, 1984)

4. RESULTS

Two different design solutions were initiated with the design development phase and these were narrowed down to one final design proposal which provided the industry collaborator - Sloan - with solutions that interested them to invest in, directly implement and quickly develop into a marketable product with the current scenario the pandemic has imposed. To collaborate on a project with a very large scale manufacturer in its field, to focus on research, market analysis, ideation and design development in a two semester timeframe, enabled the student design team and the advising faculty to see how to take position within several contexts that relate to the marketing scenarios of products during a change. The mutual understanding between two sides of the collaboration and an effective communication proved to expedite the conceptualization stages and build a more established platform for the design development. The flow of information openly between the university and the industry collaborator with the involvement of their different departments such as engineering, production, marketing, accounting and customer liaison had also a key relevance in the success of the project. This holistic approach to the constant exchange of data assisted both sides of the collaborative effort to become more efficient throughout the project. It also helped identifying the new issues as well as pinpointing potential areas for further design development.

Another remarkable observation from this process was the fact that the students forming the team were also coming from our department's unique integration of interior architecture with Industrial design. The students background with exposure to the two aforementioned fields helped them develop a coherent hybrid approach - due to pandemic situation - with the integration of spatial programming, knowledge of the architectural requirements, diverse array of materials that would benefit the project and inter-disciplinary collaboration with their peers and faculty. The achievements of these collaborative projects

could be presented as case studies to the university and set precedents for the succeeding students of the same or related programs as well as the potential upcoming projects and collaborators. This project involved research on specific user needs and preferences, addressing human factors; physical, cognitive, emotional and behavioral models; strategies, supporting systems and other elements deemed important by the team and the collaborator. This collaboration provided the student and the faculty a great foresight and behind the scenes experience in industrial design, engineering, research and development. Learning goals established at the outset of this project were also satisfied. Students who were involved in this two-phased-collaboration gained a deeper understanding of some materials and manufacturing processes such as corian, glass infused plastics, stainless steel, aluminum, plastics and CNC applications.

Difficulties and Shortcomings: Some difficulties in establishing common terminology/phraseology were observed with the engineering and production teams of the collaborator's due to difference of the fields and academic discourse. Software differences and online coordination to design simultaneously also needed to be more fluent. With this experience, it became clear once more that pedagogical models and the differences in design education from an industry training standard should be addressed rigorously.

Suggested Improvements for Academia & Industry: ID program needs to: promote the value of applied and theoretical research to ensure real outcomes for current and future industry collaborations; establish ID curriculum and pedagogies highlighting the value and benefits of collaboration in research, ideation and development as well as adaptable solutions to the latest unprecedented changes; ensure teaching and research staff are adequately informed as to the value and benefits of promoting and participating in collaborative research and development with the industry and bilateral standards; ensure ID research and development in a collaborative environment is managed and run by dedicated faculty with links to general teaching activities. The industry collaborator could hire interns and/or researchers in key areas of research & development, design, engineering, branding and related areas about design and its potentials. Symposiums may be held related to the topic areas and publications could be made with the outcomes of the projects and research to promote the outcomes. Parties could also increase the funding of the university scholarships and provide technology for ID department to facilitate more projects.

5. DISCUSSION

One of the very important take-aways from ideation to finalization was the factor of dematerialization in this newly defined usage paradigm due to the pandemic and the response trend against it. This required a lot of investigation and implementation with the proposed usage scenario(s). The research and some very recent precedents showed a trend in this direction. Especially after the reconsiderations that were almost dictated by the pandemic and its unprecedented impact on people for commercial or individual bathroom space, focusing on simplicity that comes with dematerialization became more imperative to the concept of this project. The adaptability of the student team to this change was also another remarkable attribute of academia and its open-mindness to changes, paradigm shifts, opportunities and complexities of uncharted territories. Throughout the project, there were some occasions where the only input from the industry collaborator has become a reviewing process of the certain timeframes rather than working collectively and simultaneously, In some instances, during collaborations, industry partners tend to see their collaborators – in this case the university – as "cheap labor" and extract novel information and creativity out of them in a short-term relationship. In this study, neither of the sides allowed that to happen. Also, establishing research institutes at universities to tackle the grand challenges might help the academia to address previously mentioned concerns and some others that were articulated in a report of Nat'l Academies of Science, "Rising Above the Gathering Storm." (National Academy of Sciences, 2007)

In light of the recent developments, not just the pandemic and the new measures it brought but also ever-changing human behavioral models with different generations, different needs projected by the implementation of novel technologies and innovations in materials, applications, chemistry, physics and nanotech should also be undertaken by these kinds of collaborative efforts. Maybe this would be the new design paradigm and trend. It might even be named “precautionary design”.

CONCLUSION AND FUTURE DIRECTIONS

ID education will require closer relationship with the industry’s models for decision making and other processes. The current design curriculums should become more adaptable to the swiftly changing local or global circumstances and paradigms that demand healthier and safer applications. The need for adopting new ways of design thinking and integrate multiple disciplines through holistic and empowering design processes will be a crucial part of ID education and hopefully set the standards with the industry through collaborations. Educators must also be provided with more opportunities to experience and learn from both extrinsic and intrinsic motivators and outcomes. The case-study that is presented in this paper also showed that on a grad/senior level, studio project collaborations could bear enormous potentials on rapidly changing environments, behavioral aspects for the user and shifting paradigms with the effects of the global scenarios, good or bad; in this case the peri & post-pandemic.

Several opportunities for the improvement of future collaborative projects of this nature can be identified as the ID students need a better and more frequent access to real-time data with end-user needs coming from the clients of the collaborators; alternative market analysis; and testing abilities by rapid prototyping using the collaborator’s facilities and know-how. Academia would hugely benefit from this approach, too.

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