

University-Industrial Collaboration in Industrial Design Education: A Practical Model

Tin-Man Lau, Auburn University, United States

The IAFOR International Conference on Arts & Humanities in Hawaii 2023
Official Conference Proceedings

Abstract

University/Industry-Collaboration is not new to Industrial Design curricula, however, the contents of each program vary vastly. For most collaborations, students take in design problems from sponsors and develop design solutions. The sponsor may meet with the students a couple of times to make sure students are on the right track. Eventually, if the design solutions are satisfactory to the sponsor's needs, the sponsor may come back for another project. This is a service/client collaboration model. The disadvantage of this model is that the sponsor usually funds the project much less than the fee-based design firm while taking a risk of getting less professional outcomes. Design schools become competitors of design firms at a much lower rate. If student design reaches the expectation of the sponsor, it would diminish the need for the design firm, thus bringing harm to the design profession. At Auburn, we developed a model that focused more on collaborations rather than providing design services. This model provides students a hands-on experience working with the sponsor weekly as well as possible job opportunities when they graduate from the program. This partnership model delivers solutions that await the sponsor's designers to perfect for production. As the partnership develops, the sponsor began hiring graduated students to fill their expanding design team and providing internship opportunities to students who are still in school. This collaboration model not only can provide practical experience and training to the students but also bring benefits to the design industry for more opportunities.

Keywords: Academic-Industrial Collaboration, New Product Development, On-Campus Internship

iafor

The International Academic Forum

www.iafor.org

Introduction

University-industry collaboration is described as, “It refers to any type of cooperation between universities (i.e. their researchers) and companies in order to jointly develop either new goods/services or improve existing goods/services” (<https://www.igi-global.com/dictionary/the-drivers-of-entrepreneurial-universities-in-emerging-economies/48150>).

To generate new products, processes or technologies, companies are looking for ideas outside their organizational boundaries. Collaboration with universities allows companies to acquire new knowledge that can improve their organizational performance and competitiveness. Research projects, technology transfer, research consultancies are all different forms of university-industry collaboration (UIC). (Hansen et al., 2017, p. 173)

This article is more a documentation than a research paper of a seventeen-year development and evolution of a university-industry collaboration that an on-campus office of the sponsor emerges for an internship program.

Since the late 80s, the author began taking design projects from the industry for students to work on as a class assignment. There was always a dilemma about who is leading who. Should academia be leading the industry or vice versa? Those who believe in the separation between the design academia and the design industry think that students should spend time in school to explore and exercise their freedom of imagination and creativity without constraints.

Design education often happens in hypothetical contexts indifferent to reality or the surrounding context, disregarding articulation between academy and industry and with no attention to approaches that might enable the academy and the business world to get closer and share knowledge and dynamics reflecting the cultural, technological and social realities of present day society. (Camacho & Alexandre, 2019, p. 1317)

On the other hand, those who believe in collaborating with industry think that students need to learn not only from the professor but also from the professional world. Both sides have their reasons and merits in their perspectives. However, a well-planned academic-industrial collaboration project brings more benefits to the students than a hypothetical project that may not be practical. A design concept that does not fit the market or the manufacturing requirements is somewhat of a fantasy.

Back in the late 80s we at Auburn incorporated projects from the industry to design studios such as Intergraph on CD-ROM readers and Techsonic on Humminbird fish finders. We did not even get paid to work with Intergraph but gained great experience working with their engineers and designers. Working with the industry, not only do we gain experience in the real design world, but also put the name of our program out to build a good reputation thus students may get better employment. Very often, companies come to the university to hopefully get some help in improving their existing products, especially some small and medium enterprises. (Paay, et al., 2021) This kind of collaboration relationship usually would not last once the immediate needs are met. As Austin, et al. mentioned in their research, from studying several other research, there are occasions that the intention of the industry for collaboration is to get a quick fix for a less cost for the development of new products, which

leads to unsuccessful outcomes. Both sides should have a clear understanding of the importance of trust and mutual commitment for mutual benefits (2021).

University-industry collaboration needs to be cultivated into a relationship that both the university and industry can be complementary, taking advantage of both ends to develop new products. As Paay, et al. stated “A university-industry collaboration brings mutually beneficial and complementary knowledge and resources to the design and manufacture of innovative products.” (2021, p. 2) Through collaboration, universities may bring new thinking, new approaches, and new solutions to the table while the industry brings commercial realities of materials, cost, profit, and feasibility to make sure the implementation of the new solutions can contribute benefits. (Paay, et al., 2021) They summarize well the benefit of university-industry collaboration by saying, “Codesign in a university-industry collaboration brings together research and practice, where industry people immersed in the world and actions being researched are directly involved, with both sides benefitting” (p. 5).

University-industry collaboration is not the same as a regular design service provided by a design firm. It has to preserve academic requirements on one hand, and generate new concepts for the sponsoring company with their input and training on the other, hopefully, to fulfill the expectations of the client. However, the collaboration is not supposed to be a contract guaranteeing any profitable result for the client. It is for both academics and industry to explore and experiment with something new, whether for new solutions to existing problems, or proposed solutions to newly discovered problems. It could even be a new approach to problem discovery or problem-solving. A key factor for collaboration success is trust between the university and the industry. Industry often has to provide their proprietary information without reservation for the development of new products (Paay, et al., 2021).

University-industry collaboration is also a good alternative to internships. Some schools require internship experience before graduation. The quality of internships is difficult to control especially when every student has to have an internship experience where not all internships are the same. In the paper of Shin, et al., they mentioned that although there are many advantages of an internship program for students to learn in the real industry environment while still in school, there are also shortcomings where the contents and quality of the internship are not easy to gauge. (2013) Also, in the case of required internships, the university has to provide a placement service and hope that there are enough opportunities for the students. However, internship opportunities are often affected by the economy so the supply of positions can be challenging. Moreover, an internship often requires the student to take a semester off to be full-time employed, which means a delay in graduation. Therefore, if the student can afford an internship it is certainly great to attain real-world experience before graduation. However, without the help of a placement service, it is very unlikely that every student can find an internship at the time they are ready. Conversely, industry collaboration allows a whole class of students to work with a client/sponsor. The experience applied to the number of students multiplied many folds. A possible shortcoming is that the student vs. client interaction may be reduced because of the size of the class as well as the availability of the client that depends on the frequency of meetings.

Benefits of University-Industry Collaboration

1. More students get involved than in an optional internship program

Most students do not have the opportunity to work on actual projects during their year in school. Some may take an internship in summer break or put college on a hold to take an internship for one or two semesters. These students usually become more mature after their internship experience in the industry. However, only a small portion of the class can take an internship, availability for one, and extending college graduation for another. The benefit of academic-industrial collaboration is that more students can gain experience working on actual projects without leaving school or looking for opportunities. If students take collaboration projects for multiple classes, they will have experience with several companies on their resumes. Prospective employers usually appreciate students understand how products are developed in actual settings. Since funding is provided for materials and equipment by the company through collaboration, the cost of taking the design class for the students may be greatly reduced. Moreover, it happened more than often that some students got hired after college by the sponsoring companies because they find the students during class time that they may be an asset to their companies in product development.

2. A great continued education for faculty

Although some faculty members personally stay active working with the industry, directing a university-industry collaboration project allows the faculty members to learn and develop their expertise in different industries in design and research. Since sponsors are from different industries, faculty members may acquire experience and knowledge that most regular designers would not have that chance in terms of the diversity of the nature of the industries. Since the projects with Intergraph and Techsonic, the author had the opportunities to work with NASA, IBM, Seiko Mead, Martin Marietta, Department of Energy, Brother International, ThermoFisher, and in recent years, PlayCore, to name a few famous brands. Figure 1 are some of the companies the author had the opportunity to work with through university-industry collaboration. The broad base of experiences and knowledge through working with different industries allows the faculty to teach not only on the academic side but also on the practical side. Academic-industrial collaboration also provides financial benefits in research and travel. The majority of our sponsored projects are funded that not only provide students with materials and travel, but also allow the program to have resources for research, equipment, and travel.



Figure 1: Some of the companies the author worked with.

3. Develop exposure, network, and expertise for faculty

For a faculty member that does not have much experience in a certain industry, it is a potential opportunity for the faculty to learn and grow in knowledge and even in passion for the industry. With continued collaboration, the faculty can develop research interests and expertise in that product category. Seventeen years of collaboration experience with PlayCore (see figure 2) not only cultivate the author’s research focus but also exposure to the industry as a scholar and design researcher that in return brings reputation to the faculty and the university. The author is honored to be listed on the PlayCore website as an academic scholar (figure 3) being a partner with them for more than 17 years.



Figure 2: Family of brands under PlayCore.



Figure 3: PlayCore Scholar Network.

4. A holistic learning experience for students

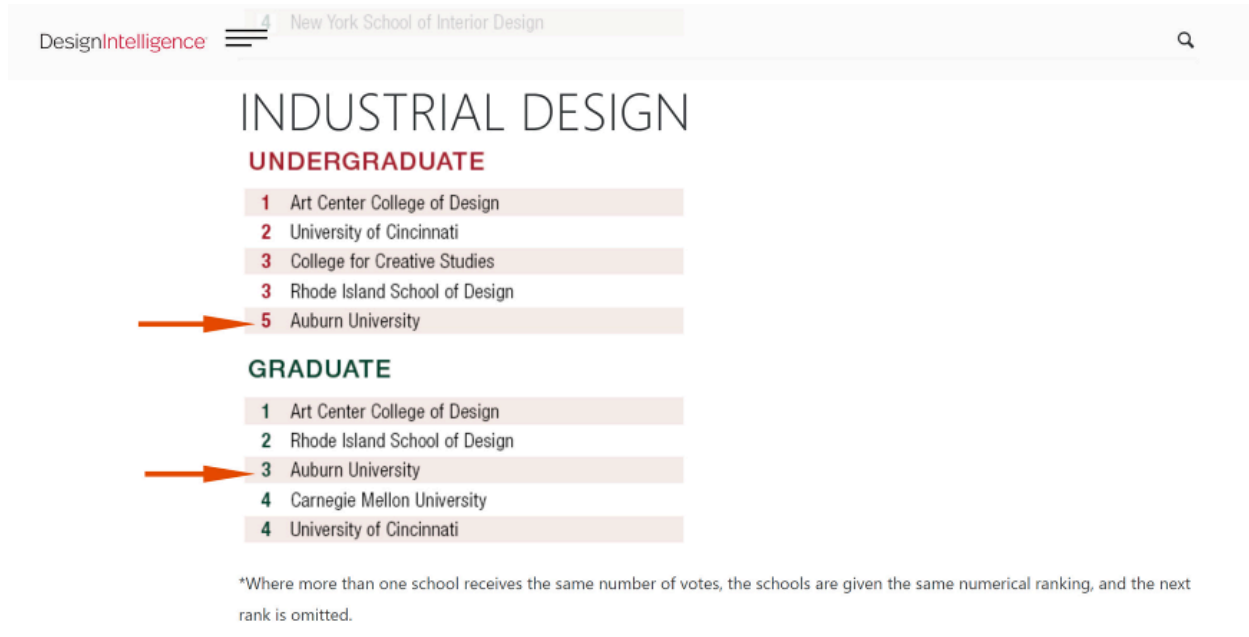
More often than not, students learn not only about design during a sponsored project because besides designers from the sponsor are involved in the process, representatives from marketing and manufacturing will also participate in the project. In return, students have to answer the designers as well as the marketing and the engineers, thus a more holistic learning experience. Another by-product of the process is that students' presentation skills improve tremendously. Since they have to present their progress to the sponsor periodically in a formal business setting, students take the presentation more seriously. Through the process, students are trained to present their ideas professionally (see figure 4).



Figure 4: A student presenting to the PlayCore leaders.

5. Build up the reputation of the school

University-industry collaboration helps build the reputation of the program and the university as well as the faculty. When the sponsoring industry discovers the benefit of working with the university to explore and develop new concepts and solutions, if the student design results are satisfactory, the name of the school will be spread out within the industry with a reputation for the quality of the program. If the sponsor continues the collaboration, it indicates that they have gained some benefits from the joint effort and that the students are contributing. Not before long, sponsors will become partners. They become advocates for the school, and more companies want to work with the school. Eventually, the ranking of the program goes up when compared to other programs in the country, which attracts better students to the program. As mentioned before, very often, internships and employment stem from university-industry collaboration. Auburn Industrial Design was ranked by Design Intelligence very high among the nation (See figure 5).



<https://www.di.net/articles/americas-best-architecture-schools-2016/>

Figure 5: Ranking by Design Intelligence.

6. A source of new ideas for the sponsor

There are also benefits for the sponsor. The classroom can be a think tank for the sponsor. In many cases, the companies that collaborate with us have their in-house design team. An appropriate relationship between the university and the industry is that the university provides new ideas under the guidance of the industry, while the industry provides real-life design experiences for the students. It is not about using students without paying for the work. Rather, it is a partnership that both sides gain mutual benefits. The design staffs in the industry have professional experiences that can be shared with students. However, often their creativity is hindered by all kinds of real-life experiences, on the top of time constraints of their tasks in their job. After working together for five years, the CEO of a sponsor said that he thought we would run out of fresh and new ideas. However, in the classroom, we get new blood and brains every year. That becomes one of the most important reasons to support university-industry collaboration. Students do not know the limit. They dare to think big and wild. As long as the sponsor and the faculty control the process, good results always happen. Many PlayCore's new products originated in the collaboration classroom such as the Expression Swing shown in figure 6.



Figure 6: Expression Swing that cultivates attunement.

7. Build up the confidence of the students

Last, but not least, students develop a sense of achievement and fulfillment as their concepts are well received by the sponsor, especially when the sponsor affirms that the new concepts will be on schedule for development into the prototyping stage for testing, and then possibly moved on to the next generation of new products. As shown in figure 7, the final design of a playground at the end of the semester, and figure 8, the actual playground built in North Carolina by PlayCore.



Figure 7: Final presentation of a playground design.



Figure 8: The Ionix Playground in Freedom Park, Charlette, North Carolina.

A practical model developed through the collaboration with PlayCore

Through the university-industry collaboration with PlayCore for 17 years, a practical model was slowly developed. Below are some essential steps that contribute to the success of the program.

- The collaboration is a long-term commitment rather than a quick-fix project. Through the relationship between the two parties, the understanding and expectations from both sides have become a mutual vision.
- PlayCore personnel, the senior vice president of innovation and business development Tom Norquist is committed to meeting with students and faculty every week, mostly in person, and scarcely remote (since COVID happened).
- As trust develops, PlayCore provides all the information needed for the projects, including their proprietary information and vision.

- Eventually, PlayCore expands its design department to handle new product concepts from the class to bring them to the market, while the collaboration continues to generate new product concepts, a positive recursion.
- Employment from the class from long-term designer positions continues to become a constant.
- Through the collaboration, PlayCore started hiring interns from the class to work on campus while students continue their school work.
- A PlayCore presence, an office at the Auburn Research Park will be set up in the coming Fall to house a continuous internship program on campus.
- Some interns have been turned into full-time designers for PlayCore after graduation.

Figure 9 shows the record of projects and the number of students in the class through the years. It also shows from the class the number of students hired as designers or interns. Figure 10 shows the number of intern positions created since the summer of 2021.

		# of students	# of hired	
1	2005 Fall	PlayCore	13	0
2	2006 Fall	PlayCore	14	2
3	2007 Fall	PlayCore	17	0
4	2010 Spring	PlayCore	20	1
5	2011 Spring	PlayCore	13	1
6	2013 Spring	Exercise playground	13	0
7	2014 Spring	Ionix	11	1
8	2015 Spring	Adult playground	16	2
9	2016 Spring	Attunement play	9	0
10	2017 Spring	Water Odyssey	14	2
11	2018 Spring	Superior Recreational Products - Shading	17	1
12	2018 Fall	Robertson Recreational Surfaces	17	3
13	2019 Fall	Research Park -- Outdoor workspace	9	0
14	2020 Spring	STEAM	13	1
15	2021 Spring	Water Odyssey	11	4
16	2021 Fall	Return to Play	12	1
17	2022 Spring	Risky Play	14	6
18	2022 Fall	Inclusive Play	15	3
19	2023 Spring	Inclusive Amenities	13	
			261	28

Figure 9: Students in the collaboration program.

	Brands under PlayCore	# of intern positions
2021 Summer	Mound Water Odyssey	2
2021 Fall	Water Odyssey	1
2022 Spring	Water Odyssey Senior Living Dero - bike rack Spectrum Umbrella/Tactile Map	5
2022 Summer	Dero - bike rack Dero - bike rack Data Collection Tactile Map - LSU Spectrum Rope Senior Living	7
2022 Fall	Dero - bike rack Dero - bike rack Rope/Inclusive Play Rope Dog Park	5
2023 Spring	Dero - bike rack Dero - bike rack Inclusive Play Inclusive Play Inclusive Play	5
		25

Figure 10: Number of intern positions created since the summer of 2021.

Some principles for Academic-industrial collaboration

1. Academic requirements

Academic-industrial collaboration should not compromise the academic side of learning. Not everything that happens in the classroom is valuable to the sponsor. The faculty who direct the program is to guard the integrity of the academic goals, standards, and requirements. Although the sponsor is an actual client, the classroom is not exactly a design firm. It is even more so, especially for public schools. The university is not supposed to provide cheaper labor to compete with the design profession. If so, it will destroy the design profession, especially the small design firms and freelancers. Therefore, the sponsor must understand that the collaboration is not a contract that promises to bring measurable benefits to the company, while it is a collaboration to explore new concepts that most design contracts do not allow that much freedom. The academic side emphasizes the process that students may learn how to research the problematic area, discover problems and explore solutions. With the sponsor's involvement, hopefully, the outcome of the collaboration brings applicable ideas to the industry.

Academically, students need to learn the design process. They need the practice of research, design methods, sketches, model making, testing, 3-D modeling, and communication/presentation. They also need to think outside the box, not just to come up with something that works, but many different ways to achieve the same purpose. Some of these contents are not demanded or required by the industry. They want to lead the students to their destination as soon as possible. Sometimes, students may have a brilliant idea, but the sponsor considers too much on the cost and is reluctant to pursue the idea. On the contrary, sometimes, the sponsor keeps chasing the rabbit that changes direction in every meeting. Not only do students become frustrated, but the project will run out of time. Therefore, it is important to train students to lead the sponsor to good designs and have enough persuading reasons to convince the sponsor. Although the sponsor gets involved in the design process and may influence the design, it should not end up being “designed” by the sponsor, and the students just do the laborious work. Students need to develop their confidence as designers. Figure 11 is a schematic diagram of the collaboration model.

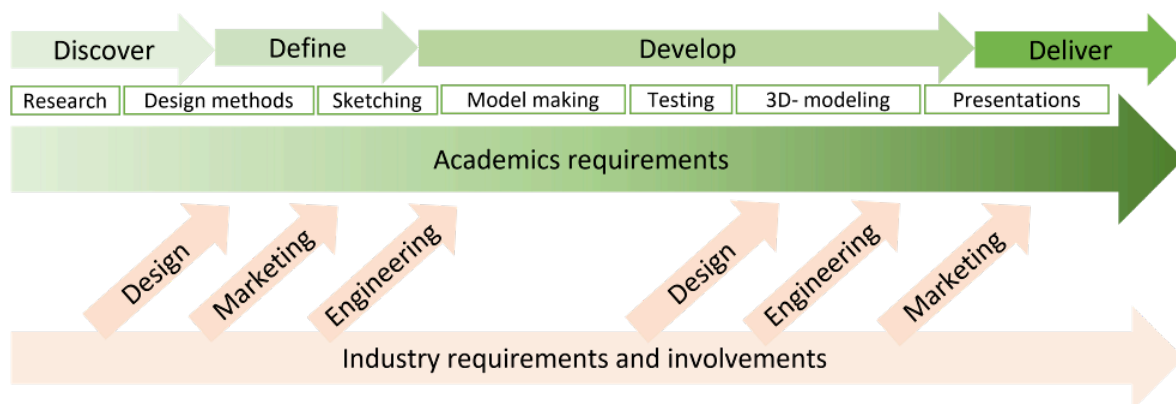


Figure 11: A schematic diagram of the collaboration model

2. Research -- new knowledge

Most of the time, research in an industry collaboration project is more thorough because the goal of the project is more defined, and students can research different aspects of the same topic, while in a regular design class, each student may be working on different topics that the depth of research may not be as complete as a whole class working on it. New techniques and new findings often occur because of the studies students researched on. It is easier for students to think outside the box because they do not have as much knowledge as those designers who work in the industry. Students are more likely to try different approaches and see problems from different perspectives. A sponsored project should not be just about the new design. It should be an incubator for academia and the industry to experiment with new approaches, and new research, and generate new knowledge.

3. Guided/verified by Industry – participation

One of the benefits of industry collaboration projects is the involvement of the sponsor. Of course, it depends on the degree of involvement. The function of their involvement is not to design for the students, but to guide the students if they wander too far away from the practical boundary. Also, if there is any potential concept, the sponsor may verify the potential so that design efforts are invested in the potential rather than wasting them. The industry’s participation sometimes may cause a problem when the industry dominates the design. On the contrary, if the involvement of the sponsor is minimized, hoping to reap good

results from cheap labor, the outcome may be a total train wreck. Therefore, a successful Academic Industry Collaborate needs a lot of mutual understanding and commitment and eventually develops into a partnership rather than a hired hand.

4. Not competing with the design industry

Academic-Industrial Collaboration is never meant to be competing with the design industry, especially for a public institution that is supported by tax dollars. If it becomes a threat to the design industry, the collaboration is killing the design profession in a long run. Therefore, all industry-sponsored projects should be governed and executed very carefully to maximize the student's learning experience, bring the sponsor new insights, and broaden the faculty's knowledge and experience bases.

5. No guarantee for the sponsor

University-industry collaboration is not and should not be a business or commercial contract expecting specific outcomes and design solutions. It should always be viewed as experimental that allows students to discover new problems and explore new solutions. Students may contribute new insights to the industry, while the industry invests in design education. It is a mutual commitment for a better future. No guaranteed outcome or design solution promises any profitable success to the sponsor. At the same time, students may not have ownership of the concepts generated in the project since there is no such new concept without the input and guidance of the sponsor. In many cases, the sponsor requests students to sign a nondisclosure agreement because they will have first-hand information about the company.

6. Development of a long-term relationship

Industry sponsors are willing to work with the university if the collaboration provides tangible incentives so that the collaboration may continue. Here is an example of our collaboration with PlayCore, one of our long-term partners since 2005. PlayCore is one of the largest playground companies in the US with over 30 brands of equipment and products in the market. In the beginning, both sides did not know what to expect. However, the key factor for this collaboration to be so successful is the commitment of PlayCore. Not only they funded the project, but the senior vice president Tom Norquist has been the key person not only to be part of the design process but also an advocate of our university to the public. He counts himself being part of us. Every year, we have at least one semester to collaborate with PlayCore working on different topics of design projects. Tom, with designers, representatives from marketing, and engineers would come to work with students every week. Their presence is not to dominate the design, but to help and direct students in the right direction. Although, once in a while the academic and industrial purposes clash, for most of the project, PlayCore does not interfere with the academic requirements to work around them. Understanding the roles of each stakeholder critically brings the success of the program. Since 2005, PlayCore hired at least 15 designers from our program. Many concepts from the collaboration ended up in their product lines. Recently, PlayCore has agreed to continue the collaboration over the next 5 years.

Conclusion

University-Industry Collaboration is a better way to teach design that brings academia and industry together as partners. It enhances the educational experience of the students. Students, gain experience working with professionals on real-life projects that could not be possible in pure classroom learning. It helps build the reputation of the design program. It provides realistic design challenges to the students. It expands the job market for future graduates as the industry needs more designers to follow up the newly developed design concepts. It also enables the faculty to establish a research focus and expertise. By investing funds and time to be involved in the whole R&D process, the sponsor may receive many new concepts for further development. The mutual understanding and commitment through collaboration create a hand-in-hand relationship for a better future for the sponsor, as well as the students and faculty.

References

- Camacho, B., & Alexandre, R. (2019). Design Education. University-industry collaboration, a case study. *The Design Journal*, 22(sup1), 1317–1332.
<https://doi.org/10.1080/14606925.2019.1594958>
- Hansen, I.-E., Mork, O. J., & Welo, T. (2017). Knowledge management of university-industry collaboration in the learning economy. *2017 2nd International Conference on Knowledge Engineering and Applications (ICKEA)*, 173–177.
<https://doi.org/10.1109/ICKEA.2017.8169924>
- Paay, J., Kuys, B., & Taffe, S. (2021). Innovating product design through university-industry collaboration: Codesigning a bushfire rated skylight. *Design Studies*, 76, 101031.
<https://doi.org/10.1016/j.destud.2021.101031>
- Shin, Y.-S., Lee, K.-W., Ahn, J.-S., & Jung, J.-W. (2013). Development of Internship & Capstone Design Integrated Program for University-industry Collaboration. *Procedia - Social and Behavioral Sciences*, 102, 386–391.
<https://doi.org/10.1016/j.sbspro.2013.10.753>

Contact email: Tin-Man@auburn.edu