INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
7 & 8 SEPTEMBER 2017, OSLO AND AKERSHUS UNIVERSITY COLLEGE OF APPLIED SCIENCES, NORWAY

TRANSDISCIPLINARY COURSE WORK IN ENTREPRENEURSHIP: CHALLENGES AND OPPORTUNITIES

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ABSTRACT
As many academic fields aim to facilitate an educational environment that mixes foundations with elements of professional practice, it is no surprise that mixed disciplinary experiences are increasingly becoming part of educational curriculum. In particular, entrepreneurship poises a unique opportunity to act as a core catalyst in facilitating on-campus transdisciplinary activities, course work and thinking. This paper disseminates the findings and insights resulting from an integrated course between product design and management students focused on new product ventures. The goal of this course was to create a single piece of curriculum that required the same accomplishments for each student as opposed to an interdisciplinary approach where each student simply relied on their own field of expertise. A mixture of design thinking and lean startup methods were brought to bear on this course which produced a hybrid structure between the two activities of design and management. The results of this class indicate that a truly transdisciplinary course can produce challenges for knowledge sharing, course projects, student focus, and faculty alignment. Although there were challenges with this scheme, this paper will also discuss opportunities for enhancing integrated education methods in entrepreneurship curriculum.

Keywords: Entrepreneurship, transdisciplinary, industrial design, management, curriculum.

1 INTRODUCTION

The future is complex and the problems that society will face require a mixed disciplinary approach. Many professional disciplines have banded together to address complexity and leverage the expertise of multiple fields to synthesize best fit solutions [1] to a range of topics. From architecture and product design to engineering and business, each of these professions has come to rely on partnerships. One particular activity that exploits mixed disciplinary thinking and action is that of entrepreneurship. The very nature of a product venture requires skills and methods that transcend a single disciplinary expertise in a parallel process combining elements of design, engineering and business. Traditionally positioned as a field of business management, entrepreneurship and in particular entrepreneurship that leverages technology and innovation requires skills and methods that transcend those found in a single academic discipline.

Academic fields focused on professional oriented disciplines like business and design or engineering and law, consistently work to facilitate an educational environment that mixes foundations with elements of professional practice. By emulating the profession, these disciplines seek to develop a student cohort that can easily transition from academics to practice. This integration of professional methods into academics also acts as an experimental space where by new methods of practice can be explored in the class room with the ultimate goal of informing new ways of practice. This give and take between academics and the profession also extends to the collaborative aspects between disciplines as is at the heart of this paper and examined case study. Although many universities in the United States are established around a holistic approach to education under the banner of 'liberal arts' the actual course work is isolated to individual subjects where the student's overall experience is mixed but the actual courses rarely combine a mixed approach. This creates a siloed and compartmentalized notion of education which inhibits two primary learning opportunities. The first being that complex problem spaces are best addressed by a mixture of knowledge and the second is that these silos encourage cultural barriers between disciplines which extend beyond academics and

bleed into the professional world long after a student has completed their degree. Beyond the courses themselves, individual disciplines have become silos of academic knowledge. Professional tracks in education like product design or engineering have spent over a century developing specializations in an effort to meet the needs of industry and respond to growing technology complexity [2]. That being said, the paradox within these academic structures is that universities, faculty and students alike recognize the need to break down barriers and explore integrated approaches.

Like many in the academics, the aim of the course described in this paper was to bridge the gap between disciplines, specifically between the fields of product design and business. As an experiment in this approach, a single course was developed to facilitate learning between not only the students but the collaborating faculty. Although undergraduate students at the university level have the ability to take a range of courses from across campus, very few of these courses model the mixed disciplinary experience that exists outside the academic realm. At the core of this course initiative was a shift from interdisciplinary to transdisciplinary studies. Susan Drake positions transdisciplinary approaches to curriculum as starting with the real world problem and context that results in methods and approaches that respond to that problem where students are the researchers [3]. This term is used as a starting point for the course activity described in this paper but differs slightly in that the instructors frame and position the primary methods of inquiry and action. New business or product ventures exhibit these transdisciplinary challenges as the problem and context framing as well as the potential solution transcend the individual specialization of a discipline. The objective was to not only establish a course that brought together product design and business students but also required that these students complete the same assignments and contribute the same deliverables throughout the 10 week team projects. In the simplest terms, business students had to do both business and design assignments and design students had to complete business as well as design related deliverables. The underlying motivation was to not only expose students to a mixed culture of problem solving but force those students to directly engage in those activities and methods. This strategy differs from an 'interdisciplinary' class were students fundamentally support their specialization through division of tasks. The three main aims behind this approach were to promote shared responsibility across; 1. Planning and strategy, 2. Action and execution, and 3. Team dialog and equity. Professionals in new ventures often share early strategic work so the course required that all student participate in this problem framing portion of the class. Assigning the same homework and deliverables across both disciplines aimed to facilitate an understanding and empathy for the respective disciplines. Moving beyond the general topics of design thinking and business strategy to the action of these tasks forced students to engage directly with these methods and not simple rely on their peer in the other discipline. Lastly, having both disciplines enter into these design and business strategy activities side by side positioned the students as equally invested and perhaps critical of work generated. The goal was to create a flat team structure where by all the participants had equal tasks. Although the aspirations for this transdisciplinary course were well grounded and created a vibrant discourse in the studio setting, there were also several challenges that arose from this scheme.

2 BACKGROUND: DESIGN PROCESS + LEAN STARTUP

Entrepreneurs in the earliest phases of a venture are primarily driven by a vision and focused on getting the right product in the right market at the right time. In many cases, striving to create a balance between something that is truly innovative and something people will buy [4]. New ventures are a case in exploration [5] and the balancing act occurs between innovation and optimization over a limited resource like time and money. This space of development is considered a runway or 'window of optimization' [6] where by iterative refinements are made to both the product offering and the business strategy. The modern intersection of these two actives lies between design process and lean start-up methods which can loosely be depicted in a cyclical diagram (figure #1).

2.1 Design Process

The design process at times can be commingled with the term design thinking, where by innovation is facilitated through a human-centred lens focused on observation, empathy as well as rapid prototyping and visualizations [7]. Expanding on this, the process is marked by iteration as a way of addressing uncertainty and refining ideas into a final concept. This quick series of hypothesis testing allows designers to explore ideas as well as the constraints of a given problem. Ultimately there exists a give and take between this framing of constraints informed by context and the ultimate solution that a designer may achieve [8]. Throughout this balancing act, the goal becomes one of refinement between

constraint and concept. At the intersection of these two elements exists the iterative method. As a form of concept development, the design process has many parallels with those of modern entrepreneurship methods like 'lean start-up'.

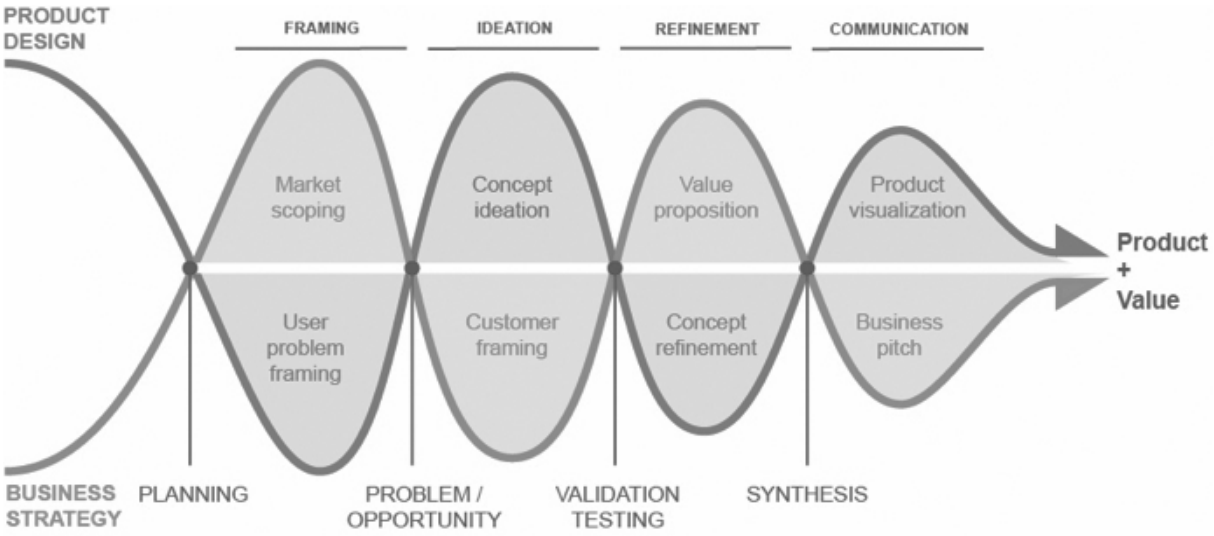

Figure 1. Iterative venture cycle

2.2 Lean Startup

In most cases, start-ups operate in conditions of extreme uncertainty [9]. In response to this uncertainty as well as a down turn in readily available capital, an interesting movement has developed in entrepreneurship over the last decade. This movement isn't solely focused on funding models or even product innovation but instead a method or approach to the actual organization and launch of a new business. Although many of the protagonists of this growing method place great emphasis on product development and seeking genuine innovation, this method is routed in a fundamental philosophy that of iteration as a means of refining a start-up from new and vulnerable entity with limited resources to a growing and sustainable business. Within this movement terms like 'failing fast', being 'agile', or 'bootstrapping' are often used to describe the approach and response that start-ups must take in order to be successful. Most recently, Eric Ries, has coined the term 'Lean Start-up' and has developed a strategic approach to venture planning and execution that integrates many of the methods developed in lean manufacturing made famous by Toyota [9]. The Lean Start-up is a process of optimizing various elements of a start-up with the primary goal of identifying productivity and eliminating waste. This is accomplished by means of taking quick iterative steps to refine either the offering or the strategy or both in order to produce a good fit between customer (customer growth) and product. Metrics are put in place at the start and a mentality of build – measure – learn is used as a feedback cycle to gain knowledge and make changes to the next iteration.

3 CASE STUDY: PRODUCT DESIGN + NEW BUSINESS MODELING COURSE

3.1 Starting point

The initial impetus for this experimental course, resulted from a conversation and collaboration between two faculties in the product design and business management programs at the University of Oregon in 2014. As with many campuses at the time, there were increasing initiatives in support of interdisciplinary research [10]. These initiatives were aimed at creating campus wide teams that could compete for research funding at both the regional and national level. Many of these funding agencies had identified the need to tackle big problems ranging from clean water and climate change to transportation and housing. In each case, interdisciplinary campus research teams were encouraged to tackle these problems. In addition to research collaborations, state wide government initiatives like the Regional Accelerator and Innovation Network [11] were targeting the source of academic research and education to accelrate that work into innovation ventures. This coupled with an expantion on university wide startup competitions like the Colligan Challenge [12] worked to increase the discourse around what it means to collaborate on campus. Much like the shift in the research climate

and start-up culture on campus there was a shift in conversation regarding mixed disciplinary course work. One of the central topics around blended course studies was that of entrepreneurship. As previously stated, the activities around entrepreneurship transcend any one specialization and for that reason, this was identified as a potentially strong point of intersection between the product design and business management undergraduate programs. With support for course planning and implementation granted through the Williams Fund [13] one faculty member from each program developed and co-taught a course titled "Integrated Product Design and New Business Modelling" in the spring quarter of 2015.

3.2 Course structure and implementation

This class was primarily focused on single project and team based work throughout the term with individual deliverables contributing to the overall performance of the group's work. Student teams were interdisciplinary and composed of both Product Design and Business undergraduate students. Although these were interdisciplinary in nature, each team member was tasked with contributing equal parts to the business planning and product design. In that way, students would learn both components of a successful venture and not just their respective disciplines. Although this course was a group project oriented course it included both individual and team deliverables throughout the quarter as well as lectures, guest speakers, discussions, reviews/critiques, in-class exercises, and presentations. In total there were 29 seniors, 15 from product design and 14 from business. These 29 students were then assigned by the faculty into mixed project teams of 3 or 4 students. The class met in a studio style format twice a week for 3 hours each meeting. These two meetings were split each week between topics and activities that supported the design portion of the project and the business portion of the project. The foundational required textbook for the course was, "Value Proposition Design" by Alex Osterwalder [14]. The design foundational knowledge was delivered with a mixture of readings and class lectures. Aside from individual deliverables, the team contributions typically resolved themselves into digital slide presentations throughout the term with the main points of reflection on 1. Research / Initial concepts, 2. Customer validations, and 3. Final pitch. Lastly, the topic or problem space that students were challenged to develop a product venture for was 'solar'. Instead of allowing students to develop ideas off topic, the aim was to centralize the theme amongst the groups to better facilitate guest speakers and early problem framing exercises.

Beyond the general structure of the course, this class was also an examination in the theoretical intersection of design process and lean start-up methods with a single project covering four main phases; 1. Problem / opportunity framing, 2. Ideation / validation, 3. Refinement / synthesis, and 4. Communication / pitch (figure #1). These phases were distributed sequentially and equally over a 10 week quarter long class. The final student team deliverable wasn't a full business plan or actual product but instead a visualized product concept coupled with a business value proposition. In scoping out the student assignments and activities, the faculty were examining how students engaged across disciplines but also how these two methods of product creation and business optimization complemented each other. As a result, observations and notes were made throughout the term to evaluate the success and challenges that resulted from this class structure.

4 DATA AND DISCUSSION

The two primary components of data collected throughout the course term were; 1. Faculty observations and 2. Student feedback at the end of the term. Faculty observations and interactions occurred during regular class meetings throughout the quarter; specifically, twice a week for three hours each meeting. Faculty summary review and discussion on success or failure of teaching strategy occurred informally on a weekly basis and formally at the end of the term. Student feedback occurred verbally throughout the term but they also completed a course evaluation with summary notes on the class. This was collected at the end of the term and used to identify common themes. These methods complemented each other in the fact that faculty perception and aspirations for the course were balanced by the students' experiences. The main points based on these observations and feedback are highlighted in the following sections.

4.1 Redundant knowledge sharing

The weekly course structure was broken up between design and business where each day was focused on delivering knowledge and content in support of these two disciplines. The most common methods of knowledge sharing was out of class readings followed by in class lectures and student exercises.

The pedagogical strategy was developed as integrated method of sharing the foundations of design thinking and lean start-up methods. Although the entire cohort of the class was exposed to these theories, there were challenges in presenting redundant knowledge that the respective disciplines had already covered in their prior education. Meaning the design students already had a strong theoretical and methods based background in the topics being discussed in class where by contrast the business students had no foundational knowledge on the topics. The reverse was also true when topics and activates in support of the business component of the class were introduced. Going through student feedback obtained at the end of the class, this was the single largest drawback that was identified. To mitigate this in the future, a course like this would benefit from a 'flipped' structure [15] where the knowledge sharing is primarily delivered online thus allowing the respective students to engage with the appropriate information while saving valuable class time for the more active learning aspects of advancing the project. Although this format allowed for a somewhat level playing field as well as presenting an explicit examination of the two theories side by side, it proved to be limitation in this integrated approach.

4.2 Rudimentary assignment overlap

Similar to the challenge identified in section 4.1, the aspirations of standardizing the assignment deliverables between business and design students meant that compromises had to be introduced to allow for the respective students to execute new methods and skills. Again, what might be a new method for one student could be considered a rudimentary technique for another student. Observations of this were present in completed homework assignments as well as delivered team presentation materials.

4.3 In class exercises and field work

One of the strongest components in this course was the in class exercises used to facilitate problem framing and brainstorming within mixed disciplinary student teams. These exercises provided for advancing the product concepts and value propositions but also supported structured dialog between the culturally different student disciplines. In addition to the in class work, field customer validation interviews allowed students to have common structured goals when interviewing potential customers and gaining direct insights from end users.

4.4 Faculty alignment

As mentioned before, this course was an experiment that examined transdisciplinary student work between product design and business undergraduate students. It also explored the collaboration of faculty from those respective disciplines. This faculty collaboration was well balanced and collegial but like any new undertaking required negotiation between two strategic theories of innovation and optimization as well as the tactical day to day execution of the class. Co-teaching any class can be rewarding and educational for the faculty but also challenging in creating a perfectly aligned delivery. This is true for instructors that work in the same discipline but even more so for those that work across disciplines. It was also discovered that planning and preparation for this type of co-taught course across disciplines takes approximately 2.5 times as long to develop when compared to in-discipline solo-taught courses. As a result of this experimental class, the faculty participating in the planning and implementation of this course held a debriefing meeting at the end of the term and identified the previously listed pain points as well as opportunities to shift knowledge sharing and content delivery during course meetings.

4.5 Validation testing

This course was juggling several initiatives at once where by the faculty were exploring an integrated teaching approach to group problem solving but also using this as a platform to examine the iterative method between product design and business strategy for new product ventures. The main activities outlined in figure #1 proved to be a resilient structure for the class except for one main deliverable point. That point of review was the 'validation testing' portion of the process where by students developed several concepts and use those as a tool to gauge potential customer interest before moving on to refinement. At the time of delivery, the concepts proved to be too broad to gain actionable customer insights as end users desired more fidelity in the concepts. This could be addressed in future courses by extending this phase of the product ideation process as well as imposing a narrowed number of ideas presented to customers for feedback.

5 CONCLUSION

The future is complex and the problems that society will face require a mixed disciplinary approach. Much like the professional world, academics and university education continues to introduce an experiment with interdisciplinary and transdisciplinary methods of research and teaching. In an effort to breakdown long standing disciplinary silos and blend education experiences, it takes willing faculty and students combined with a supportive academic environment. Based on the for mentioned course and highlighted insights, truly transdisciplinary studies implemented as an individual course offering during the senior undergraduate year present a number of challenges. Perhaps the single greatest influence on these challenges is the level of education of the students involved. By selecting seniors, the faculty aimed to have students well versed in their respective disciplines with a maturity that would support collaboration. Both proved to be true but left the students with some redundant knowledge and rudimentary assignment overlap. It was also too close to the end of their education to influence future academic collaborations. To truly promote a blended course offering and a balance between inter and transdisciplinary studies, the strongest opportunity lies in starting these at a much sooner in the students' academic career. Freshman and sophomore students could greatly benefit from this exposure and overlap before they reach the final years of their education. As this experiment was as much about knowledge sharing as cultural collaboration, early and often should be the mantra. To facilitate common ground across disciplines, entrepreneurship poses a strong coalescing topic as it bears relevance to most of the contemporary professional disciplines while transcending any one of them.

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