Northwestern | INSTITUTE FOR SUSTAINABILITY AND ENERGY

Course Syllabus – DRAFT

ISEN 421 - Scaling Sustainable Technology

Northwestern University

Course Synopsis: This course will introduce students to concrete strategies that can be employed in taking new sustainable offerings to scale in the development life cycle. The course will focus on expanding test products into larger volume market deployment strategies, modes of financing, testing and future-proofing. This course will have specific focus on sustainability-related products and services and content is relevant for students who want to understand corporate new product development, corporate venturing and private equity / VC growth considerations for sustainable offers.

Course Goals:

- **Culture & Innovation:** The course will introduce concepts around culture and change. Topics will include the "innovate or die" mindset popularized by Peter Drucker. In this course, students will learn about methods of incentivizing innovation in energy and sustainability and communication and cultural adoption of a new model or offer.
- **Offer Evolution:** Students will evaluate markets with an eye on total addressable market, differentiation and growth. Students will review how to build a market-facing product which will drive volume. They will also learn about methods of testing the product and developing it through varied iterations at scale. This includes efforts "beyond the S curve".
- **Business Model & Capital Allocation:** The course will cover corporate and private equity decision making around new product / service funding. Corporate models for scaling innovation will be reviewed and growth sector funds in private equity will be introduced. This topic requires consideration of the entire company or PE portfolio with regard to the new offer(s).
- **Scale Deployment Strategies:** Deploying new offers at scale presents considerable challenges – whether in an independent company (perhaps PE backed) or inside a larger organization. The importance of marketing, messaging and communication both inside and outside the organization is critical. For scale "production", new offers must adopt process and structure that likely was not a part of early product development.

Grading/Assessment:

Grading will be based on the following rubric:

Component	Weight	Details	Due
Effort and Attendance	15%	Effort will be graded through attendance and class participation. This includes preparation and active participation in Q&A of Final Case presentations.	Ongoing
Case Study Assignments	50%	Written, individual submissions. Students will be given a case study, which they will have to analyze using the	Weeks #2,3,4,5,8

		methods learned in class. They will have to answer questions about the case in a 2-3 page paper. (10% each)	
Final Case (Group Project)	35%	Final cases will be applications of the material covered in class—groups will be assigned a company / product/service in a sustainability-relevant industry and students will be asked to apply the concepts from a real-world innovation (a potential list of topics will be offered but students can also propose an alternative innovation). The group will submit one, 5-8 page paper (Week #9) and will give a 15 minute summary of their findings in class.	Weeks #9 & 10

Grading Policy:

- Grades will be assigned based on all the work you have completed during the semester following the traditional practice of A=90-100, B=80-89, C=70-79, D=60-69, F<60.

Course Readings:

Selections of the following books will be assigned by the instructor(s)

- Humble, Jez, Joanne Molensky and Barry O'Reilly. Lean Enterprise: How High Performance Organizations Innovate at Scale. January 3, 2015.
- Viki, Dr. Tendayi, Dan Toma and Esther Gons. The Corporate Startup: How established companies can develop successful innovation ecosystems. March 1, 2019.
- Ries, Eric. The StartUp Way. October 17, 2017.
- Christensen, Clay. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. December 15, 2015
- Kim, W. Chan and Renee Mauborgne. Blue Ocean Strategy, Expanded Edition: How to Create Uncontested Market Space and Make the Competition Irrelevant. Jan 20, 2015.
- Kim, Gene, Kevin Behr and George Spafford. The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win, Feb 6, 2018.
- The Enforcement of Intellectual Property Rights: World IP Organization, 2013.[1]

Instructor will also provide case studies (e.g. HBR cases) in a course pack.

Additional Readings:

- Kim, Gene. The Unicorn Project: A Novel about Developers, Digital Disruption, and Thriving in the Age of Data, November 26, 2019.
- How Solar Energy Became Cheap: A Model for Low-Carbon Innovation: Nemet (2019)
- Principles of Marketing Engineering: The STP Approach: Lilian (2007)
- Christensen, Clay. The Innovator's Solution. November 19,2013
- Niemann, Jorg, Serge Tichkiewitch and Englebert Westkamper. Design of Sustainable Product Life Cycles: November 17, 2008.

[1] https://www.wipo.int/publications/en/details.jsp?id=357

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CLASS OUTLINE

Weekly Topic	Description
1: Culture & Innovation – Objectives, Barrier & Opportunities	• *Introduction to course logistics, grading and syllabus.* • How do corporates or private equity funds look at innovation? • What is the importance of innovation and new products for these players? • What are the existing barriers & opportunities for larger organizations when it comes to innovation? • How do circumstances vary between operators and different types of financial investors?

2: Culture & Innovation – Models for larger organizations	• What is the genesis of the "innovate or die" culture that is integrated into much of US business today?
	• How have large organizations failed to innovate?
	• What are the models for successful innovation?
	• How are financial investors and large organizations looking to integrate innovation into their businesses?
	  ○ The "Rise" of the Growth Fund (TPG)
	  ○ Corporate Venturing (Salesforce Ventures, Maersk Ventures)
	  ○ Corporate Innovation Teams
	  ○ Spin-outs
	  ○ Intrapreneurship
	  ○ Cultural Programs, Crowdsourcing etc
	• Can you drive a culture of innovation through a whole organization at scale?
	
	CASE STUDY #1 – Model of successful or failed innovation at scale

3: Offer Evolution – Offer Updates, Cannibalization, Branding & Positioning	• Review of basic themes of the product life cycle, tech commercialization process, S curve • **Market size & offer updates** – How does market / consumer demand change if led by a larger organization? How can offers benefit from large company resources such as improved channel access, brand equity, scale marketing campaigns, corporate or PE expertise? • **Cannibalization & Market Confusion** – What are some of the challenges in a scale introduction of new and disruptive offers? How are disruptive innovations treated by an incumbent (given that some departments will be negatively impacted by new offers)? How can organizations successfully navigate self-cannibalization?

	CASE STUDY #2 – Review a sustainable offer that has changed when part of a larger organizational portfolio
4: Offer Evolution – Branding & Positioning	• How can scale segmentation impact branding/marketing/positioning? • What considerations are important when competing with an incumbent offer (yours or other competitor)? • If the new offer cannibalizes your own existing offer, how should that transition be managed? • How does the sustainable component of the new offer play in? • Are there any critical and consistent trends or rules of thumb in development of sustainable technologies in today's market? **CASE STUDY #3 –** Review the efficacy of positioning a new offer as "sustainable" or "green" at scale
5: Business Model & Capital Allocation – The Business Model	• What are the important considerations in determining pricing? For new offers and incumbent offers? • How are the overall economics of an existing business impacted by the new offer? • How can the economics of cannibalization be attractive? • What are the channel considerations? How can larger or incumbent organizations navigate potential channel conflict? • What are other risks of new product introduction (e.g. higher cost to produce sustainable offer, cost of sustainability certification necessary for marketing)? • How should businesses incorporate positives and risks into the strategic plan and business case? **CASE STUDY #4 –** Evaluate a case that balances downside and upside in consideration of "the whole" (e.g. market share increase vs. cannibalization of high margin incumbent product)
6: Business Model & Capital Allocation – Decision Making	• How do corporates allocate investment dollars? How does this vary? • How do private equity firms determine deployment of capital? How does investment philosophy play into this? • For corporates and PE firms, what is considered beyond financial returns (if anything)? • How will valuation of sustainable offerings be estimated given risk of new product or service / unproven market potential? • How are decisions made in PE and corporate environments? What are some of the models? Who are the typical stakeholders? • How can an "intrapreneur" or a scaling business seeking "mature" funding influence the key decision makers?

	● What tools are most effective in getting funding for a sustainable offer or suite of products? **Students must have formed groups and proposed their final presentation plans to the instructor by the beginning of Week #6.**

7: Scale Deployment Strategies – Legal Considerations, Brand Claims and Intellectual Property Rights	● Overview of legal considerations at scale
	● Discuss any specific requirements for a product that has sustainability claims attached
	● Review of patents, trademarks, trade secrets and copyrights.
	  ○ When are they needed and how can they be acquired in the US?
	  ○ What do you do when your technology is infringed upon?
	  ○ Protecting IP: licensing strategies and dealing with infringement of IP.

8: Scale Deployment Strategies – Supply Chain, Procurement, Production and CSR compliance at scale	● How do you structure scale business processes and procurement to allow for management of required Scope 1/2/3 emissions for the sustainable offer? ● What other considerations are important for the integrity of the product or service (e.g. Human Rights)? ● How will the supply chain be structured to ensure compliance with offer standards (e.g. waste stream management, energy efficient production, sustainable sourcing)? ● How will any modified business processes and associated results be structured, communicated, tracked, enforced and improved? **CASE STUDY #5 –** Assess the supply chain and business process implications of shifting to a sustainable offer
9: The Big Picture – Sustainability at Scale	● Review of the critical factors required to scale ● Discussion on the greatest challenges and opportunities in scaling businesses ● Review of tools / frameworks / methods that can be leveraged to scale ● Reminder of expectations for final presentation ● Announcement (to full class) on groups and topics **Case Summaries must be available electronically to full class by Friday EOD in shared folder. All students will read all case summaries by Monday morning of Week #10 to allow for robust Q&A**
10: Final Presentations	● Groups will give a 15 minute presentation (a summarized version of their write up provided in advance) of their "Scaling Sustainability" case. Other students are expected to come prepared with thoughtful questions for classmates.

	● Student groups will have submitted detailed briefs of their assessment of a scaled solution that failed / succeeded in a given sustainability offer. ● 25 minutes x 6 groups = 150 minutes of class time. Buffer of 30 minutes present assuming 3 hours of class in a given week.