Course Syllabus

ISEN 421 - Scaling Sustainable Technology
Spring 2021

Northwestern University

Instructors:
Brian Tolliver  Bert Valdman
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Class Time:  Mondays 12:30p-3:20p
Location:  Tech L361
Teaching Modality:  Hybrid
Office Hours:  E-mail is the fastest and most reliable way to contact us. We will try to be in the classroom from 11:30a to 12:00p before class and remain after class is completed. Please email us to schedule an alternate time.

Course Synopsis: This course will introduce students to conceptual and practical strategies that can be employed in taking new sustainable offerings to scale. The course will focus on the life cycle of the creation process, expanding products and services into larger volume market deployment strategies, modes of financing, testing and future-proofing. This course will 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 considerations for scaling sustainable offers.
To be successful in this course and enjoy the best experience, you should have a sincere interest or passion for learning and experiencing how an idea can become a real business, whether in a new venture or mature corporate setting.

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 scale. 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
<th>Due</th>
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<tbody>
<tr>
<td>Effort and Attendance</td>
<td>15%</td>
<td>Effort will be graded through attendance and class participation. This includes preparation and active participation in Q&amp;A of Final Case presentations. In general, students fall into four participation categories that essentially correlate with grades of A, A-, B+/B, B-. They are outstanding contribution, excellent contribution, average contribution, and no contribution.</td>
<td>Ongoing</td>
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<tr>
<td>Class write-ups (5% each)</td>
<td>25%</td>
<td>Each student will submit a 2 to 3-page summary of key take-aways from day’s class (readings, speaker presentation and discussion, class discussion). At their discretion students will select 5 classes for write-ups.</td>
<td>On-going Due at the start of the next class</td>
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<tr>
<td>Case Study Assignments</td>
<td>25% (15% first case, 10% second case)</td>
<td>Written, individual submissions. Students will be given case studies which they will have to analyze using the methods learned in class. They will have to answer questions about the case in a 3-4 page paper, posted to Canvas by the date and time posted. Assignments that do not follow these rules will be returned and considered late when resubmitted correctly if it is past the time it is due. Papers turned in after the due date will lose 20% of the total points for that case.</td>
<td>Weeks #3 &amp; #5 Cases are due at the start of class in the respective weeks</td>
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The final case will be the application of concepts and strategies 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 to a real-world innovation (a potential list of topics will be offered but students can also propose an alternative innovation).

Each group will submit one, 5 to 8-page memo (Week #9) and will give a 15-minute summary presentation of their findings in class.

**Grading Scale**
All questions and problems regarding grades must be presented in writing within one week after the test, homework, or project has been returned. The grading scale is fixed, please do not wait until the end of the quarter if you are concerned about the direction of your grade. Grades will be assigned based on all the work you have completed during the semester using the following scale:

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<thead>
<tr>
<th>Grade</th>
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<tr>
<td>A</td>
<td>93.333 to 100</td>
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<tr>
<td>A-</td>
<td>90.000 to 93.333</td>
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<tr>
<td>B+</td>
<td>86.666 to 90.000</td>
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<tr>
<td>B</td>
<td>83.333 to 86.666</td>
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<tr>
<td>B-</td>
<td>80.000 to 83.333</td>
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<tr>
<td>C+</td>
<td>76.666 to 80.000</td>
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<tr>
<td>C</td>
<td>73.333 to 76.666</td>
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<tr>
<td>C-</td>
<td>70.000 to 73.333</td>
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<tr>
<td>D+</td>
<td>66.666 to 70.000</td>
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<td>D</td>
<td>63.333 to 66.666</td>
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<td>D-</td>
<td>60.000 to 63.333</td>
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<td>F</td>
<td>&lt; 60.000</td>
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**CLASS OUTLINE**

**Class 1: Establishing the foundation of an entrepreneurial culture**
Tuesday, March 30th
Valdman & Tolliver; REMOTE

Please prepare responses to the following prompts and be prepared to discuss in class:

- What are common characteristics of successful teams and business leaders?
- How would you describe an entrepreneurial mindset and culture? How is this different for a corporate mindset?
- What should business leaders consider in shaping a company culture?

**Guest Speaker:** Pete Kadens

**Class preparation:** Webcasts and readings to skim:
Sinek, Simon. Start with why—how great leaders inspire action. TEDx. 


Grant, Adam. The surprising habits of original thinkers. 


Dinin, Arron. Web Masters Episode 1: Interview of Louis Monier (podcast). Lantona’s. 
https://latonas.com/blog/web-masters-episode-1-louis-monier/

Damco, Alex. Secrets about People: A Short and Dangerous Introduction to Rene Girard. 


Class 2: Culture & Innovation - Corporate Culture
Monday, April 5th
Tolliver; REMOTE

Guest Speaker: Ben Gaddy, Breakthrough Energy
https://www.breakthroughenergy.org/scaling-innovation/scaling-innovation

Key concepts and tools:
- What is the genesis of the “innovate or die” culture that is integrated into much of US business today?
- How have large organizations succeeded or failed to innovate?
- What are the models for successful innovation culture?
- How are organizations, especially large, looking to integrate innovation into their businesses?
  - Corporate Venturing (Salesforce Ventures, Maersk Ventures)
  - Corporate Innovation Teams
  - Spin-outs and Spin-Ins
  - Intrapreneurship
  - Cultural Programs, Crowdsourcing etc.
- Can you drive a culture of innovation through a whole organization at scale?
- How can objectives be achieved in upstarts as well as mature companies?
Class preparation:
https://www.ft.com/content/a81c934c-cb31-11e9-af46-b09e8bfe60c0. November 20, 2019.


Nisewanger, Jeff. Greenlots is purchased by Shell Oil. *Electric Revs.*

Class 3: Offer Evolution - Building a brand
Monday, April 12th
Tolliver; IN-PERSON

**Guest Speaker:** Yann Kulp, eIQ Mobility (a NextEra Energy Company)

**Key concepts and tools:**
- Review of basic themes of the product life cycle, tech commercialization process, S-curve
  - Product Life Cycle and the relation to the BCG Matrix
- Market size & offer updates – How does market / consumer demand change if led by a larger organization? What is the impact of broader distribution channel access, and can a new offer succeed without traditional channel access?
- 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 can organizations successfully navigate self-cannibalization?
- How are disruptive innovations treated by an incumbent (given that some departments will be negatively impacted by new offers)?

Class preparation:
Kim, John. What is a S-Curve?. *Consultant’s Mind.*
https://www.consultantsmind.com/2013/09/21/what-is-an-s-curve/


Class 4: Going to market
Monday, April 19th
Valdman; IN-PERSON

Please prepare responses to the following prompts and be prepared to discuss in class:
- What are common characteristics of start-ups that were able to successfully scale?
- Why has it been so challenging for start-ups to scale and remain independent in the clean technology sector?
- Will developments over the next 5 years in customer preference, technology innovation, and public policy make it easier or harder for clean technology start-ups to independently scale?

Guest Speaker: Larry Stapleton, President, Optimum Energy, https://optimumenergyco.com

Class preparation: Webcasts and readings to skim:
Review posted videos and articles on Optimum Energy’s website

Jim Collins, Bill Lazier. Be 2.0: Turning Your Business Into An Enduring Great Company
- Chapter 6, What Makes Great Company’s Tick
- Chapter 7 Strategy


Crockett, Zachary. How one of the world’s fastest-growing start-ups burned through $300m. The Hustle. https://thehustle.co/how-one-of-the-worlds-fastest-growing-startups-burned-through-300m/. January 16, 2021

Class 5: Building a Clean Technology Portfolio to Enable Transformational Change
Monday, April 26th
Valdman; IN-PERSON

Please prepare responses to the following prompts and be prepared to discuss in class:
- What criteria would you formulate for investing the clean technology sector?
- What clean technology sectors show more investment return promise than others? Why?
- How would you balance near term financial returns with long term impact? What is your measure of impact?

**Guest Speaker:** Tom Biegala, Gates Ventures

**Class preparation: Webcasts and readings to skim:**


Review Breakthrough Energy Website and familiarize yourself with investment portfolio: [https://www.breakthroughenergy.org](https://www.breakthroughenergy.org)

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**Class 6: Business Model/Capital Allocation/Decision-making**

Monday, May 3rd

Tolliver; *IN-PERSON*

**Guest Speaker:** Jim Murphy, co-founder and President & Chief Operating Officer, Invenergy [https://invenergy.com/](https://invenergy.com/)

**Key concepts and tools:**

- How do corporates allocate investment dollars? How does this vary? Organic vs inorganic growth?
- 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?

**Class preparation:**


<table>
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<tr>
<th><strong>Class 7: Launching and Scaling Clean Technology</strong></th>
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<tr>
<td>Monday, May 10th</td>
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<td>Valdman, IN-PERSON</td>
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Please prepare responses to the following prompts and be prepared to discuss in class:

- What role did federal and state subsidies play in the residential and commercial solar business?
- What are some lessons learned from the solar sector that can be applied to other areas of clean tech?
- Will old economy companies absorb new economy companies or vis versa?

**Guest Speaker:** Nat Kraemer, Chief Executive Officer, Advanced Energy Economy (Co-founder of SunRun, former CEO of Spruce Finance)
[https://www.aee.net/about/team/nat-kreamer](https://www.aee.net/about/team/nat-kreamer)

**Class Preparation:**


Guest Speaker: John Tough, Energize Ventures
https://www.energize.vc/

Key concepts and tools:
- How do you structure and 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?
- Review of the critical factors required to scale, and tools / frameworks / methods that can be leveraged
- Discussion of the greatest challenges and opportunities in scaling businesses
- Reminder of expectations for final presentation
- Announcement (to full class) on groups and topics

Class preparation:


Class 9: Final Presentations  
Monday, May 24th  
Valdman & Tolliver; IN-PERSON

- Groups will give a 15-minute presentation (a summarized version of their write up provided in advance) of their “Scaling Sustainability” case, followed by 10-minutes of Q&A.
- 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.

Additional Information

Statement on Spring 2021 COVID-19 Classroom Requirements
Students, faculty, and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the COVID-19 Code of Conduct. With respect to classroom procedures, this includes:

- Students, faculty, and staff are required to wear a face covering in all public and shared environments on campus, including during class sessions when others are present.
  - Disposable face masks will be available at identified building entrances in all campus buildings.
  - Clear face coverings may be worn to improve ability to read lips; if an accommodation is needed, please contact Accessible NU (students) or Office of Equity (faculty).
  - Face shields are no longer allowed as an alternative to a face mask, per guidance from the CDC and Northwestern Medicine. This includes instructional spaces regardless of social distancing.
- Students, faculty, and staff are expected to observe the rules of social distancing, which require that you are no closer than six feet from other individuals.
- No food is allowed inside classrooms. Drinks are permitted, but please keep your face covering on and use a straw.
- Chairs and tables in classrooms are set to maintain a six-foot distance between individuals. Do not move chairs from their place in the room.
- There will be assigned seating in every class. Instructors may be asked to provide seating information to aid in contact tracing if a student tests positive for COVID-19.
- Class dismissals will start with the seat/row closest to the exit door and be managed by the instructor so as to minimize congestion near the exit.
- Students and faculty will allow those occupying rooms to fully exit before they enter the room.
- Faculty, students, staff and visitors are expected to use the daily symptom check web app for daily health monitoring on days they come to campus.
- As noted below, ALL graduate students must receive a negative test during Wildcat Wellness and before starting in-person classes on April 6. Throughout the semester we expect MSES students to be tested weekly or bi-weekly. Please abide by the email reminders you receive from the testing center.
- The University will again hold a Wildcat Wellness period from March 29 through April 5. During this time ALL graduate students must be tested for COVID-19 and ALL classes will be held remotely.
In the event that a student fails to comply with the COVID-19 Code of Conduct or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.

It is also the policy of the MSES Program that all lectures will be recorded and offered in a synchronous, hybrid format. On in-person days there will always be a synchronous Zoom option for any students that feel ill or are uncomfortable coming to class.

**Class Recording**
This class or portions of this class will be recorded by the instructor for educational purpose and available to the class during the quarter. Your instructor will communicate how you can access the recordings. Portions of the course that contain images, questions or commentary/discussion by students will be edited out of any recordings that are saved beyond the current term.

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact AccessibleNU. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University’s Copyright Policy, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

**Expectations for Class Participation**
Being prepared for class is about more than just showing up, it’s also about making sure you’ve completed the readings, homework, etc. so that you are able to make thoughtful contributions during class. Sitting silently and/or being unprepared can damage your participation grade. When in a virtual class, we expect students to keep their camera and mute on as much as possible. When in the classroom, we expect students to keep their phones off and put away.

**Academic Integrity**
Academic integrity is taken very seriously at Northwestern. Students are responsible for reading and understanding Northwestern’s Academic Integrity policies. All suspected violations will be reported to the McCormick College of Engineering’s Dean’s Office. These include cheating, plagiarism, fabrication, unfair advantage, unauthorized collaboration, and aiding and abetting of academic dishonesty. Students found in violation of academic integrity may receive a zero on the assignment or a failing grade for the course and may be suspended or permanently expelled from the University. See Academic Integrity: A Basic Guide for more information.

**Accessibility Statement**
Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in
the academic setting, please contact AccessibleNU to move forward with the university’s established accommodation process (e: accessiblenu@northwestern.edu; p: 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

**Illness and Medical Leave of Absence**
Review the University’s policy on missing academic work due to illness. Your instructor cannot waive an assignment missed due to illness unless the illness can be verified (e.g., by University Health Services or other licensed health professionals).

**Discrimination and Sexual Harassment**
Northwestern’s Policies on Discrimination, Harassment, and Sexual Harassment apply to all members of the University community, including students, staff, faculty, and third parties. Any student, staff, faculty member, or third party who believes that they have been discriminated against or harassed on the basis of their race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, pregnancy, parental status, marital status, age, disability, citizenship, veteran status, genetic information or any other classification protected by law, should contact the Office of Equity at (847) 467-6571. Additional information about the University’s discrimination and harassment policies, including the campus resources available to assist individuals with discrimination or harassment concerns, is available online on the Office of Equity Website. Students, staff, and faculty who report harassment, discrimination, or sexual misconduct are also protected under the University’s Policy on Non-Retaliation.

**Sexual Misconduct and Reporting**
Northwestern University is committed to fostering an environment where students are safe and free from sexual misconduct. Confidential resources are available to those who have experienced sexual misconduct. Faculty and instructors are not confidential resources and are required to report incidents of sexual misconduct, whether discussed in your assignments or in person, to the Office of Equity, which can provide information about resources and options. We encourage students who have experienced sexual misconduct to talk with someone to get support. For more information, including how to request interim protective measures and academic accommodations or file a complaint, see the Get Help page.

**Other Resources**
Students can find useful resources for safety and security, academic support, and mental and physical health and well-being at the NUhelp website.