

#### Master of Science in Sustainability Management

SUMA PS5260 Digital Product Development for Sustainability Meeting Day/Time: TBD 3 Credits Elective

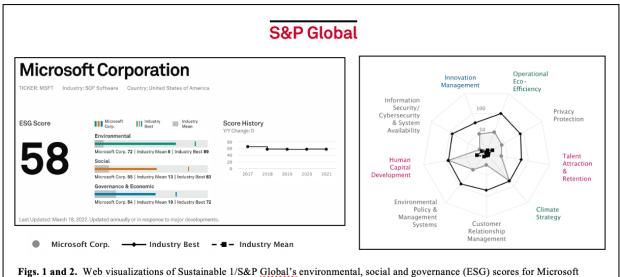
Instructor:Teri Mendelsohn, Lecturer, TM137@columbia.edu, 917.603.3987Office Hours:TBDResponse Policy:Email inquiries during the workweek are preferred. I will respond within 24 hours.

Facilitator/Teaching Assistant: TBDOffice Hours:TBDResponse Policy:TBD

### **Course Overview**

In April 2022, the Intergovernmental Panel on Climate Change (IPCC) reported that global efforts are unlikely to reduce carbon emissions in line with COP21 targets of 1.5° C above preindustrial levels. This finding underscores the urgency around decarbonizing the economy and sustainably managing natural resources. A so-called "big, hairy, audacious goal," it requires that similarly ambitious solutions be implemented across countries and industries.

It is only by measuring resources that stakeholders can manage them and ensure that they are available in sufficient quantities for future generations. Web tools provide up-to-date analyses of aggregated data; distill complex issues into accessible visualizations; enable users to drill down to answer questions; offer insights into complicated and interdependent issues; and display changes in performance over time. For example, Sustainable 1/S&P Global's ESG Scores are valuable because they expose patterns in data related to environmental, social and governance risks and opportunities:



Corp. Source: ESG Scores, S&P Global, downloaded 7/7/22 from https://www.spglobal.com/esg/scores/results?cid=4004214

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**Fig. 1** displays Microsoft's total weighted ESG score; the breakdown of each component score compared to the software industry's best and median scores; and the company's ESG performance over time. **Fig. 2** summarizes underlying ESG factors on which Microsoft was scored and benchmarks factor scores against those of the best performers in the industry and the industry mean. Together, these visualizations alert Microsoft to its overall standing and investors to the benefits and risks of investing in Microsoft.

Efforts are underway -- locally, regionally, nationally and internationally -- to address climate and ESG issues and many more need to appear on drawing boards. Examples include:

- In the northeastern U.S., 30 gigawatts of offshore wind, enough to provide electricity to 10 million homes, are slated to be installed by 2030.
- Globally, companies need to evaluate opportunities to deploy renewable energy and energy efficiency measures in their facilities in order to reduce carbon emissions and costs.
- Coastal cities are studying their exposure to sea-level rise so they can harden electricity infrastructure and avoid blackouts caused by more frequent storms.
- Indigenous populations and local governments in the Amazon wish to protect the jungles that act as global carbon sinks and generate revenue opportunities from carbon credits.
- Investors want to understand the exposure of their portfolios to ESG risk.

This elective course will introduce students to the digital product management role in the context of sustainability. Students will get a strong understanding of what it means to be a product manager and its role in the organization. The course will demonstrate how to define a product vision; identify a product strategy; create product roadmaps; design a customer experience; enable data-driven decisions; understand the development process; manage for results; and, by "leading through influence," coordinate cross-functional teams of business analysts, developers, data providers, marketing, users, customers, senior management and other stakeholders. The course is about product strategy and how to innovate and launch new products and features. Students will be prepared for product management roles in companies; though many of those skills are applicable to entrepreneurship, the course is not geared toward start-ups or new ventures.

Students will be introduced to issues and information needs for governance, solar and wind energy, water, sustainable finance, wildlife, and diversity, equity and inclusion (DEI). Industry experts will deliver guest lectures.

The on-campus, full-semester course is intended for 24 second-year students with previous grounding in climate and environmental issues. In-class exercises will provide hands-on experience with product management methods. Instructor permission is required to enroll in the course.



## Learning Objectives

The objectives of this course are to:

- L1: Use tools and techniques to conceive, build, and manage sustainability-related products and services over their life cycle
- L2: Define and communicate the product strategy and business case
- L3: Understand how to develop and execute a go-to-market strategy for digital products
- L4f Apply agile methods and key business metrics to build an effective product portfolio
- L5: Understand the requirements to lead cross-functional teams and manage with influence.

#### Required Reading (available on Canvas except where otherwise indicated):

Bose, Satyajit, Guo Dong and Anne Simpson, *<u>The Financial Ecosystem: The Role of Finance in</u> <u>Advancing Sustainability</u>. Palgrave Macmillan, 2019, pp. 1-18 and 83-110 (44 pp.)* 

Beamish, Paul, Alexander Brown and Elena Simpson, "Membertou First Nation: Possible Acquisition of Clearwater Seafoods," Harvard Business Publishing, May 2023, pp. 1-13 (12 pp.)

Brennan, Kevin J., Sallie Godwin and Filip Hendrickx, *Digital Product Management*. BCS, 2022, pp. 1-173 (172 pp.)

Daigger, Glenn T., Nikolay Voutchkov, Upmanu Lall, and Will Sarni. "The Future of Water." *Water and Sanitation Division*, Spring 2020, pp. 42-93 (51 pp.)

Drucker, Peter F. "The discipline of innovation." *Harvard business review* 80, no. 8 (2002): 95-102 (7 pp.)

Kelley, Tom and Jonathan Littman, *The Ten Faces of Innovation: IDEO's Strategies for Beating the Devil's Advocate & Driving Creativity throughout Your Organization.* Profile Books, 2016, pp. 1-14 (13 pp.)

Hawken, Paul, ed. *Drawdown: The most comprehensive plan ever proposed to reverse global warming.* Penguin, 2017, 10 pp. of your choosing

Henderson, Rebecca. Reimagining capitalism in a world on fire. Public Affairs, 2020, pp. 31-50 (29 pp.)

Knight, S. "Designing the Apocalypse," New Yorker, Sept. 25, 2023, pp. 22-28 (6 pp.)

McGrath, RG & IC Macmillan, "Driving Corporate Growth with the Right Disciplines: A Discovery-Driven Approach," Harvard Business School Publishing, 2009 (28 pp.)

McGrath, Rita, "The New Disrupters," Harvard Business Publishing, Feb. 2020, pp. 1-9 (8 pp.)

McKinsey & Co. and LeanIn.org, *Women in the Workplace 2023*, <u>https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace#/</u>, pp. 4-41 (37 pp.)

Muller, Jerry Z., The tyranny of metrics. Princeton University Press, 2015, pp. 1-59 (58 pp.)

Samuelson, Judy, "Sustainability Takes on New Meaning," NACD, Jan. 22, 2024, <u>https://www.nacdonline.org/all-governance/governance-resources/directorship-magazine/2024-future-board-special-issue/sustainability-takes-on-new-meaning/</u>, 1 p.

Smith, Edward and Steven C. Wheelwright, "The New Product Development Imperative," Harvard Business School Publishing Corp., 1999, pp. 1-21 (20 pp.)

Tufte, Edward R. The visual display of quantitative information. Graphics Press, 1983, pp. 13-52 (39 pp.)

Usher, Bruce, Renewable Energy, Columbia University Press, 2019, pp. 29-54 (25 pp.)

Vernis, Alfred et al., *Moltacte: A social enterprise that puts employees like me at the center*, Harvard Business School Publishing, 2021 (20 pp.)

Wainwright, John and Mark Mulligan, *Environmental modelling: Finding simplicity in complexity, 2e.* Wiley-Blackwell, 2013, ch. 11: Modelling Catchment and Fluvial Processes and their Interactions, pp. 3-26 (25 pp.)

### **Recommended Videos:**

<u>"Renewable Energy Storage,</u>" Energy & Environment Women's Circle, Columbia Business School Alumni Affairs, 2020.

### **Recommended Reading:**

Antonelli, Paola. *The Neri Oxman Materials Ecology Catalogue*. Museum of Modern Art, 2020 (181 pp.).

Barry, Roger G., and Eileen A. Hall-McKim. *Essentials of the Earth's climate system*. Cambridge University Press, 2014 (272 pp).

Cohen, Allan R., and David L. Bradford. Influence without authority, 3e. John Wiley & Sons, 2017 (320 pp.).

Daly, Herman. Steady state economy. W.H. Freeman & Co., 1973, Introduction, pp. 47-52 (5 pp.)

Elkington, John. *Green swans: The coming boom in regenerative capitalism.* Fast Company Press, 2020 (284 pp.).

Godin, Seth. The carbon almanac. Penguin, 2022, pp. 263-311 (48 pp.).

Gregory, R., L. Failing, M. Harstone, G. Long, T. McDaniels, and D. Ohlson, *Structured Decision Making: A Practical Guide to Environmental Management Choices*. Wiley-Blackwell, 2012 (299 pp.)

Heal, Geoffrey. *Endangered economies: How the neglect of nature threatens our prosperity.* Columbia University Press, 2017 (240 pp).

Hendriks, Martin R., Introduction to Physical Hydrology. Oxford University Press, 2010 (352 pp.).

Mitchel, Andy. "The Esri Guide to GIS Analysis: Volume 1, Geographic Patterns & Relationships." ESRI Press, 1999 (312 pp.).

Pearce, Fred. When the rivers run dry, fully revised and updated edition: water-the defining crisis of the twenty-first century. Beacon Press, 2018 (328 pp.).

Roberts, Callum M., Colin J. McClean, John E.N. Veron, Julie P. Hawkins, Gerald R. Allen, Don E. McAllister, Cristina G. Mittermeier et al. "Marine biodiversity hotspots and conservation priorities for tropical reefs." *Science* 295, no. 5558 (2002): 1280-1284 (4 pp.).

Sachs, Jeffrey D. The Age of Sustainable Development. Columbia University Press, 2015 (544 pp.).

Smil, Vaclav. Energy myths and realities. Washington, DC: AEI Press, 2010 (232 pp.).

Yunus, M. (1999). The Grameen Bank. Scientific American, 281(5), 114-119 (5 pp.).

## **Assignments and Assessments**

- Assignment 1: Critique a web-based decision-support tool -- Identify an existing web-based decision support tool and prepare a 750-word, double-spaced critique of it that addresses these questions: What is effective about the site (design, data)? What doesn't work? What would you change in future releases? For whom would the site be valuable in its current version? If the changes you recommend were made, how would the site be improved from the user's perspective? The assignment will instruct students how to think critically about the user experience of existing digital solutions. Grading criteria: 1) select relevant web tool with substantial content, features and functions; 2) answer discussion questions thoughtfully; 3) consider solution's shortcomings from user's perspective and respond with product manager's ability to discern opportunities to improve or expand product's look-and-feel and functionality. Comments and a grade and will be returned to students two weeks after submission. [L1, L2; 10% of final grade]
- Midterm exam The take-home midterm exam will assess the students' grasp of material covered in the course and enable them to synthesize that understanding. Grading criteria: 1) grasp of product management responsibilities; 2) ability to identify which product management tools to use when. [L1, L2, L3; 25% of final grade]
- Assignment 2: Case With your team, discuss case provided and prepare case questions, also provided, for class discussion. Grading criteria: 1) grasp of conflicting demands presented in the case; 2) ability to communicate clearly your team's assessment of the situation. [L2, L5; 10% of final grade]
- 4. Assignment 3: Final project proposal, presentation and report
  - **a. Project Proposal --** Prepare a project proposal outlining the product idea and its business case. Grading criteria: 1) thoughtful proposal; 2) convincing product opportunity
  - **b. Presentation** -- Prepare a 10-minute PowerPoint presentation that you will present to the class during the last week of the course. The presentation will summarize the product opportunity, the mock-up of the product and the business case for the product. Grading

criteria: 1) quality of PPT presentation; 2) product need; 3) business case; 4) meets time limit

c. Business Plan -- Prepare a 5–7-page business plan outlining the product opportunity, assessing Porter's Five Forces and displaying a mock-up (PowerPoint) or interactive demo (e.g., wpdemo.com, duda.co) of your web site. Grading criteria: 1) business case;
 2) business analysis; and 3) financials

The final project will be an opportunity to identify an issue in sustainability, develop a digital product related to it and assess the market opportunity for the product. Grading criteria: ability to 1) identify a viable product opportunity; 2) convey how the product will satisfy user needs; and 3) present a compelling business case for the solution. **[L1, L2, L3, L4, L5; 25% of final grade]** 

Quizzes and Homework Presentation – There will be two in-class quizzes and one homework presentation that will assess the students' grasp of the homework and class material. Quiz grading criteria: 1) firm grasp of the material; 2) ability to explain material succinctly and clearly. [L1, L2, L3, L4, L5; 15% of final grade]

## Grading

The final grade will be calculated as described below:

Grade	Percentage
A+	98–100 %
Α	93–97.9 %
A-	90–92.9 %
<b>B</b> +	87–89.9 %
В	83-86.9 %
B-	80-82.9 %
C+	77–79.9 %
С	73–76.9 %
C-	70–72.9 %
D	60–69.9 %
F	59.9% and below

### FINAL GRADING SCALE

Assignment/Assessment	% Weight	Individual or Group/Team Grade
Assignment 1: Critique a web-based decision support tool	10%	Individual
Assignment 2: Case preparation and discussion	10%	Team
Midterm exam	25%	Individual
Assignment 3: Final project presentation and report	25%	Team
Participation	15%	Individual

Quizzes/Homework presentation	15%	Individual
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## **Course Schedule/Course Calendar**

Date	<b>Topics and Activities</b>	Readings (due on this date)	Assignments (due on this date)
Sept. 3	Week 1: Course introduction; what is product management	<ul> <li>Brennan, Kevin J., Sallie Godwin and Filip Hendrickx, <i>Digital</i> <i>Product Management</i>. BCS, 2022, ch. 1, pp. 1- 17 (17 pp.)</li> <li>Hawken, Paul, ed. <i>Drawdown: The</i> <i>most comprehensive</i> <i>plan ever proposed to</i> <i>reverse global warming</i>. Penguin, 2017 (10 pp.)</li> <li>Henderson, Rebecca. <i>Reimagining capitalism</i> <i>in a world on fire</i>. Public Affairs, 2020, pp. 31-50 (29 pp.)</li> </ul>	<ul> <li>Pre-work: Using your phone, take a photograph the contents of your refrigerator and bring it to class.</li> <li>Pre-work: Read about five solutions proposed by Hawken that seem promising to you and explain why (1 page).</li> </ul>
Sept. 10	Week 2: Product vision: Enabling customer value	<ul> <li>Brennan et al., Digital Product Management. ch. 2, pp. 18-39 (21 pp.)</li> <li>Drucker, Peter F. "The discipline of innovation." Harvard business review 80, no. 8 (2002): 95-102 (7 pp.).</li> <li>Kelley, Tom and Jonathan Littman, The Ten Faces of Innovation: IDEO's Strategies for Beating the Devil's Advocate &amp; Driving Creativity throughout Your Organization. Profile Books, 2016, Introduction, pp. 1-14 (13 pp.)</li> </ul>	Assignment 1: Critique a web- based decision support solution, due by 5 PM, 9/9/24.

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Date	<b>Topics and Activities</b>	Readings (due on this date)	Assignments (due on this date)
Sept. 17	Week 3: Product Strategy: Creating business value	<ul> <li>Brennan et al., <i>Digital</i> <i>Product Management.</i> ch. 3, pp. 41-71 (30 pp.)</li> <li>McGrath, Rita, "The New Disrupters," Harvard Business Publishing, Feb. 2020, pp. 1-9 (8 pp.)</li> </ul>	
Sept. 24	Week 4: Product Roadmaps	<ul> <li>Brennan et al., <i>Digital</i> <i>Product Management.</i> ch. 4, pp. 72-86 (14 pp.)</li> <li>Muller, Jerry Z., <i>The</i> <i>tyranny of metrics.</i> Princeton University Press. 2015, pp. 1-59 (58 pp.).</li> </ul>	
Oct. 1	Week 5: Discovering and designing a valuable customer experience; Governance	<ul> <li>Brennan et al., <i>Digital</i> <i>Product Management.</i> ch. 5, pp. 88-115 (27 pp.)</li> <li>Samuelson, Judy, "Sustainability Takes on New Meaning," NACD, Jan. 22, 2024, 1 p.</li> <li>Beamish, Paul et al., "Membertou First Nation: Possible Acquisition of Clearwater Seafoods," Harvard Business Publishing, May 2023, 12 pp.</li> </ul>	Prepare the assignment questions for the Beamish case with your team and be prepared to discuss in class

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Date	<b>Topics and Activities</b>	Readings (due on this date)	Assignments (due on this date)
Oct. 8	Week 6: Data-driven decisions; Wildlife	<ul> <li>Brennan et al., <i>Digital</i> <i>Product Management.</i> ch. 6, pp. 117-139 (22 pp.)</li> <li>Wainwright, John and Mark Mulligan, <i>Environmental</i> <i>modelling: Finding</i> <i>simplicity in complexity.</i> <u>2e.</u> Wiley-Blackwell, 2013, pp. 3-26 (23 pp.)</li> <li>Read an Environmental Impact Statement for a company of your choosing</li> </ul>	Take-home midterm exam due by 5 PM, 10/7/24
Oct. 15	Week 7: Development; Renewable Energy: Wind and Solar	<ul> <li>Brennan et al., <i>Digital</i> <i>Product Management.</i> ch. 7, pp. 140-148 (18 pp.)</li> <li>Usher, Bruce, <i>Renewable Energy</i>, Columbia University Press, 2019, Ch. 4-5, pp. 29-54 (25 pp.)</li> </ul>	
Oct. 22	Week 8: Managing for results; Water	<ul> <li>Brennan et al., Digital Product Management. ch. 8, pp. 159-173 (14 pp.)</li> <li>Daigger, Glenn T., Nikolay Voutchkov, Upmanu Lall, and Will Sarni. "The Future of Water." Water and Sanitation Division, Spring 2020, pp. 42-93 (51 pp.)</li> </ul>	

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Date	<b>Topics and Activities</b>	Readings (due on this date)	Assignments (due on this date)
Oct. 29	Week 9: Go-to-market planning; Diversity, equity & inclusion	<ul> <li>Guest speaker: social justice</li> <li>McKinsey &amp; Co. and LeanIn.org, Women in the Workplace 2023, pp. 4-41 (37 pp.)</li> <li>Vernis, Alfred et al., Moltacte: A social enterprise that puts employees like me at the center, Harvard Business School Publishing, 2021 (20</li> </ul>	Assignment 2: With your team, prepare case discussion questions and be ready to discuss in class
Nov. 12	Week 10: Managing teams; Sustainable finance	<ul> <li>pp.)</li> <li>Smith, Edward and Steven C. Wheelwright, "The New Product Development Imperative," Harvard Business School Publishing Corp., 1999 (20 pp.)</li> <li>Bose, Satyajit, Guo Dong and Anne Simpson, <i>The Financial Ecosystem: The Role of Finance in Advancing</i> <i>Sustainability</i>. Palgrave Macmillan, 2019, pp. 1- 18 and 83-110 (44 pp.)</li> </ul>	
Nov. 19	Week 11: User interface and experience (UI/UX)	<ul> <li>Guest speaker</li> <li>Tufte, Edward R. <i>The</i> visual display of quantitative information. Graphics Press, 1983, ch. 1, pp. 13-52 (39 pp.)</li> </ul>	Work on final project

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Date	<b>Topics and Activities</b>	Readings (due on this date)	Assignments (due on this date)
Nov. 26	Week 12: Product Management Tools	<ul> <li>Guest speaker</li> <li>McGrath, RG &amp; IC Macmillan, "Driving Corporate Growth with the Right Disciplines: A Discovery-Driven Approach," Harvard Business School Publishing, 2009 (28 pp.).</li> </ul>	Work on final project
Dec. 3	Week 13:	Present final project in class	Assignment 3: Submit final presentation and report by 5 PM on 12/2/24

## **Course Policies**

## Participation and Attendance

I expect you to come to class on time and thoroughly prepared. I will keep track of attendance and look forward to an interesting, lively and confidential discussion. If you miss an experience in class, you miss an important learning moment and the class misses your contribution. More than one absence will affect your grade.

## Late work

Work that is not submitted on the due date noted in the course syllabus without advance notice and permission from the instructor will be graded down 1/3 of a grade for every day it is late (e.g., from a B+ to a B).]

## Citation & Submission

All written assignments must use standard citation format (e.g., MLA, APA, Chicago), cite sources, and be submitted to the course website (not via email).

## **School and University Policies and Resources**

#### Copyright Policy

Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

#### Academic Integrity

Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at <u>https://sps.columbia.edu/students/student-support/academic-integrity-community-standards</u>. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

#### **Diversity Statement**

It is our intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture.

#### Accessibility

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: <a href="https://health.columbia.edu/content/disability-services">https://health.columbia.edu/content/disability-services</a>.

#### Class Recordings

All or portions of the class may be recorded at the discretion of the Instructor to support your learning. At any point, the Instructor has the right to discontinue the recording if it is deemed to be obstructive to the learning process.

If the recording is posted, it is confidential and it is prohibited to share the recording outside of the class.

#### SPS Academic Resources

The Division of Student Affairs provides students with academic counseling and support services such as online tutoring and career coaching: <u>https://sps.columbia.edu/students/student-support/student-support-resources</u>.

#### Columbia University Information Technology

<u>Columbia University Information Technology</u> (CUIT) provides Columbia University students, faculty and staff with central computing and communications services. Students, faculty and staff may access <u>University-provided and</u> <u>discounted software downloads</u>.

#### Columbia University Library

<u>Columbia's extensive library system</u> ranks in the top five academic libraries in the nation, with many of its services and resources available online.

#### The Writing Center

The Writing Center provides writing support to undergraduate and graduate students through one-on-one

consultations and workshops. They provide support at every stage of your writing, from brainstorming to final drafts. If you would like writing support, please visit the following site to learn about services offered and steps for scheduling an appointment. This resource is open to Columbia graduate students at no additional charge. Visit <a href="http://www.college.columbia.edu/core/uwp/writing-center">http://www.college.columbia.edu/core/uwp/writing-center</a>.

#### Career Design Lab

The Career Design Lab supports current students and alumni with individualized career coaching including career assessment, resume & cover letter writing, agile internship job search strategy, personal branding, interview skills, career transitions, salary negotiations, and much more. Wherever you are in your career journey, the Career Design Lab team is here to support you. Link to <u>https://careerdesignlab.sps.columbia.edu/</u>