

University of California, Berkeley

Design, Evaluate and Scale Development Technologies

Dev Eng C200, Mech Eng C200, MBA 290T

Fall 2014

General Information

Faculty:

Alice M. Agogino, Department of Mechanical Engineering, 415 Sutardja Dai Hall (CITRIS Building), (510) 642-6450, <https://twitter.com/agogino>, agogino@berkeley.edu

David Levine, Haas School of Business, F671 Haas, (510) 642-1697, levine@haas.berkeley.edu

Reader: TBA

Class Meetings:

11:00 am -12:30 pm M W (330 Cheit Hall, Haas School of Business)
Optional (but highly recommended) workshops noon-1:00 pm F (I-Lab, Memorial Stadium)

Office Hours and and Optional Discussion/Workshops:

Agogino: W 1:30-3:00, 415 Sutardja Dai Hall (CITRIS Building) or after class
Levine: M 1:30-3:00 in F671 Haas or by appointment

Class Representatives

Two student volunteers will be invited to help from both the technical and economic/ business disciplines.

Course Description

This required course for the Designated Emphasis in Development Engineering will include projects and case studies, many related to projects at UC Berkeley, such as those associated with the Development Impact Lab (DIL)). Student teams will work with preliminary data to define the problem. They will then collect and analyze interview and survey data from potential users and begin to design a solution. Students will explore how to use novel monitoring technologies and rapid feedback for product improvement and evaluation. The student teams will use the case studies or their own projects to develop a plan for scaling and evaluation with a rigorous controlled trial.

Course Objectives

Students will use multiple qualitative and quantitative methods to learn about user needs, to come up with new ideas, and to understand how new products and services achieve or fail to achieve their goals in a development setting. Students will consider solutions in context and devise business plans and plans for continuous improvement.

Desired Course Outcomes

The primary goal is to provide students with a set of skills that will allow them to flourish in a climate of complex problem solving and design challenges in development engineering. Students will learn to participate in and lead innovation and creativity in collaborative settings. Students will learn how to learn from users using qualitative and quantitative tools including surveys, interviews, new monitoring technologies, statistical analyses and experimental designs. Students will be able to apply these skills to current challenges in development engineering.

Topics Covered

1. Project Design (including human-centered design with participant observations and interviews using qualitative research and survey data collection).
2. Development Technologies (including wireless sensors, mobile data collection, and prototyping);
3. Measurement and evaluation techniques (including design of experiments, statistical analysis for impact analysis). Methodologies for collection and evaluation of data to improve projects in the field, and eventually scaling projects and conducting a rigorous evaluation.
4. Developing and evaluating social impact (including sustainability and scaling of projects). Going beyond rigorous evaluations to look at broader impact on people and communities

Class/Laboratory Schedule

3 hours lecture per week and one hour optional workshop/discussion.

Assessment of Student Progress Toward Course Objectives

- 20% on homework assignments
- 20% class participation
- 30% team exercises
- 10% final class presentations on capstone project

- 20% on capstone USAID DIV Letter of Interest

Class Participation

Students are co-producers of each class. *Students will need to come to class prepared by completing the required reading, preparing the discussion questions, completing any homework, and reading relevant current events.* Class participation makes up 20% of the grade, but it is also a requirement to pass. There are multiple measures of class participation:

- Be present and prepared at the start of each session;
- Post good questions, comments, articles, or suggested links on bCourses
- Presentations of team work
- Peer Reviews: For most assignments students should review each others' work. That way, professors receive better assignments and students get used to pretesting every work product and to helping each other.

Class Preparation and Participation

Readings are meant to guide your thinking about the class assignments. Readings are given in the class schedule; we expect you to come to class prepared to discuss the readings and the suggested questions. In any given class session, a handful of students may be called upon specifically to speak about the readings and answer questions about them. If you have prepared in advance according to the syllabus, you will have no problem responding when called upon. Your individual class participation grade will be based upon your in-class remarks during discussions and will be judged by the teaching staff.

Individual Assignments

We have periodically assigned individual exercises to have you experiment with some of the concepts we are teaching. These are due at the start of each class, unless otherwise noted. Late assignments are discouraged but accepted, heavily penalized at 20% of the total score (20 points out of 100) for each day late.

ALL INDIVIDUAL ASSIGNMENTS ARE TO BE SUBMITTED VIA THE bCOURSES "ASSIGNMENTS" TAB UNDER THE APPROPRIATE HEADING PRIOR TO THE START OF CLASS ON THE DAY THEY ARE DUE. YOU MAY WANT TO BRING ONE COPY OF YOUR HOMEWORK TO CLASS, AS WE WILL FREQUENTLY ASK YOU TO SHARE YOUR RESULTS (DIGITAL SHARING IS FINE).

bCOURSES Website

We will make extensive use of the course Website both to communicate information to you and to converse with you about your readings, homework and your projects. You will find the course listed on <https://bcourses.berkeley.edu>.

Laptop, Tablet and SmartPhone

Class time will focus almost entirely on in-class exercises to bring to life project-based learning. You will need to give your full attention to your teammates, to the work you are being asked to do together, and to what you are taking away from that work. Please do not use your laptops or smart phones in class, unless it is for a class exercise or to take notes (no email, texting, web browsing, Facebook, etc.) Any violation of this policy will lead to a reduction in your participation grade. We love the way Adaptive Path, one of the design firms we work with, describes its policy along these lines:

***HONOR THE GATHERING.** In this ever more interrupt-driven digital world, it's a challenge to bring together all the right people at the same time to think, make and solve problems that are too complex for just a few people to figure out. Gatherings of this magnitude need opening ceremonies to acknowledge the value of the time we are about to spend together. Typically these ceremonies don't include marching bands or fireworks (although that would be cool), but there are small and simple actions that help us all recognize that this is a sacred time. These small things include sending out invitations ahead of time, providing food and drink, creating an environment where people can focus without laptops or smart phones, welcoming and orienting people to our day together, and having the client sponsor begin the workshop with essentially an opening blessing for the people gathered and the work we will accomplish.*
(www.adaptivepath.com)

Schedule

The schedule below provides learning goals for each session, along with required readings and assignments. The assignments are listed chronologically in order of the date assigned. We have made every effort to provide you all course details in this syllabus, but we sometimes have to make changes due to unexpected circumstances, such as a change in the visit date of a guest lecturer. Please check bCourses announcements and assignment updates for changes to the schedule.

DAY	TOPIC
1 W 8/27 C330	<p style="text-align: center;">Phase I: Understanding the Problem, Context and Needs</p> <p>Unit 1: Introduction to Development Engineering</p> <p>MBA elective classes begin on 8/25 and engineering on 8/28. As a compromise for this mixed disciplinary class, we will start on W 8/27 with an introduction to the course and the field of development engineering. What are the key issues and challenges? Who are the stakeholders? We will also discuss capstone project options.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Hans Rosling, "New insights on poverty". TED talk, March 2007: http://www.ted.com/talks/hans_rosling_reveals_new_insights_on_poverty.htmlhttp://www.ted.com/ • Amy Smith, "Simple designs to save a life," Feb. 2006: https://www.ted.com/talks/amy_smith_shares_simple_lifesaving_design • Wong, Kristine, 2014: "Cleantech in the developing world: from solar power to refrigeration," http://www.theguardian.com/sustainable-business/2014/jun/13/cleantech-developing-world-solar-power-refrigeration
M 9/1	<p>Labor Day holiday – no class.</p>
2 W 9/3 C330	<p>Preview the iterative design thinking processes in the context of development engineering, associated research methods and their roles in needs assessment. Cover theories of persistent poverty.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Banerjee, Abhijit V., and Esther Duflo. 2007. "The Economic Lives of the Poor." <i>Journal of Economic Perspectives</i>, 21(1): 141-168. (bCourses) • Whitesides, George, 2012. "The Frugal Way: The promise of cost-conscious science," <i>Science</i>, pp. 154. (bCourses) • T. Brown and J. Wyatt. "Design Thinking for Social Innovation (SSIR)," 2010: http://www.ssireview.org/articles/entry/design_thinking_for_social_innovation/ <p>Optional Readings:</p> <ul style="list-style-type: none"> • Sarika Bansal, "Innovation Within Reach" <i>New York Times</i>, "Fixes" blog,, Aug. 21, 2014. http://opinionator.blogs.nytimes.com/2014/08/21/innovation-within-

	<p>reach/#more-153952</p> <ul style="list-style-type: none"> Abhijit Banerjee and Esther Duflo. <i>Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty</i>, Public Affairs, 2011. Amartya Sen. <i>Development and Freedom</i>. Anchor. 2000 <i>Voices of the Poor</i> by World Bank, http://bit.ly/worldbank-voices-of-poor <p>Exercise: Describe you interest in this class.</p> <ul style="list-style-type: none"> Your interest may be quite general or focused on one or two specific domains or problems. If you are particularly interested in pitching a capstone project for a class team, describe it in a few sentences (and how far along the project is).
<p>HW 1 Due: 9/8</p>	<p>Homework: Spend at least 30 min. observing handwashing practices in a restroom, dining room or restaurant. Do you see different results when subjects know you are observing them? Take photos of the associated handwashing facilities, along with related signage. Document your observations and photos. Bring hard copies to class on Sept. 15. Also identify one study on hand washing practices in the U.S.</p>
<p>3 M 9/8 C330</p>	<p>Unit 2: Needs Assessment with Primary, Secondary & Tertiary Sources</p> <p>Review of needs assessment methods in development engineering and introduction of one case study. Where are problems in different locations? To design a “Safe water solution” you have to know more than water. The solution to a development challenge must be based on knowledge of: Market segments (urban/rural, high/low education), ability to pay (levels and timing of income; access to credit and costs of credit), information sources for consumers, household decision making structures (role of women), existing social groups (e.g., formal, informal, NGO government), distribution channels, and so forth. We will first discuss research methods using tertiary data (e.g., published data) and secondary sources first (e.g., individuals or organizations working in the area, organizations that work in similar areas).</p> <p>Required Readings:</p> <ul style="list-style-type: none"> Luby, Stephen P., et al. "Difficulties in maintaining improved handwashing behavior, Karachi, Pakistan." <i>American journal of tropical medicine and hygiene</i> 81.1 (2009): 140 http://www.ajtmh.org/content/81/1/140.full.pdf+html Curtis, Val, et al. "Hygiene: new hopes, new horizons." <i>The Lancet infectious diseases</i> 11.4 (2011): 312-321. (bCourses) Rose George, “Let's talk crap. Seriously.” http://www.ted.com/talks/rose_george_let_s_talk_crap_seriously.html (Ted Talk, 2013). <p>Optional Readings:</p> <ul style="list-style-type: none"> Mathers CD, Loncar D (2006) Projections of Global Mortality and Burden of Disease from 2002 to 2030. <i>PLoS Med</i> 3(11): e442. doi:10.1371/journal.pmed.0030442. http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.0030442
<p>HW 2 Due: 9/15</p>	<p>Conduct an interview about your respondent’s hand washing practices. Summarize your interview and any additional observations. Add this qualitative data to those you obtained in HW 1.</p>

	<p>When you have completed your observation and interview:</p> <ul style="list-style-type: none"> • Write up a one-page summary of your key findings including quotes from those you observe or interview. Don't over-generalize at this point, as you want to keep the people you learned about "alive" for your classmates. Include a short description of the person you interviewed and the circumstances in which you interviewed him or her to set the context for your findings. • Create a one-page document that captures the best story you observed or heard to highlight one of your key insights. The story should not rehash the entire interview, but should bring alive a particular insight for your study team members. <ul style="list-style-type: none"> ○ Start with a catchy headline ○ Include a picture or drawing ○ Write a one-paragraph story that captures the essence ○ Close with the "moral" of the story – one line that captures the insight <p>Upload your work – one-page summary <u>and</u> one-page story to bSpace before class. Bring a copy of your story to class to share with your teammates</p>
<p>4 W 9/10 C330</p>	<p>We introduce a range of research methods for performing primary data collection for needs assessments, including observations, interviewing, focus groups, and embedding/empathic design. We will discuss trade-offs across the various methods, issues in reducing the distance between researchers and subjects (novices/experts, local/ distant geographies, wealthy/poor, etc.), and how to communicate user needs research within your team.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Sandhu, Jaspal S. "Measure early, measure often: rapid, real-time feedback in design for social innovation". Jan. 2013: http://poptech.org/e3_jaspal_sandhu • "Designing For Humans: an Ethnography Primer," IDSA, 2010: http://www.aiga.org/ethnography-primer/ • HCD Connect, IDEO.org http://www.hcdconnect.org/ • Getting People to Talk: An Ethnography & Interviewing Primer, http://vimeo.com/1269848 • David Levine, "Advice on doing research interviews," (bCourses) <p>Optional Readings:</p> <ul style="list-style-type: none"> • Ware NC, Idoko J, Kaaya S, Biraro IA, Wyatt MA, et al. (2009) Explaining Adherence Success in Sub-Saharan Africa: An Ethnographic Study. PLoS Med 6(1): e1000011. doi:10.1371/journal.pmed.1000011 http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1000011 <p>Class Exercise: In-class exercises on observations and interviewing.</p>
<p>5 M 9/15 C330</p>	<p>Unit 3: Analyzing Qualitative Data</p> <p>Building on qualitative research methods, this unit will focus on analyzing data from design research. Students should bring all of their data on customer and user needs– interview notes, photographs, etc. – to class. We'll also use this class time to work with students on applying some of the framing and reframing tools to a case or on real data. Techniques will include personas, scenarios, 2x2 matrices, and journey maps.</p>

	<p>Required Readings:</p> <ul style="list-style-type: none"> • Weiss. Robert S. <i>Learning From Strangers</i>. Chapter 4: Interviewing, pp. 61-119. The Free Press, 1995. (bCourses) • An Introduction to personas and how to create them, http://www.steptwo.com.au/papers/kmc_personas/index.html <p>Optional Readings:</p> <ul style="list-style-type: none"> • Jenkins, Carol, and Peter Howard. "The use of ethnography and structured observations in the study of risk factors for the transmission of diarrhea in highland Papua New Guinea." <i>Medical anthropology</i> 15.1 (1993): 1-16. <i>Note on Observation</i> on bSpace. Note the value of failure stories! <p>Class Exercise: Create personas for 2x2 framing.</p>
<p>HW 3</p> <p>Due: 9/22</p>	<p>Homework: Analyze existing survey data on handwashing. xxdata</p> <p>An extract from the Dhaka handwashing survey as well as a description is on bCourses. Use ReadyMade or other software of your choice (e.g., Stata or R) to analyze the Dhaka handwashing survey and determine the demographic characteristics of people who are more or less likely to self-report handwashing with soap. What results surprise you?</p> <p>Note: The project is described in "Disgust and Shame: Motivating Contributions to Public Goods," with Raymond P. Guiteras, Stephen P. Luby, Thomas H. Polley, Kaniz Khatun-e-Jannat and Leanne Unicomb. UC Berkeley: Center for Effective Global Action. 2014. http://www.escholarship.org/uc/item/3qm437jc</p>
<p>6 W</p> <p>9/17</p> <p>C330</p>	<p>Unit 4: Quantitative and Mixed-methods Needs Assessment</p> <p>Review and comparison of quantitative and mixed (qualitative and quantitative) methods in research design: surveys, phone and internet tools. Reflections and instruction on human subjects and ethical considerations.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Survey Research, Research Methods Knowledge Base, 2006. http://www.socialresearchmethods.net/kb/survey.php • Schaeffer, N.C. and Presser, S. (2003). The science of asking questions. <i>Annual Review of Sociology</i>, 29, 65-88. http://www.ssc.wisc.edu/~alang/357/Schaeffer%20and%20Presser_Science%20of%20Asking%20Questions.pdf • Albert, Jeff, Jill Luoto, and David Levine. "End-user preferences for and performance of competing POU water treatment technologies among the rural poor of Kenya." <i>Environmental science & technology</i> 44.12 (2010): 4426-4432. http://faculty.haas.berkeley.edu/levine/papers/Albert_et_al_EST_2010.pdf <p>Optional Readings:</p> <ul style="list-style-type: none"> • Dillman, Don A., <i>Mail and Internet Surveys</i>, second edition (updated), 2007. <p>Class Exercise: Write an outline for an open-ended, semi-structured interview and then have a classmate review it. Use this interview to inform your next homework assignment.</p>

<p>7 M 9/22 C330</p>	<p>Framing and Reframing the Problem with Insights from Research. Launch of your new capstone design teams. Developing a user research plan.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Vechakul, Jessica, and Alice M. Agogino. 2013. "A Comparison of Two Transdisciplinary Human-Centered Design Approaches for Poverty Alleviation". <i>Proceedings of The Future of Transdisciplinary Design (TFTD13)</i>. (bCourses) • Bansal, Sarika. August 21, 2014. "Innovation Within Reach," New York Times, Opinion, http://opinionator.blogs.nytimes.com/2014/08/21/innovation-within-reach/ <p>Class Exercise: Form capstone teams of 4-5 people, each with at least one Engineer and one Haas student for your Capstone project. Team launch exercise.</p>
<p>HW 4 Due: 9/29</p>	<p>Team Assignment: Write and pilot a section of survey</p> <p>Write part of a survey on hand washing behaviors and barriers to consistent hand washing with soap (potentially related to what you observed). You are welcome to test first with classmates. Implement on ODK or related platform and then use a local audience to pilot the survey. You should also have a paper copy as well during the survey. To diversify your population, the local audience might include groups such as:</p> <ul style="list-style-type: none"> • Food workers • Recent immigrants • Homeless
<p>8 W 9/24 C330</p>	<p>Introduction to big data and new sensors. Field experiments and experiments in the field. This lecture will involve hands-on use of sensors for data collection and a case study.</p> <p>Thought question: How might you obtain sensor data for your handwashing problem?</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Wilson, Daniel, Mohammed Idris Adam, Omnia Abbas, Jeremy Coyle, Angeli Kirk, Javier Rosa, and Ashok Gadgil, 2014. "Comparing Cookstove Usage Measured with Sensors Versus Cell Phone-Based Surveys in Darfur, Sudan". CoDev (Center for Cooperation and Development), http://cooperation.epfl.ch/page-107182-fr.html. (bCourses) • OpenDataKit: magnifying human resources through technology. http://opendatakit.org • Albert, Jeff, Jill Luoto, and David Levine. "End-user preferences for and performance of competing POU water treatment technologies among the rural poor of Kenya." <i>Environmental science & technology</i> 44.12 (2010): 4426-4432. http://faculty.haas.berkeley.edu/levine/papers/Albert_et_al_EST_2010.pdf
<p>9 M 9/29 C330</p>	<p>Unit 5: Integrating Needs Assessment Findings to Develop Solutions</p> <p>The goal is to gain insights from the qualitative and quantitative data from the needs assessment. This is sometimes called "Telling today's story" to understand the context and users' most important challenges and needs.</p> <p>Required Readings:</p>

	<ul style="list-style-type: none"> • Sherwin, David. September 23, 2013. "A Five-Step Process for Conducting User Research. http://www.smashingmagazine.com/2013/09/23/5-step-process-conducting-user-research/ • Wood, Amy E. and Christopher A. Mattson. 2014. "A Method for Determining Customer Needs in the Developing World." Proceedings of the ASME 2014 International Design Engineering Technical Conference, DETC2014-35357. <p>Class Exercise: Bring your handwashing homework to class as a paper copy for a class exercise.</p>
HW 5 Due: 10/6	Team Assignment: Each capstone team should submit 2-3 sentences on your proposed project goals for the USAID DIV Letter of Interest. Also turn in a draft assessment plan (target audience, methods for qualitative/ quantitative user needs, prototype testing) for your capstone project.
10 W 10/1 C330	<p>Guest speaker Laura Stachel will speak on how she decided solar suitcases were important in Nigerian labor and delivery clinics (even though solar lights were not related to the obstetric medical skills she intended to disseminate).</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • WECARESolar, http://wecaresolar.org and http://dil.berkeley.edu/technology-portfolio/current-projects/we-care-solar/
11 M 10/6 C330	<p style="text-align: center;">Phase II: Prototyping a Solution</p> <p>Unit 6: Designing Concepts</p> <p>This session will focus on really diverging – or in other words generating a LOT of ideas for your project. We'll use a variety of methods to get you to view your situation from different perspectives, and thus be able to generate different contextual ideas.</p> <p>Potential Readings:</p> <ul style="list-style-type: none"> • <i>Creative Thinking Techniques</i> (http://www.virtualsalt.com/crebook2.htm) <p>Class Exercise: Use tools presented in class to create or improve a solution. Create 50 new concepts. Consider potential partners: Researchers, designers and engineers in poor nations or technical experts who may not know much about poverty. Your solution can be about measuring hygiene, either for research or for feedback and motivation.</p>
12 W 10/8 C330	<p>Unit 7: Prototyping & Testing Early Concepts</p> <p>Techniques for low and medium fidelity prototyping will be covered, along with how these prototypes can be used for generating new concepts, "building to think", communicate concepts and concept testing. Hypothesis testing and evaluating data. The goal: Fail fast, get rich feedback, and improve. Test to select concepts</p> <ul style="list-style-type: none"> • Think forward a few steps: <ul style="list-style-type: none"> ○ Prioritize concepts that are more likely to fit with a business model ○ Simulate the impact under different assumptions ○ Evaluation of ideas depends on the setting. For example, in one problem

	<p>the apparent right answer might be “Kill all the animal disease vectors” – except the target consumer group is Buddhist.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • “Prototyping Is The Shorthand Of Design”, http://bit.ly/ep-84086B33-F723-4B8A-A609-D766810B0329 <p>Class Exercise: Prototype solutions.</p>
13 M 10/13 C330	<p>Introduction to the CellScope Case Study.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Opoku-Agyemang, Kweku and Syed Imran Ali, “How Should the CellScope Scale-Up?” 2014, Case Study. • Switz NA, D'Ambrosio MV, Fletcher DA 2014. “Low-cost mobile phone microscopy with a reversed mobile phone camera lens”, http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0095330
14 W 10/15	<p>Guest Speaker: “Mobile Microscopy for the Masses” with guest speaker Prof. Dan Fletcher, Chair in Engineering Biological Systems Department of Bioengineering at UC Berkeley.</p>
15 M 10/20 C330	<p style="text-align: center;">Phase III: Taking it to the Field</p> <p>Unit 8: Pilot and Field Testing – Qualitative</p> <p>Phases II and III are iterative, in a spiral of continuous improvement that should be taken into account in your assessment plan. How do you get your prototype to work in the lab. Pilot test with nearby experts and role playing. Once it works in and near the lab, design plan to test in target settings.</p>
16 W 10/22 C330	<p>Unit 9: Technologies for Monitoring & Testing</p> <p>Case study of technologies for monitoring and testing. Guest speaker will be Dr. Susan Amrose, Research Scientist in the Indoor Environment Group of LBNL.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Galitsky, Christina, Asho Gadgil, Mark Jacobs and Yoo-Mi Lee. 2005. “Fuel Efficient Stoves for Darfur Camps of internally Displaced Persons: Report of field trip to North and South Darfur.” • Amrose, Susan, G. Theodore Kisch, Charles Kirubi, Jesse Woo and Ashok Gadgil, “Development and Testing of the Berkeley Darfur Stove,” 2008. LBNL Report .
10/24 HW 6	<p>Friday Workshop (2 hours, required)</p>

iLab Due: 11/3	<p>Team exercise: Analyze data from stove usage monitors (SUMs). How well do the data from the SUMs line up with the observations? Submit as homework.</p> <p>We will examine some or all of:</p> <ul style="list-style-type: none"> • Envirofit wood-burning stove • Berkeley-Darfur wood-burning stove • Ugastove charcoal stove • Solar Household Energy’s HotPot solar oven
17 M 10/27 C330	<p>Analyzing large datasets for insight.</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Tatem, Andrew J., <i>et al.</i> “The use of mobile phone data for the estimation of the travel patterns and imported Plasmodium falciparum rates among Zanzibar residents.” <i>Malaria Journal</i> 8 (2009): 287. http://www.biomedcentral.com/content/pdf/1475-2875-8-287.pdf • Neil Patel, Krishna Savani, Paresh Dave, Kapil Shah, Scott R. Klemmer and Tapan S. Parikh. 2013. Power to the Peers: Authority of Source Effects for a Voice-based Agricultural Information Service in Rural India, <i>Information Technologies and International Development (ITID)</i>, Vol. 9, No. 2.
18 W 10/29 C330	<p>How to use “big data” for your project.</p> <p>Team exercise: Consider data sources such as:</p> <ul style="list-style-type: none"> • Administrative data such as electronic health records, school test scores, or government purchases • Operational data such as all mobile phone calls in a nation, every sale by Amazon, or every search by Google • Ubiquitous sensor data such as GPS on all cars, or satellite observations of land use, low-cost sensors you can put on your products and they will use SMS or other means to communicate back to you <p>Assume you had access to one or more of these "big data" sources (or another data source that might be available in a few years). How would you use those data to improve the functionality of your solution and/or speed the design, ongoing improvement, or monitoring and evaluation of your solution?</p>
19 M 11/3	<p>Unit 10: Pilot and Field Testing – Quantitative</p> <p>Quantitative methods for pilot testing. Dimensions to test include: product features, messaging to motivate purchase and usage, pricing, sales offers (free trial, lay-away, credit, etc.), channels. Determine the effect of the customers types on demand and willingness to pay, usage and satisfaction. At each stage, feed the results back to the development team.</p>

	<p>Required Readings:</p> <ul style="list-style-type: none"> • “The Effect of Marketing Messages, Liquidity Constraints, and Household Bargaining on Willingness to Pay for a Nontraditional Cookstove,” with Theresa Beltramo and Garrick Blalock. UC Berkeley: Center for Effective Global Action. 2014. http://www.escholarship.org/uc/item/4vj3w941 • Rob Bailis, “The Kitchen performance test (KPT),” 2007. http://www.pciaonline.org/files/KPT_Version_3.0_0.pdf <ul style="list-style-type: none"> ○ Just skim for the main idea. Read closely enough to point out several limitations. • “A/B testing,” <i>Wikipedia</i>, http://en.wikipedia.org/wiki/A/B_testing <p>Optional Readings:</p> <ul style="list-style-type: none"> • Ludwig, Kling and Mullainathan. “Mechanism Experiments and Policy Evaluation”, <i>Journal of Economic Perspectives</i>, Summer 2011, pp 17-38. • Bandiera, Barankay and Rasul, “Field Experiments in Firms,” <i>Journal of Economic Perspectives</i>, Summer 2011, pp 63-82.
<p>20 W 11/5 C330</p>	<p>Class Exercise: Sketch an experiment to speed product improvement.</p>
<p>HW 7 Due: 11/10</p>	<p>Team Exercise: Design an experiment to speed product improvement for your capstone project. (You may choose another product with instructor approval.)</p> <p>Your experiment could measure product usage, product effectiveness, consumer willingness to pay, etc. It can study variation in marketing messages, product offers, product features, distribution channels, etc. It can examine how the product’s is used differently by different types of users (urban vs. rural, high vs. low literacy, etc.).</p>
<p>21 M 11/10 C330</p>	<p>Unit 11: Business models</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • <i>Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers</i>, by Alexander Osterwalder and Yves Pigneur, 2nd Edition, 2010, pages 1-50. http://www.businessmodelgeneration.com/downloads/businessmodelgeneration_preview.pdf • Levine “Notes on sales offers for stoves and filters” • David I. Levine, Theresa Beltramo, Garrick Blalock, and Carolyn Cotterman, “What Impedes Efficient Adoption of Products? Evidence from Randomized Variation in Sales Offers for Improved Cookstoves in Uganda,” 2013. <p>Optional Readings:</p> <ul style="list-style-type: none"> • A nice slideshow by Osterwalder introducing the Canvas http://www.slideshare.net/Alex.Osterwalder/business-model-innovation-matter

<p>22 W 11/12 C330</p>	<p>Team Exercise: Business Model Canvas</p> <ul style="list-style-type: none"> • Divide into teams. • In class we will post a challenge and constraint for each team. For example, “Teach middle school education in remote villages that lack Internet access.” • Use the Business Model Canvas (channels, partnerships, customer segments, etc.) to design a business model. • We (or other teams) will then add an additional constraint (e.g., “No mobile money”), and let you revise your business model.
<p>HW 8 Due: 11/19</p>	<p>Team Exercise: Design part of a business model for your capstone project. (You may choose another product with instructor approval.) You can work on one portion of a business model such as:</p> <ul style="list-style-type: none"> • Supply chain • Determining demand and consumer willingness to pay • Distribution • Finance • Etc.
<p>23 M 11/17 C330</p>	<p>Unit 12: Rigorous Impact Evaluation</p> <p>Required Readings:</p> <ul style="list-style-type: none"> • Esther Duflo: Social experiments to fight poverty (TED Talk) • David Levine “Template for evaluation design.” bCourses. • Paul J. Gertler, Sebastian Martinez, Patrick Premand, Laura B. Rawlings and Christel M.J.Vermeersch, <i>Impact Evaluation in Practice</i>, pages 1-79. <ul style="list-style-type: none"> ◦ https://openknowledge.worldbank.org/bitstream/handle/10986/2550/5/99980PUB0ID181BLIC1009780821385418.pdf?sequence=1 <p>Optional Readings:</p> <ul style="list-style-type: none"> • Edward Miguel, Michael Kremer. “Identifying Impacts on Education and Health in the Presence of Treatment Externalities,” <i>Econometrica</i> 2004 vol. 72(1), pp 159-217.
<p>24 W 11/19 C330</p>	<p>Required Readings:</p> <ul style="list-style-type: none"> • Reread Gertler, et al., <i>Impact Evaluation in Practice</i>, “When Can Randomized Assignment Be Used?” (pp. 55-56) and “Two Variations on Randomized Assignment” (pp. 64-79). <p>Class Exercise: Sketch an impact evaluation for a project you are interested in or a project we propose.</p>
<p>HW 9 Due: 12/1</p>	<p>Team Exercise: Design an impact evaluation for your capstone project. (You may choose another product with instructor approval.) If your capstone project is not sufficiently advanced to merit a rigorous impact evaluation, assume preliminary stages go well enough</p>

	to justify a large-scale study.
25 M 11/24 C330	<p>Unit 13: Scaling & Understanding Impact at Scale</p> <p>Required Readings:</p> <ul style="list-style-type: none"> Prahalad, C.K. and Hart, S.L. "The Fortune at the Bottom of the Pyramid." <i>Strategy+Business</i> 26: 54-67. <p>Optional Readings:</p> <ul style="list-style-type: none"> Prahalad, C.K. <i>The Fortune at the Bottom of the Pyramid</i> (Wharton School Publishing, 2004). Karnani, Aneel. "The Mirage of Marketing to the Bottom of the Pyramid." <i>California Management Review</i> 49.4 (2007): 90-111.
26 W 11/26 C330	Cancelled to make up for required cook stove workshop.
27 M 12/1 C330	<p>Group Exercise: Sketch a framework for monitoring.</p> <p>Sketch a framework for monitoring a development technology that would provide ongoing estimates of social benefits and would detect large problems with the product or service.</p> <p>Option: Link to carbon markets or donor accountability?</p>
HW 10 Due: 12/1	Capstone Group Exercise: Turn in a completed draft USAID DIV letter of interest and presentation. Share both with another group for peer review.
28 W 12/3 C330	<p>Unit 14: Class Summary</p> <p>Summary of class. Provide pointers to recommended classes in the Development Engineering Designated Emphasis.</p>
HW 11 Due: 12/5	Share your peer review with the group whose project you reviewed and turn in your review on bCourses.
29 W 12/10 C330	Capstone Group Exercise: Final presentations (in lieu of a final exam) based on your USAID DIV letter of interest. Special two-hour session during RRR week. 11:00-2:00 pm. Turn in your final USAID DIV letter of interest and presentation on bCourses before class.