

## **Technology Evaluation for Global Development**

Instructors: Bishwapriya Sanyal, Daniel Frey, Jennifer Green, Jarrod Goentzel, and Kendra Leith, Anish Antony and special contributions for Lauren McKown.

Course Start Date: Jun 01, 2017 at 12:00 AM (EST)

Course End Date: Jul 21, 2017 at 12:00 AM (EST)

### **Course Description**

This is a six week course on technology evaluation, as it relates to people living in poverty and international development. When a person lives on less than \$2 a day — as some 2.7 billion people around the world do — there isn't room for a product like a solar lantern or a water filter to fail. Investment in failing products undermines future innovation by reducing confidence and depleting scarce resources.

It's a challenge faced every day by development agencies, nongovernmental organizations (NGOs), and consumers themselves. With so many products on the market, how do you choose the right one?

This course, developed by MIT's Comprehensive Initiative on Technology Evaluation (CITE) will explore the fundamentals of technology evaluation for global development. It includes a deep dive into CITE's 3S methodology, looking at products from three angles:

- Suitability—does a product perform its intended purpose?
- Scalability—can the supply chain effectively reach consumers?
- Sustainability—is it a product that can be used correctly, consistently, and continuously over time?

This course is designed for academics and global development practitioners; those interested in conducting their own technology evaluations to promote data-driven decisions through research or development practice.

### **Grading and Completion Criteria**

The course is organized in 6 one-week modules. Each week is broken up into an introduction, and 6 to 9 lessons. The lessons and their respective assignments and discussion components will require daily dedication of about 2 hours in your most convenient schedule. As a part of this course, you are eligible to pursue a Verified Certificate to highlight the knowledge and skills you gain.

To participate in this delivery, please acquaint yourself with its structure, and refer to the user guide ([edX Learner's Guide](#)) for how to use the edX platform.

If you encounter any technical difficulties, please send a message to us in the [Discussion](#) section where a special topic Troubleshooting is established for your convenience. If you email your

questions to our Teaching Assistant, please include the course name and a clear description of the problem.

For successful completion of the course, you need to complete all activities satisfactorily.

Activity	Deadline	Grading	Weight
Multiple Choice Questions	End of each week	Scored	60%
Peer Assessment Questions	Submit a response by the end of each week, and assess peers by the end of the following week.	Scored	
Final Assessment Question	July 21	Scored	40%

### **Due Dates**

1. Week 1: Homework due on June 8, 2017 at 12:00 AM (EST)
2. Week 2: Homework due on Jun 15, 2017 at 12:00 AM (EST)
3. Week 3: Homework due on June 22, 2017 at 12:00 AM (EST)
4. Week 4: Homework due on June 29, 2017 at 12:00 AM (EST)
5. Week 5: Homework due on July 7, 2017 at 12:00 AM (EST)
6. Week 6: Homework due on July 14, 2017 at 12:00 AM (EST)
7. Final Assessment due on July 14, 2017 at 12:00 AM (EST)
8. Peer Assessment of Final Assessment due on July 21, 2017 at 12:00 AM (EST)

### **Course Schedule**

#### **1. Week 1: International Development and Appropriate Technology**

Jun 01, 2017 at 12:00 AM (EST)

In the first week of the course, you're going to meet CITE's Director and Principal Investigator, Professor Bish Sanyal. Bish is Ford International Professor of Urban Studies and Planning within the Department of Urban Studies and Planning at MIT. In this first week, Bish is going to cover some important aspects relating to international development and appropriate technology, providing the context and motivation for CITE's work. The course begins with a historical overview of why and how the evaluation of products, such as solar lanterns or household water filters, which are used by individual households, became an important task for development practitioners. You will learn about the rise, fall, and re-emergence of appropriate technology, and more importantly, that the key issue is not really that there aren't products available for people living in poverty, but rather there is an oversupply of products, and therefore the need to evaluate is particularly important.

- I. Introduction to Week 1
- II. Lesson 1 and 2: Why History and Context Matter
  - a. Lesson 1: Why history matters for technology evaluation
  - b. Lesson 2: Contextualizing the relationship between development and poverty reduction
- III. Lesson 3, 4, and 5: Early Development Goals, Models, and Critiques
  - a. Lesson 3: Early development goals & strategies
  - b. Lesson 4: Early development models and consequences
  - c. Lesson 5: Critiques to early developmental approaches
- IV. Lesson 6, 7, 8, and 9: Appropriate Technologies and the Need for Evaluation
  - a. Lesson 6: The appropriate technology model
  - b. Lesson 7: The rise and decline of the appropriate technology model
  - c. Lesson 8: The re-emergence of appropriate technologies
  - d. Lesson 9: Over supply of technologies for the poor and the need for better evaluations

### Suggested Readings

1. Arndt, H. W. (1989). *Economic development: The history of an idea*. University of Chicago Press.
2. Lewis, A. (1951). *Measures for the economic development of under-developed countries*. United Nations, New York
3. Rostow, W. W. (1959). The stages of economic growth. *The Economic History Review*, 12(1), 1
4. Weigel, V. B. (1986). The basic needs approach: Overcoming the poverty of “homo economicus”. *World development*, 14(12), 1423-1434.
5. Sanyal, B. (1994). “From the Benevolent to the Evil State: History of the Rise of the Anti-Government Sentiment in Developmental Discourse”, in *Cooperative Autonomy: The Dialectic of State-NGO Relationship in Developing Countries*, *International Labor Studies*, p. 3-32.
6. Schumacher, E. F. (2011-1973). *Small is beautiful: a study of economics as if people mattered*. Random House.
7. Zelenika, I; Pearce, J M. (2011) Barriers to Appropriate Technology Growth in Sustainable Development. *Journal of Sustainable Development* 4.6 (Dec 2011): 12.
8. Prahalad, C. K. (2006). *The Fortune at the Bottom of the Pyramid*. Pearson Education India.
9. Polak, P., & Warwick, M. (2013). *The business solution to poverty: Designing products and services for three billion new customers*. Berrett-Koehler Publishers.
10. Smillie, I. (2000) *Mastering the Machine Revisited*. Practical Action Publishing

## 2. **Week 2: CITE's Approach to Product Evaluation: Motivation and Preliminary Steps**

Jun 08, 2017 at 12:00 AM (EST)

In this week you will meet three CITE Faculty members- Kendra Leith, who works with CITE as our monitoring and evaluation manager; Professor Dan Frey, who is the faculty lead for suitability here at CITE, and the faculty director of D-Lab; and Jennifer Green, CITE research lead for sustainability. In this week, you will be introduced to important preliminary steps for technology evaluation, including how to select products and how to carry out a scoping study. As you will learn, CITE considers technology evaluation through three important lenses. Suitability or how well a product performs; Scalability or how well a product reaches a consumer; and Sustainability or how a user and a product interact over time. Specifically, this week will cover the following topics:

- a. We will begin with a discussion on the history and context of evaluation, and specifically as it relates to technology evaluation.
- b. To provide you with some knowledge from the field, we will introduce you to two CITE partners- Jeff Asher, who is with Consumer Reports, and Shanti Kleiman and Jeff Wishnie, who work with Mercy Corps. They provide two interesting perspectives on technology evaluation- one of them from the Consumer Reports model in the US, which very much inspired CITE's research and work, and then the second, a contrasting view on technology evaluation from the perspective of a large humanitarian organization working globally.
- c. You will hear from Lauren McKown on the definition and meaning of evaluation within the context of this course.
- d. Next, we will learn how we actually select products for evaluation- an overview, and the introduction of a methodology known as "design of experiments."
- e. Having determined what products are going to be evaluated, an important next step is to carry out a scoping study. This week will introduce you to two types of scoping studies: desk-based scoping studies and field-based scoping studies.

- I. Introduction to Week 2
- II. Lesson 1, 2 and 3: The History of Evaluation and Motivation for CITE's Work
  - a. Lesson 1: History of evaluation
  - b. Lesson 2: Technology evaluation at consumer reports
  - c. Lesson 3: Reflections from our partners in the field
- III. Lesson 4, 5 and 6: Terminology and Choosing Products
  - a. Lesson 4: Comparative evaluation - Criteria, metrics, weightings
  - b. Lesson 5: Choosing products in the product family – Overview
  - c. Lesson 6: Choosing products in the product family – Design of experiments
- IV. Lesson 7,8,9: Scoping Studies
  - a. Lesson 7: What is a scoping study?
  - b. Lesson 8: Desk based scoping studies
  - c. Lesson 9: Field based scoping studies

### **3. Week 3: 3S Methodology: Suitability – Approach and Applications**

Jun 15, 2017 at 12:00 AM (EST)

In this week, we will discuss a key aspect of evaluation- Suitability or how well a product performs. Professor Dan Frey, and Kendra Leith will define suitability from CITE's perspective and discuss the importance of well-chosen metrics. In addition, you will be introduced to the relevance, advantages, and disadvantages of two modes of testing: lab-based testing and field-based testing. Through this, we hope that you will develop an understanding of how to select the most appropriate mode of testing for your particular situation. Furthermore, we will discuss the value of instrumenting products in order to collect data. Through this, we will seek to impart a key lesson of the week: sometimes, simple tools for making measurements might also be the most appropriate.

- I. Introduction to Week 3
- II. Lesson 1: Suitability Definition and Metrics Development
  - a. Lesson 1: Developing a set of evaluation metrics
- III. Lesson 2,3, 4 and 5: Suitability – Laboratory and Field Based Testing
  - a. Lesson 2: Suitability – What's the most appropriate way to test, in the lab or in the field?
  - b. Lesson 3: Suitability - Laboratory testing
  - c. Lesson 4: Suitability - Instrumenting products for field testing
  - d. Lesson 5: Suitability - Testing products in the field
- IV. Lesson 6, and 7: Suitability Case Studies
  - a. Lesson 6: Suitability - Solar lantern example
  - b. Lesson 7: Suitability - Water filter example

#### Suggested Readings

- a. CITE Suitability : an exploration of product evaluation methodologies for developing world technologies
- b. Solar Lanterns: Solar Lantern Report, pp. 1-1 to 2-22
- c. Water Filters: Water Filter Report, pp. 3-13

### **4. Week 4: 3S Methodology: Scalability – Approach and Applications**

Jun 22, 2017 at 12:00 AM (EST)

In week four, you will meet Jarrod Goentzel, CITE's scalability research lead, and the founder and director of MIT Humanitarian Response Lab. Jarrod will introduce you to several key aspects of technology evaluation within the context of scalability. Scalability, or how well a product reaches consumers, can be a difficult concept to evaluate. We will first define the term “scalability” and its unit of analysis from CITE's perspective. After this, aspects of supply chain models and design evaluation are covered, including a lesson on multi criteria decision analysis. This is a methodology that CITE used to evaluate alignment of actors in the supply chain in the context of CITE's evaluation of Malaria Rapid Diagnostic Tests in Uganda. A key

lesson from this week for you will be the relevance of the unit of analysis and how important it was to define that within a supply chain.

- I. Introduction to Week 4
- II. Lesson 1 and 2: Scalability Definition and Unit of Analysis
  - a. Lesson 1: Scalability - Defining scalability
  - b. Lesson 2: Scalability - Unit of analysis
- III. Lesson 3, 4, and 5: Scalability – Evaluation of the Supply Chain
  - a. Lesson 3: Scalability - Describing the supply chain
  - b. Lesson 4: Scalability - Criteria and metrics
  - c. Lesson 5: Scalability - Supply chain design evaluation
- IV. Lesson 6 and 7: Scalability Case Studies
  - a. Lesson 6: Scalability - Market survey evaluation
  - b. Lesson 7: Scalability - Multi-criteria decision analysis evaluation
- V. Lesson 8: Conclusion
  - a. Lesson 8: Summary of Scalability

## **5. Week 5: 3S Methodology: Sustainability – Approach and Applications**

Jun 29, 2017 at 12:00 AM (EST)

In Week 5, we focus on the last of the 3 S's of our evaluation model: "Sustainability". As you would have learned by now, the course defines sustainability as the way that a user and a product interact over time, rather than an evaluation of environmental factors. In this week, Jennifer Green, CITE's Research Sustainability Lead and former Humanitarian Logistics Specialist at Oxfam America, will explore the definition of Sustainability from CITE's perspective. Specifically, you will focus on identifying and analysing the user profile and also identifying and analysing implementation models that are relevant for various technology focused projects. Finally, the week introduces you to computer based models for technology evaluation.

- I. Introduction to Week 5
- II. Lesson 1, 2, and 3: Sustainability and the User Profile
  - a. Lesson 1: How CITE defines sustainability
  - b. Lesson 2: Defining the user profile
  - c. Lesson 3: Analysing the user profile
- III. Lesson 4 and 5: Sustainability -- Identifying and Analysing Implementation Models
  - a. Lesson 4: Identifying implementation models
  - b. Lesson 5: Analysing implementation models
- IV. Lesson 6: Sustainability Case Studies
  - a. Lesson 6: Introduction to computer models

## 6. Week 6: Practical considerations and future evaluations

Jul 07, 2017 at 12:00 AM (EST)

We've now considered the three conceptual lenses through which the course considers evaluation, the 3 S's: Suitability, Scalability, and Sustainability. In this final week, we will introduce you to some additional considerations for evaluation. Specifically, the week will focus on the following:

- a. In the first lesson, you will consider the topic of integrating the results and the data that come out of an evaluation. There are two important points to think about in this lesson: how do we actually integrate results from teams working in different disciplines using different methodologies, and how do we integrate results when the units of analysis have also been really quite distinct?
- b. Secondly, we will have a discussion on disseminating information and results to a broad range of stakeholders, making them relevant and accessible. You will receive information on how to communicate your evaluation results to the rest of the world
- c. We next consider the vital issue of ethics, a particularly important topic in relation to evaluation within international development.
- d. We will do a deep dive into the idea of "Lean Research", introduced earlier. CITE is a founding member of an approach to research, which champions rigorous, respectful, relevant, and right sized research.
- e. We consider two additional important considerations for evaluation: working with partners and generalizability. Kendra Leith is going to take you through the importance of working with partners. For this, we draw from CITE's own example, where we have worked in the field together with a network of global partners to collect data, analyse results, and produce reports that have impact in the field. On generalisability, we will discuss how to make the results as valuable as possible to a wide as community of people as possible, especially when the particular data from one location might translate to another.
- f. Finally, we end with an interview by Lauren McKown with Jeff Asher formerly of Consumer Reports. You were introduced to Jeff Asher in the second week of this course, where he talked about Consumer Reports here in the US. At the end of the course now, Jeff reflects on carrying out its evaluation with CITE and the important differences in terms of evaluation for an emerging market.

- I. Introduction to Week 6
- II. Lesson 1: Bringing the Pieces Together
  - a. Lesson 1: Putting the pieces together: Completing the Evaluation
- III. Lesson 2, 3 and 4: Ethics and Lean Research
  - a. Lesson 2: Ethics in technology evaluation
  - b. Lesson 3: Lean Research in Practice
  - c. Lesson 4: Lean Research in Practice 2
- IV. Lesson 5 and 6: Partners and Expanding the Relevance of Evaluations to other Locations

- a. Lesson 5: Partner Engagement in the Evaluation
  - b. Lesson 6: Generalizability: Expanding the Relevance of Evaluations to Other Locations
- V. Lesson 7: Final reflections
- a. Lesson 7: Reflections from our Partners in the Field

### Suggested Readings

- a. The Lean Research Framework: Principles for Human-Centered Field Research

### **7. Panel based on Final Assessment**

The course will aim to conclude with a faculty-led discussion on the final assessment responses. The faculty will randomly select a set from the top responses for discussion, which will be either in the form of a pre-recorded panel discussion or a Google Hangout session with selected students. This will provide the students whose responses are selected an opportunity to interact with faculty members and gain critical feedback on their final assessments. We expect the concluding session to be of broader relevance to all the students of the course.