

USTM

BOOST – 2013

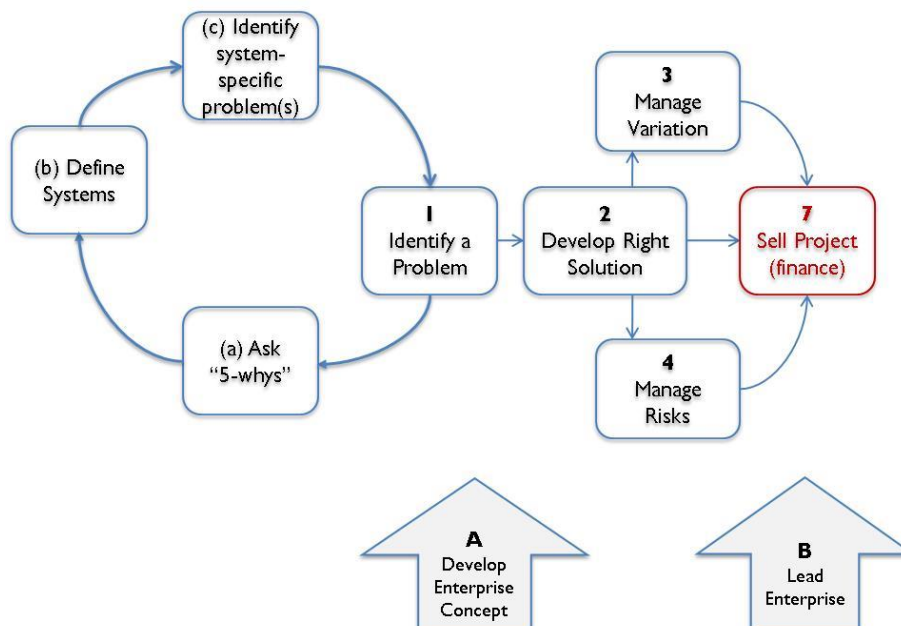
[Schuhmann]

Overview

Participants are early career university faculty in engineering. Faculty will participate in three example classes that build upon each other. The classes are rooted in broadly applicable engineering principles and tools (i.e. applications in mechanical, materials, civil, industrial engineering), while developing three critical attributes of technology entrepreneurship: (1) Seeing; (2) Imagining; (3) Influencing.

Each class module generally contains a 30-minute topic-framing using PPT slides with a clear nexus to engineering, a 30-minute team activity, and finally 30-minutes for the team to present results and engage in reflection and discussion.

Each faculty participant will leave each class with: (1) class lesson plan; (2) slide deck of materials presented in class; (3) direct user experience with the activity; (4) insights from peers gained during reflection and discussion. Faculty can subsequently customize the slide decks with topic/discipline-specific material for their own classes, and exercises are easily (as participants will experience for themselves) expandable to multi-class activities with computer supported applications.



I. Engineering Systems - Seeing

Possessing an ability to think holistically, viewing complexity and focusing on critical features, identifying inter-relationships and emergent qualities, and creating abstractions and models that simplify comprehension.

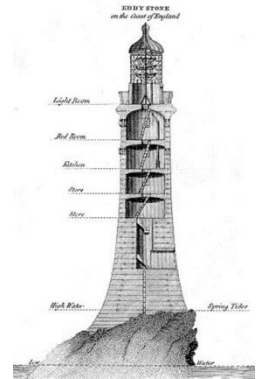
Overview: Presentation about system thinking, interspersed with a system analysis exercise offering explanation and application in the real world.

Activity: Participants are asked to analyze a simple building product – concrete – identify its form (e.g. limestone + 1450F kiln, blast furnace slag, gravel), its function (e.g. building infrastructure), and emergent functions (e.g. mining, CO₂ emissions, surface water runoff, heat island effect, skin burns, particulate inhalation, infrastructure, etc.).

Learning Objectives: By the end of the activity, participants will be able to: Define system thinking and emergence; describe the steps of system analysis; apply the steps of system analysis to a selected system and identify emergent qualities.

Assessment: Responses to the exercise will be discussed during class debrief.

Timeline/Duration: 01:30:00



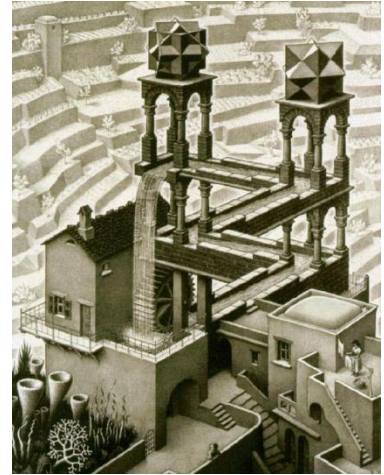
Time	Activity	Notes
00:5:00	Introduction	Outline activities
00:30:00	Presentation: PPT presentation outlining steps of systems analysis	Participants will receive a handout with the steps of system analysis/phases
00:35:00	Exercise: Concrete	Participants use systems approach to decompose and predict emergence from concrete
00:20:00	Report and Debrief	Participants report findings, review learning objectives, outcomes

II. Engineering Designership - Imagining

Possessing an ability to think methodically and creatively in order to identify critical product features in support of new product ideation.

Overview: Presentation about the engineering design process, empathic design, and designership as a tool for structured thinking and product ideation, followed by an engineering design activity intended to promote “concrete” ideation.

Activity: Participants are asked to use the engineering design process (define problem, develop solution, test solution, implement solution) to “invent” the worst building material (e.g. weak, dense, toxic, destroys planet) in order to identify critical product features. These properties are then optimized and redefined as features of “best” building material (strong, light, non-toxic, renewable) as a first step towards new product ideation. Participants must combine these properties into a new product concept. This concept must not be an existing material and participants are encouraged to think beyond what exists to what might exist. The product should be creative,



maybe even possessing fantasy (but not ridiculous) components and features. Participants are encouraged to consider biomimicry as inspiration (honeycomb, flea joint resilin, termite mound, etc.).

Learning Objectives: By the end of the activity, participants will be able to: Use the engineering design process to identify critical product features as a pathway towards new product design.

Assessment: Responses to the exercise will be discussed during class debrief.

Timeline/Duration: 01:30:00

Time	Activity	Notes
00:5:00	Introduction	Outline activities
00:20:00	Presentation: PPT presentation outlining steps of systems analysis	Participants will receive a handout with the steps of the engineering design process
00:45:00	Exercise: Inverse Design	Participants use inverse design to move from designing the worst-to-best object
00:20:00	Report and Debrief	Participants report findings, review learning objectives, outcomes

II. Engineering Enterprise Construction and Communication - Influencing

Possessing an ability to convert conceptual ideas into enterprise plans by constructing and effectively communicating a value proposition.

Overview: Presentation about object-process diagrams, effective communication using graphics, the fundamental components of an elevator pitch and quad diagram, followed by an activity intended to promote new venture creation.

Activity: Participants were asked in the previous (Imagining) exercise to define the parameters of a new, optimal alternative to concrete as a building material and develop a new product concept. Participants must now: (1) define the market need; (2) refine their new product concept, graphically developing and defining exactly why it is a unique value proposition (diagram/illustrate using OPM and/or Minard); (3) define the general business model (e.g. identify customers, competitors); (4) define the operational model (e.g. enterprise location, number of employees); (5) define the general capital needs (e.g. \$x-million, paid back after y years); (6) identify the team (e.g. any additional expertise necessary). Teams must capture this information effectively in a quad diagram and then deliver a 1-minute elevator pitch to the group encapsulating their idea, relying only upon the quad diagram as support.



Learning Objectives: By the end of the activity, participants will be able to use systems thinking and the engineering design process to develop a new product concept and frame and communicate that concept within a conceptual business model.

Assessment: Responses to the exercise will be discussed during class debrief.

Timeline/Duration: 01:30:00

Time	Activity	Notes
00:5:00	Introduction	Outline activities
00:10:00	Presentation	Participants receive new venture handout development of and are introduced to this topic and effective communication via PPT
00:10:00	Activity - Part 1	Participants work in teams to define market need develop value proposition
00:10:00	Activity - Part 2	Participants work in teams to define business and operational models, capital needs, and identify team
00:15:00	Activity - Part 3	Participants communicate their business model in a quad diagram and prepare for their elevator speech
00:30:00	Presentations	Teams deliver 1-minute elevator pitches. Other groups provide written feedback on performance
00:10:00	Feedback/ Debrief	Reflection on activity