The Practice of Systems Thinking Based Innovation

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What I do when not teaching this course...

- Systems modelling for UN SDGs
- Sustainability and ESG assessment
- Strategic sustainability planning
- Stakeholder engagement
- Environment and Energy Research and reporting
- Sustainability Leadership training and support
AtKisson Group … a global network dedicated to transformative change

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Levi Strauss & Co. • Ernst & Young • Nike • Baltic 21 (the 11 nations of Northern Europe) • European Sustainable Development Network • Brother, Inc. (Japan) • Earth Charter International • Swedish SIDA’s Advanced International Training Programs • United Nations Division for Sustainable Development • Egyptian National Competitiveness Council • Government of Singapore • Greater New Orleans, Inc. • SEIYU (Japan) • SERDP - Strategic Environmental Research & Development Program (US Government) • Seliger Forum 2010 (Russia) • Sustainable Fashion Academy • States of Queensland, Victoria, NSW, and South Australia • Stockholm County • Sustainable Seattle • Heinz Endowments • Toyota • UNEP • UNDP • Nile Basin Initiative • Bank of Indonesia • Volvo Cars
My Session Objectives

✓ Provide a practical introduction to systems thinking – How to apply systems thinking in situational analysis or problem solving

✓ Explore and realize how innovation design and development can be enhanced by incorporating a systems thinking approach.
What can a hoola hoop teach us about Systems, Sustainability and Leveraging Change?
What Sustainability Looks like

Too much

“Sustainability”

Not enough

Sustainable Development is ...
... a managed process of continuous innovation and systemic change.

Sustainability is ... a set of conditions and trends in a given system that can continue indefinitely.
Our situation and the way forward.

**Declining**
resources and ecosystem services

**Increasing**
demand for resources and ecosystem services (needs)

Unsustainability

We are here!

A new sustainable future!

Through innovation, creativity & the unlimited potential for change we can reopen the walls of the funnel to a Third Industrial Revolution!!!

What will be required!
Aspects of the Global Sustainability Challenge

- Speed
- Scale
- Complexity
- Time
Three emerging market force trends

- Declining Resources
- Radical Transparency
- Increasing Stakeholder Expectations

Business Value

- Energy
- Metal & Minerals
- Climate
- Soil
- Species
- Water
- Food
- Social Equity

Adapted from: Zhæxæmbæyæva N. and Laszlo C., Embedded Sustainability. 2013.

Climate Change

Increasing Stakeholder Expectations

Radical Transparency

Business Value
The Good news is that there is a rush of new innovations and technologies linked to this living more Sustainably.
We are Innovating like never before.

Waves of Innovation

1st wave
- Iron
- Water power
- Mechanisation
- Textiles
- Commerce

2nd wave
- Steam power
- Railroad
- Steel
- Cotton

3rd wave
- Electricity
  - Chemicals
  - Internal combustion engine

4th wave
- Petrochemicals
- Electronics
- Aviation
- Space

5th wave
- Sustainability
- Radical resource productivity
  - Whole system design
  - Biomimicry
  - Green chemistry
  - Industrial ecology
  - Renewable energy
  - Green nanotechnology

6th wave
- Digital Networks
- Biotechnology
- Software
- Information technology

1785  1845  1900  1950  1990  2020
Business Sustainability Transformation Through Innovation

Source: Why Sustainability is Now the New Key Driver of Innovation, by Ram Nidumolu, CK Prahalad, and MR Rangaswamy (Sept 2009)
So how can Systems Thinking make problem solving, planning and innovation more effective and sustainable?
The Value of a Systems Perspective
By fixating on the parts of a system, we miss understanding the whole
For Sustainability, we must learn to see and understand the world as a whole system not a collection of individual parts.

Like a new world view Sir?

We all have a different ‘window’ on the world!
A System is a …

… group of discrete elements that work together to make a whole.

Systems are bound together by the laws of cause and effect, and governed by flows of information, energy and materials.

People give definition to systems based on an idea of what should happen at a given point in time. Thus, systems have a function and a purpose.

Some Examples …
The Basic Components of a System

Elements    Inter-connections    Function
Th Problem is our mental model

We are in a non-linear world
Reality is made up of circles, but we see straight lines. Herein lies the beginnings of our limitation as systems thinkers.

- Peter Senge
Most of our policies are based on analytical and linear ‘cause & effect thinking’
The Solution to one problem may cause another problem – “unintended results”

Secret… The key to reducing this tendency is in how we see the problem in the first place!
Thinking in Systems

• Systems thinking is a vantage point from which you see a whole, a web of relationships, rather than focusing only on the detail of any particular piece. Events are seen in the larger context of a pattern that is unfolding over time. - *Isee Systems, inc.*

• Systems thinking is a perspective of seeing and understanding systems as wholes rather than as collections of parts. A whole is a web of interconnections that creates emerging patterns. – Peter Senge
**Systems Thinking helps us to . . .**

- . . . move the focus away from **events** and **patterns of behavior** *(which are symptoms of problems)* and toward **systemic structure** and the underlying **mental models**

*Source: Senge, Peter, The Fifth Discipline, 1996.*
THE ICEBERG

Events
What happened? What we see!

PATTERNS
interactions between components
What is happening over time?

SYSTEMIC STRUCTURES
What the system looks like
What is enabling these patterns to continue?

MENTAL MODELS/MIND MAPS
People’s values, beliefs, assumptions and understanding that sustain these systems & structure
Iceberg systems Analysis of Bangkok Waste
PATTERNS
interactions between components
What is happening over time?

SYSTEMIC STRUCTURES
What the system looks like
What is enabling these patterns to continue?

MENTAL MODELS/MIND MAPS
People’s values, beliefs, assumptions and understanding that sustain these systems & structure

Events
What happened? What we see!

What was?
What is?
What can be?

Adapted from Maani and Cavana, 2007
“Systems Thinking is seeking to understand the connections among elements in a system

✓ what depends on what,
✓ what is causing what,
✓ where are information flows,
✓ where control decisions are made,
✓ what information flows are critical,
✓ And how best to manage or intervene in the system for desired results.
Systems Thinking as a tool for System Change Efforts and Innovation
Linear problem solving is our dominant System Change Mental Model
How Systems Change really works…

- A conceptual gap between how change agents think about systems change and the actual reality of how systems function tends to be a problem.
Systems Dynamics... finding simplicity on the other side of complexity (video)
Systems Mapping & Change Case Study Exercise

Sustainable Tourism in Cat Ba Island, Vietnam
Cat Ba Island Biosphere Reserve, Vietnam
A LINEAR THINKING PROCESS

Enhance Tourism

More Tourists

More Jobs

More $$$

Improved Quality of Life

Source: Professor Ockie Bosch and Dr Nam Nguyen
Cat Ba Island Biosphere Reserve, primary indicators of development (2006)

Source: Bosch, Defining the face of sustainable development 2007
Decision making that Operates in “Silos”

Departments of Cat Ba / Hai Phong City

© Professor Ockie Bosch and Dr Nam Nguyen
Increase in tourists
Increase in infrastructure
Decrease in environment quality & natural resources & attractiveness of the island
Increase in immigration
Decrease in education quality

Siloed problem analysis, planning, and decision making

Socialism & Capitalism economic planning and solutions
Economic growth = poverty alleviation and increased human welfare
Economy is more important than environmental preservation
Linear / Reductionist problem solving mental model

Increase tourism
Increase investment
Increase infrastructure
Increased economic growth
Deteriorating environment

Deeper Understanding
Increasing Leverage

Adapted from Maani and Cavana, 2007
Causal Systems Mapping
Example: Water Quality in Chao Phraya River

**Drivers / Causes**
- Discharge from Industry sources
- Factories complying with the law
- Enforcement of the law
- Revenue Profits (Income – Expenses)
- Government Policy Regulations and laws
- Corruption

**Responses / Effects**
- Riverine aquatic and terrestrial biodiversity
- Ability to catch fish and other commercial species in the river
- Cost of raw water for use in manufacturing
- Effects on Human health
- Economic Growth
- Public perception of the problem
- Reputation of the company
- Outside Investment
- Education

Overall Water quality and quantity
Example: Water Quality in Chao Phraya River

Overall Water quality and quantity

- Cost of raw water for use in manufacturing
- Economic Growth
- Revenue Profits (Income – Expenses)
- Public perception of the problem
- Reputation of the company
- Outside Investment
- Education

- Enforcement of the law
- Factories complying with the law

- Illegal Discharge from Industry sources

- Riverine aquatic and terrestrial biodiversity
- Human health
- Ability to catch fish and other commercial species in the river

- Outdoor recreation on or near river

- Government Policy Regulations and laws

- Revenue Profits (Income – Expenses)

- Factories complying with the law
- Enforcement of the law
- Corruption

- Education

- Outside Investment

- Government Policy Regulations and laws

- Factories complying with the law
- Enforcement of the law
- Corruption

The Key to Systems Thinking is Understanding Feedback

- In most cases, changing one factor will impact on another factor, which will then affect the first.
- Feedback will either reduce the impact of the change, or will amplify it.

<table>
<thead>
<tr>
<th>Illegal Discharge of waste water from Industry sources</th>
<th>Pollution Levels in the River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Factories complying with Water Effluent laws</td>
<td>Company Revenue Profits (Income – Expenses)</td>
</tr>
<tr>
<td>Cost of treatment of water for use in manufacturing</td>
<td></td>
</tr>
</tbody>
</table>
Sustainable Tourism Systems Mapping Exercise

Your Task

1. Divide yourselves into three Groups
   - Socio demography and Economy Group
   - Socio demography and Natural Resources Group
   - Economy and Natural Resources Group

2. Read the Case Study Handout provided

3. Carry out a Stakeholder Analysis with the Stakeholder Wheel
Step 1: Stakeholder Engagement and Issues Mapping
It is all about Perspective
Stakeholder Analysis Using the Sustainability Compass

The Sustainability Compass is an orientation, assessment, planning and collaborative action tool for system transformation and sustainability.

The Sustainability Compass is designed to accommodate many kinds of differences: cultural, sectorial, geographic, etc.
The Compass Points in Practice

*It helps us think about issues from many different perspectives*

- **N = Nature =**
  - Environmental impact, resource use, waste, ecosystems and habitat, water, energy, climate change

- **E = Economy =**
  - Production, consumption, employment and work, money, investment, debt, business, innovation

- **S = Society =**
  - Governance, equity, transparency, security, culture, institutional management, levels of trust

- **W = Wellbeing =**
  - Health, education, self-expression, happiness, relationships, family, creativity, quality of life

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Exercise: Stakeholder Engagement / Analysis Wheel

- Tour Operators
- Police
- Educators
- Local Authority
- Farmers
- Tourists
- Youth
Cat Ba Island Stakeholder Analysis

Instructions
1. Put the Stakeholder Wheel in the middle of your table Group
2. When the music starts, starting spinning or turning the wheel until the music stops.
3. When the music stops, identify your stakeholder and think about two things:
   a. Which quadrant of the Compass would they be most affiliated with?
   b. What issues and concerns would they have regarding the tourism issue for Cat Ba Island.
Step 2 - Mapping the Causal links in your System

Step 2: Map the Links

Figure out how trends, decision-making, and information flows are linked together in multiple cause-effect relationships.
Sustainable Tourism Systems Mapping Exercise

Your Task

1. Read the Case Analysis handout provided for you.

2. Using the Flip Chart Paper and Post-its, construct a systems map showing the factors related the dynamics of tourism on the island of Cat Ba from your group’s sub-system focus. (25 minutes)

Note: Feel free to add additional elements not addressed in the description as you feel appropriate.
Some youth leader examples (Singapore Youth Environment Envoys Programme)
Economy and Natural Resources
Causal Diagram

Source: Van Mai & Bosch, University of Queensland
Socio-demography and Natural Resource Causal Diagram

Source: Van Mai & Bosch, University of Queensland
Socio-demography and Economy Causal Diagram

Source: Van Mai & Bosch, University of Queensland
A SYSTEMS THINKING Perspective

Source: Professor Ockie Bosch and Dr Nam Nguyen
Step 3: Finding point of Leverage to change the dynamics of the system

Step 2: Map the Links

Figure out how trends, decision-making, and information flows are linked together in multiple cause-effect relationships

Step 3: Find the Leverage Points

Use that analysis to identify the best leverage points for introducing change
Small Actions can yield large results

A “leverage point” is a place in a system where a large change towards desired behavior or results can be accomplished by applying relatively few resources.

Artist: Gary Larson

Picture source: http://thwink.org/sustain/glossary/LeveragePoint.gif
The Triangles Game...

...proving that we live in non-linear systems of often invisible connections
We can use systems thinking tools such as the Iceberg to help ask the right questions towards understanding the best places to "leverage change" in a system.

**Events (Physical Level)**
- What happened? How do quickly deal with it?

**Events (Informational Level)**
- What are the longer term trends and patterns we can find linked to the events?

**System Structure (Social Level)**
- What has influenced and helped generate these patterns and trends? What are the key relationships between the elements?

**Mental Model (Conscious Level)**
- What assumptions, values and beliefs do people hold about the system in question?
- What beliefs keep the system in place?

**Leverage Actions**
- React
- Anticipate
- Design, Redesign
- Transform
Finding the Leverage Points for system intervention

**Your Task:**

Identify the most powerful leverage points for change -- places in the system that you diagramed this morning - where change and innovation can have the most powerful positive impact

Leverage Points are where you can intervene with an initiative, technology, project, etc. that will change the trends in the system towards the direction that you want to happen.

Mark these place with the symbol:
Causal Loop Diagram of Sustainable Tourism Plan for Cat Ba Island – Identifying Leverage Points for Intervention and new ideas

Source: Van Mai & Bosch, University of Queensland
Causal Loop Diagram of Sustainable Tourism Plan for Cat Ba Island – Identifying Leverage Points for Intervention and new ideas

Source: Van Mai & Bosch, University of Queensland
Group System Presentations

- Identify your group focus and what is the change you want to achieve there.
- Identify the main feedback loops and tell is story
- Describe the key leverage points that you agreed on.
Comments, Questions, Discussion
Step 3: Coming up with a “new idea” for system change / system behaviour change and sustainable impact.
Innovation: What we do at the leverage points
What Sustainability Innovation Means

✓ New targets and standards
✓ New materials and technologies
✓ New controls and feedback mechanisms
✓ New information flows to new people
✓ New rules, policies, incentives
✓ New forms of organization, cooperation, collaboration
✓ New models, frameworks, environments
✓ New overarching goals and visions
✓ New knowledge, skills and capacities
✓ New mindsets and paradigms
✓ A NEW WILINGESS TO TRY NEW THINGS

Questions and Discussion
Summary & Wrap up Discussion
Summary of System Thinking

Non-Systems Thinking

Systems Thinking

Today's solutions tomorrow's problems
In order to meet the sustainability challenges we face, we will need to explore new ways of thinking.

*Systems thinking* is the cornerstone of how this new thinking paradigm.
“It’s like the old expression, ‘You are what you eat’. If you start thinking differently, you see things differently. And all your actions start to change.”
- Pat Walls, FedEx
Sustainability planning uses a ‘backcasting’, multi-stakeholder and systems thinking based approach.
Thank You For Your Attention & Participation!

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