Humanitarian Technology Project Design Focusing Social Return on Investment (SROI) in Sustainable Development State

Shaikh Fattah, Ph.D., SMIEEE, FIEB

Professor, Dept. of EEE, BUET, Dhaka, Bangladesh
Education Chair, IEEE Humanitarian Activity Committee
It supports the IEEE Board-endorsed vision of IEEE volunteers around the world carrying out and/or supporting impactful humanitarian activities at local level.
HAC 2019 Committee

Kartik Kulkarni, Chair
Paul Cunningham, Immediate Past Chair
Simay Akar, Chair, Assessment Committee
Supavadee Aramvith, Chair, Communications Committee
Satish Babu, Chair, Partnerships Committee
Jim Conrad, Chair, Events Committee
Shaikh Fattah, Chair, Education Committee
Elizabeth Johnston, Chair, Ad Hoc on Platform for Engagement & Metrics
Nirupama Prakash Kumar, Chair, Projects Committee
Sampathkumar Veeraraghavan, Chair, IEEE SIGHT
HAC Professional Staff Team in Piscataway, NJ, USA

Holly Schneider Brown
• HAC Staff Lead

Julianna Pichardo
• IEEE SIGHT Staff Lead

Betsy Toland
• Administrative and Operational Support
HAC Education Committee

Chair
Shaikh Fattah, PhD
Professor, EEE, BUET

Member
Yu Zheng Chong
Lect, UTAR, Malaysia

Member
Yasuhiro Soshino, Ph.D.
Dir., IMRD, JRCK Hospital

Member
Tokunbo Ogunfunmi, Ph.D.
Professor, EE, SCU

Member
Alexander Anderson
Chair, ISV Partner Engag.

Member
Thiago Alencar, Ph.D.
MDC, IEEE Brazil Council
Objectives of HAC Education

▸ To offer necessary education materials and interactive training to professional engineers or engineering students who want to serve local community with the help of impactful humanitarian projects.

▸ To cover fundamental knowledge and skills required to deal with humanitarian technology projects/events focusing social return on investment in sustainable development space.
Part-I: Sustainable Development
Sustainable Development

A development that meets the present needs without compromising future generations’ ability to meet their needs.

Our Common Future (WCED, 1987 p. 41)
The 3 Pillars Behind SD

- **People** (For whom) - Fair practices for all
- **Planet** (How to do) - Manage renewables while reducing waste.
- **Profit** (Why) - Measurable benefit (financial).
SD: Two Key Concepts

(1) **Needs:** Can vary depending on various factors like: financial, technical, social, geographical

(2) **Limitations:** Technological, social organizational, environmental, finance.
UN Sustainable Development Goals (SDG)
#1: End poverty in all its forms everywhere
#2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
#3: Ensure healthy lives and promote well-being for all at all ages
#4: Ensure inclusive & quality education for all & promote lifelong learning
#5: Achieve gender equality and empower women and girls
#6: Ensure access to water and sanitation for all
#7: Ensure access to affordable, reliable, sustainable & modern energy for all
#8: Promote inclusive and sustainable economic growth, employment and
#9: Build resilient infrastructure, promote sustainable industrialization and foster innovation
#10: Reduce inequality within and among countries
#11: Make cities inclusive, safe, resilient and sustainable
#12: Ensure sustainable consumption and production patterns
#13: Take urgent action to combat climate change and its impacts
#14: Conserve and sustainably use the oceans, seas and marine resources
#15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.
#16: Promote just, peaceful and inclusive societies
#17: Revitalize the global partnership for sustainable development
The 2030 Agenda for Sustainable Development: An Overview

1. End poverty in all its forms everywhere
2. Ensure access to affordable, reliable, sustainable and modern energy for all
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and quality education for all and promote lifelong learning
5. Achieve gender equality and empower women and girls
6. Ensure access to water and sanitation for all
7. Promote inclusive and sustainable industrialization and foster innovation
8. Build resilient infrastructure, promote sustainable industrialization and foster innovation
9. Reduce inequality within and among countries
10. Make cities inclusive, safe, resilient and sustainable
11. Conserve and sustainably use the oceans, seas and marine resources
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts
14. Promote just, peaceful and inclusive societies
15. Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss
16. Revitalize the global partnership for sustainable development
Can We Play Role in SD?

- **Development finally needs implementation**
  - Only engineers can design and develop new products and services

- **Not all implementation leads development**
  - Needs and limitations are changing dynamically. Engineers must think to implement their designs.

- **Smart Engineers Can Bring Development**
  - Adaptive, well planned future oriented design.
Need A Change in Think Process

A change in an individual's or a society's view of how things work in the world.

A change from one way of thinking to another.

It's a revolution, a transformation

NOT IMPOSSIBLE
Part-II: Quality HT Project Design
Sustainability of a HT Project

It implies the continuation of project activities and sustenance of project outcomes after the initial/primary grant expires.

Financial Sustainability: Ensuring a steady flow of funds and generating revenue so that the project continues even in the absence of donor’s support.

Organizational Sustainability: Ensuring continuation of institutional, manpower and technological support.
Steps in HT Project Design with SD

- Find out the local community to be served (people) - get involved with them closely.
- Identify the local community needs (problems, causes/effects)
- Understand the problem/need in depth by community engagement and discussion
- Analyze all existing solutions of that need/problem
- Find out the best possible solution involving PE related technology
Steps in HT Project Design with SD

- Design—implement prototype—validate—modify/redesign—finalize implementation—test—evaluate performance
- Analyze from various perspectives of your possible solution and modify/redesign as long as you are not fully satisfied
- Project implementation in the real life and take feedback and update accordingly
Community Needs:

• Deficits or gaps between available and required/expected services/facilities/benefits.
• Performance need, Instrumental need and Conscious/unconscious needs

Community Assets:

• A set of skills, talents, abilities of an individual or group
• Some resources that are available
Example - Need and Asset

- Modernization of agriculture system to achieve better/efficient production
- A community enjoying the benefit of special soil and skill to produce a certain type of product

Assessment:
- Whether community is interested for modernization. Even if interested, to what extent modern technology can be deployed depending on local capacity.
Issues Regarding Community Need Assessment

- Local or global
  [local need and to be solved locally or globally]
- Consider categories of needs
  [Service, Technology, Policy]
- Weakness within a community
- Already known problem in the community
Participatory Community Need Assessment

- Direct/indirect (active/Passive)
- Consultation/family-friends-groups
- Collaborative/social/religion/culture
- Independent/organizational/appropriate stakeholders
- Presence of facilitator (inside or outside)
Participatory Community Need Assessment

- Success depends on level of participation by the community/stakeholders
- Integral involvement of the community is required in determining community needs and resources
- Community should have a belonging to the process (being empowered)
Walking very far to attend school—[bad weather, social problems but only one school in that area]

http://www.sahos24.com/english/2015/12/18/4956
A group of young villagers transformed three-wheeler to support the girls

Low cost and mostly assembled by local people

Later solar panel was introduced in that vehicle

Carry girls to school

Served as emergency transport—by slight modification—ambulance, medicine transport

At night moves to many houses in that village for computer education
Check an Example HT Project with SD

BRAC University- http://xtra.newagebd.net/2776/powered-by-the-sun/
Assessment Stage

- Determining assessment policy
- Well balanced and well designed survey
- Involve local community in the design and implementation
- Volunteer and external member engagement
- Consider social, cultural, religious, ethical issues
- Planning and organizing data
- Data collection, coding, aggregation
Critical Issues in Assessment

- Information collection process
- Nature of survey questionnaire
- Size of survey population and restrictions
- Information interpretation process
- Information preservation
- Rights of use the information collected
- Information disclosure
- Information preservation data format
Technological Constraint in Assessment:

- Technology selection based on need and limitations
- At the very beginning inclusion of technologist/engineer /scientists can help better design
- Change in technology influences the need
- Multiple solutions exist to specific needs that need to be investigated
Choice of Technology:

• High Tech or Low Tech
• Proven conventional Tech
• Appropriate Tech
• Advanced Tech
• Innovative Tech
• Green Tech
• Smart Tech
Technological Constraints:

- Know how or expertise
- Capacity building
- Cost, efficiency, life/duration
- Availability of resources
- Repair and maintenance
- Scaling up or availability of more units
Steps for Sustainability

- Long term vision:  
- Integrate sustainability in all of the projects:
  - Communication and Outreach:
  - Involve key stakeholders:
  - Diversify funding sources:
  - Create inventory of resources:
  - Use of donor database:
Existing Practice of Project Handling

- How in other countries certain problems are solved
- Efficient alternative ways need to be considered
- Compare the proposed solutions
Gov/NGO/Foreign/Industry Initiatives

- Communication and Outreach:
- Involve key stakeholders:
- Diversify funding sources:
Long Term Forecasting

- Never think that the project is just for the duration of you need to implement
- Must have long term impact study
- How the project will be running in future?
Financial Analysis

- Financial stability is an important aspect
- It is not sufficient to consider only the cost of the projects
- Some earnings in future can provide better stability
Other External Factors

- Social issues
- Political problems
- Ethical issues
- Health hazard
- Environmental issues
Scalable or Not

- Try to focus on small scale implementation at first
- Local capacity building for scalability
- Impact of scalable nature
Mode of Implementation

- Plan the implementation phase by phase
- Make sure that at least a certain phase must be implemented at any cost even without the guaranteed funding
Ten Key Factors

1. Project must address a community need
2. Proper mapping with the appropriate SDG
3. Current practice of handling the project
4. Initiatives from Government/NGO/Foreign/Industries
5. Forecasting the long term status/need of the project
6. Financial analysis
7. Social/ethical/health/political/environmental effect
8. Scalable or not
9. Mode of implementation
10. Sustainability
Part-III: Social Impact Investigation
SROI is a framework for measuring the value of an investment in an initiative or service in terms of expected outcomes.

**Investment:**
- money, time, hours, expertise, facilities...

**Outcomes:**
- quality of life, intellectual property, reputation...

---

HT Project Design Focusing SDG and SROI

Dr. Shaikh Fattah, Education Chair, IEEE HAC
Social Return of Investment

- SROI - people/organization that experience/ contribute
- Includes environmental and economic outcomes.

- SROI = \[\frac{\text{value of benefits}}{\text{value of investments}}\]

SROI = 3 Investment of $1 delivers $3 of social value
Social Return of Investment

- **Prove**: impact to funders and investors, customers, government and other stakeholders.
- Understand what value you are uniquely well suited to generating.
- **Improve** impact to increase benefits created and build non-financial capitals (social and environmental)
- Effective long-term creation of value.
SROI: Forecast & Actual

- **Actual SROI:**
  Evaluative the social value based on actual outcomes that have already taken place.

- **Forecasted SROI:**
  To predicts how much social value will be created if the activities meet their intended outcomes.
  
  ✓ It is useful in the planning stages of an activity.
  ✓ It helps show how investment can maximize impact
  ✓ It can help identifying required data to be collected once the project is up and running.
Principles of SROI

- Involve stakeholders.
- Understand what changes.
- Value the things that matter.
- Only include what is material.
- Do not over-claim.
- Be transparent.
- Verify the result.
1. Find key stakeholders.
2. Mapping outcomes [inputs, outputs, outcomes]
3. Evidencing outcomes and giving them a value.
4. Establishing impact, 5 Calculating the SROI.
5. Reporting, using and embedding.
Understanding SROI Steps

1. Establishing scope and identifying key stakeholders.  
   What to cover, who will be involved in the process, how.

2. Mapping outcomes [Relationship between inputs, outputs and outcomes]
   Engaging the stakeholders develop an Impact map or theory of change

3. Evidencing outcomes and giving them a value.
   Need data to find a value corresponding to outcomes
Understanding SROI Steps

4. Establishing impact
   Need to exclude changes that would have happened anyway or as a result of other factors

5. Calculating the SROI.
   Adding up all the benefits, subtracting any negatives

6 Reporting, using and embedding.
   Sharing findings with stakeholders and responding to them
Learning SROI via an Example

Sources:
thethirdploe.net and
Safe Water Business Perspective
In a village, getting pure drinking water is a problem. Villagers very often suffer diseases due to water. A water tank with purifier and supply system will be established by a group of volunteers. The proposed system is set up in front of a clinic. 20% villagers shown interest to take the service. The clinic will take the service.

Project cost: $P_c = 20,000$ USD for 3 years
1. Stakeholders & Scope

- 1 Villagers: Who will get the benefit (250 people)
- 2. Clinic: Which sectors will be benefitted?
- 3. Volunteers: Amount of volunteer hours and gain

- Need some survey data: local and national
- For example: Average annual income, health spent, spent on leisure,...
2. Mapping Outcomes

1 Inputs

2 Outputs

3 Outcomes (Benefits)

20% Villagers agreed to use with an expectation to reduce chances of diseases and it will result in Good Health and Well-being (SDG-3)

\[ OC = 250 \times 0.2 = 50 \]
3. Assigning Value to Outcome

- Quality Adjusted Life Year (QALY)

1 QALY = 1 year in perfect health
Consider loss of QALY
UK 1 QALY = 20-30K £

Consider--
1 QALY = 1000, & Loss = 0.5
Q0 = OC x QALY x Loss =
50 x 1000 x 0.5 = 25,000 $
2 Years = 2x25,000 = 50,000
Return = Q0/Pc = 50000/20000 = 2.5

Source: wikipedia
4. Calculating Impact (net)

- **Deadweight/counterfactual (DW):** the change that stakeholders would experience in the absence of organisation.
- **Attribution/contribution (AT):** the change attributable to your organisation rather than other organisations.
- **Displacement (DP):** *all* or *part* of the value is not actually created by the activities, but is moved elsewhere.
4. Calculating Impact (net)

- **Deadweight Considered Outcome (DWO):**
  
  $\text{DW}=0.2$, $\text{DWO} = \text{OC} - \text{OC} \times \text{DW} = 50 - 50 \times 0.2 = 40$

- **Attribution Considered Outcome (ATO):**
  
  $\text{AT}=0.9$, $\text{ATO} = \text{DWO} \times \text{AT} = 40 \times 0.9 = 36$

- **Displacement Considered Outcome (DPO):**
  
  $\text{DP}=0.0.055$, $\text{DPO} = \text{DWO} \times (1-\text{DP}) = 34$

- Note that previously we consider benefited OC = 50
5. SROI Calculation

1 QALY =1000, & Loss=0.5, i-th outcome

QA1 = DPO x QALY x Loss = 34x1000 x 0.5 = 17,000 $

QA2 = QA1 x (1-Drop)= 17,000 x (1-0.3)= 11,900 $

In 2 Years QA_i = QA1 + QA2 =28,900

Net Present Value QAn_i = 27721

\[ NPV = \frac{R_t}{(1+i)^t} \]

\( t \) = time of the cash flow
\( i \) = discount rate
\( R_t \) = net cash flow

SROI_i = Qan_i/Pc =27721/20000=1.39

Similarly find Qan_i for other outcomes and stakeholders.

\[ SROI = \sum QAn_i / Pc \]