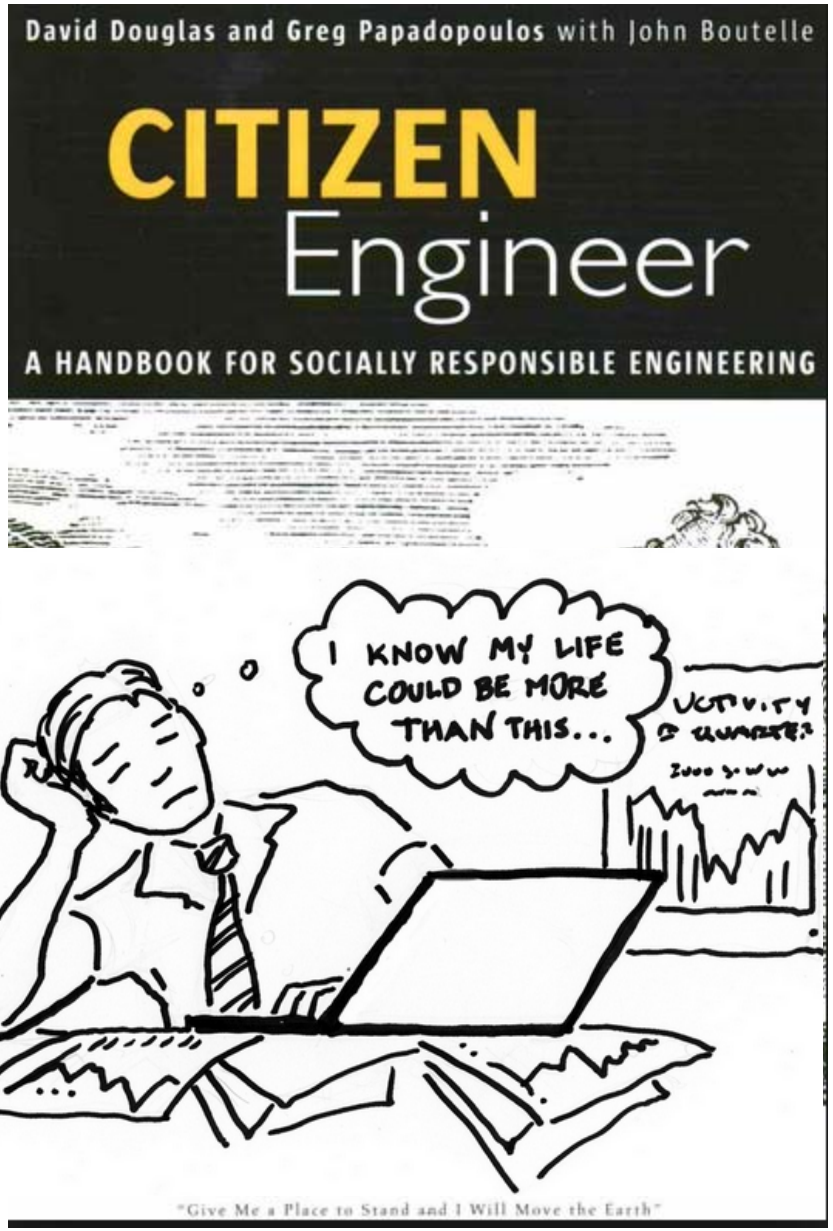
Citizen Engineer



Engineer

- Constructive Artist
  - Art:
  - Art of Engineering:
  - Tools and Materials:
  - Build and Optimize things
- Pragmatists
  - Deal with ( ) of technical limitations, business ( ), and ( ) realities
  - ( ) constraints

Citizen

- Member of a ( )
- Implies also a ( ) element
  - Rights and responsibilities
- Citizenship
  - ( ) in community
  - Working toward the ( ) of the community
  - Economic participation and public ( )
  - Improvement of the state of all other ( )

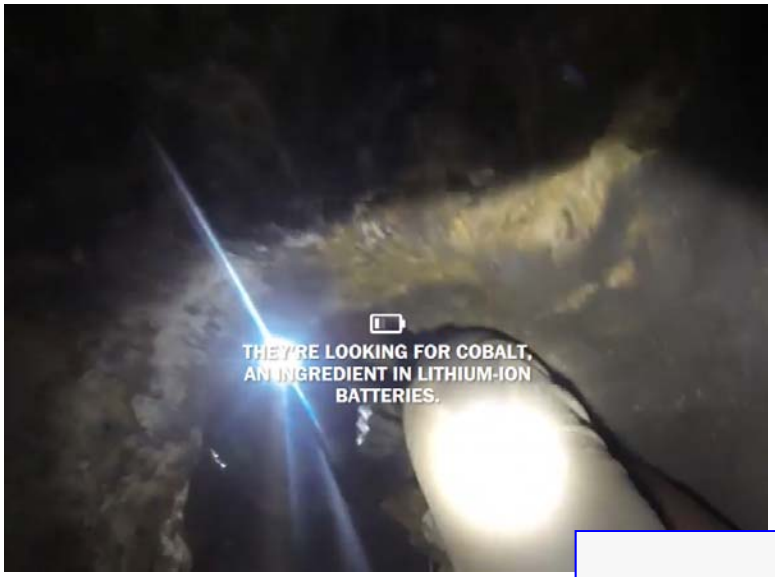
Citizen Engineer

- Citizen Engineer: Blend of ( ) and ( )
- New Demand and Awakening
  - Engineers are being asked to extend their sphere of responsibility to new areas
    - Developing world
    - ( )
    - Security and Privacy Issues
  - Society is asking engineers to accept more responsibility for the ( ) of the products and serviced they design
- Socially Responsible Engineering
  - Create better products and to make a positive, lasting ( ) on our society and planet – unprecedented opportunities for new generations of engineers

Responsibilities of Engineers

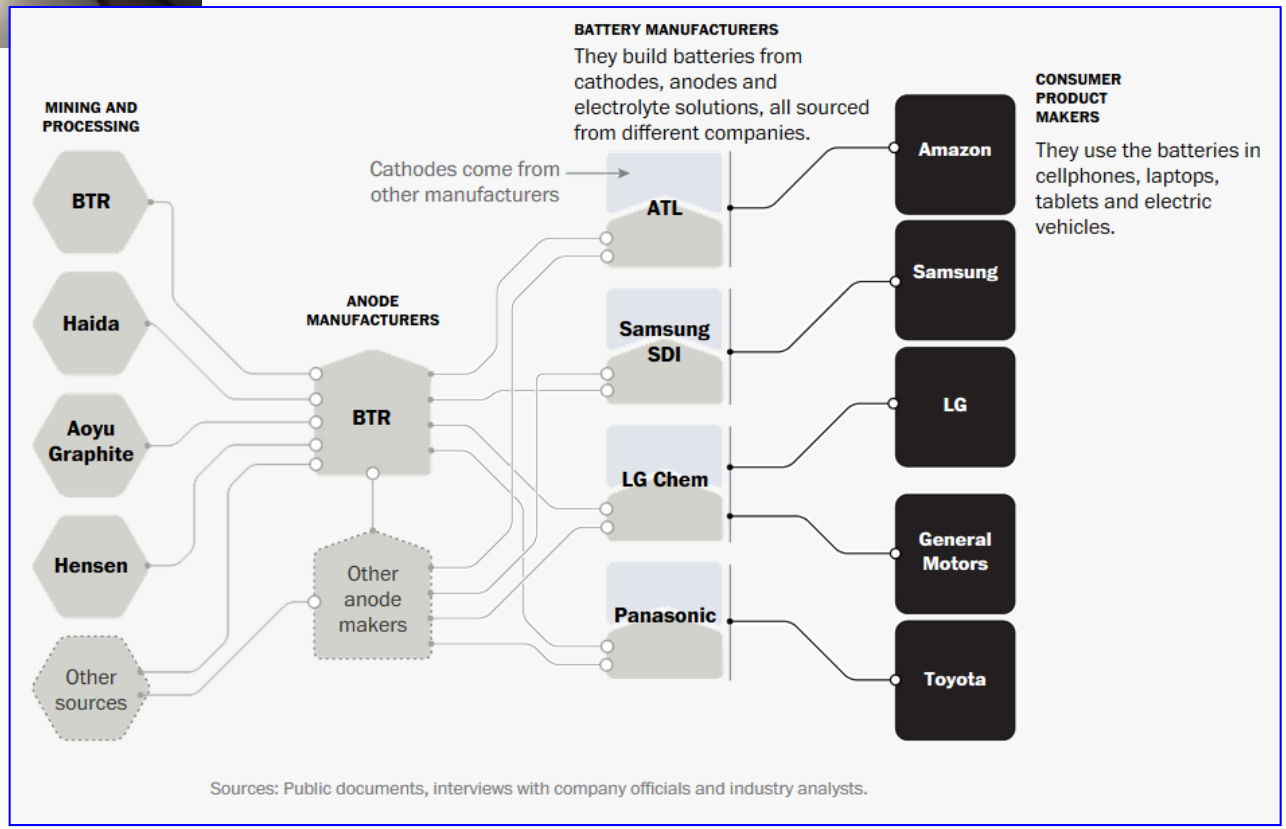
- Basic Responsibilities
  - Engineers have an ( ) obligation to make decisions that are consistent with the safety, health, and welfare of the ( ), and to disclose factor that might endanger the public or the ( ). → Code of Ethics
- Social/Environmental Responsibilities
  - Engineers should consider the total environmental impact of the products and services they design over the entire ( ), from raw materials through manufacture, assembly, distribution, sales and marketing, use, recycling, and disposal.

Responsibilities of Engineers



Responsibilities of Engineers

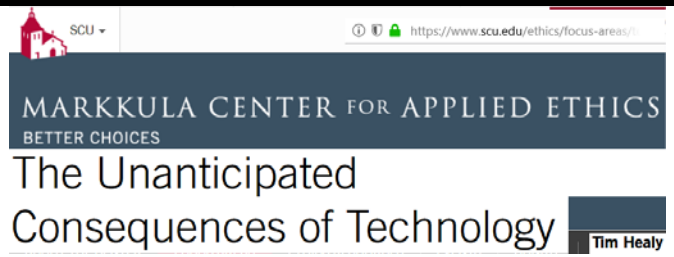
– **Link**



Challenges of Socially Responsible Engineering

- Social responsibility remains difficult and uncharted territory for most engineers today
- Four (4) Challenges
  1. The number of possible social/environmental impacts is **large**, and each one can be **difficult to calculate**
  2. Key impacts of our product may lie outside our company (or competency). (Ex) Evolution of fish species near power plant
  3. Most attempts to reduce impacts in one area result in impacts somewhere else. (Ex) Wind farm noise and bird killing → **unanticipated consequence**
  4. Trade-offs often involve things that appear, at the surface, to have little to do with each other. (Ex) Paper bag vs. plastic bag.

Unanticipated Impact/Consequence of Engineering



SANTA CLARA UNIVERSITY

- **Anticipated Consequences**
  - **i)**
  - **ii)**
  - **Iii)**
- **Unanticipated Consequences**
  - **i)**
  - **Ii)**

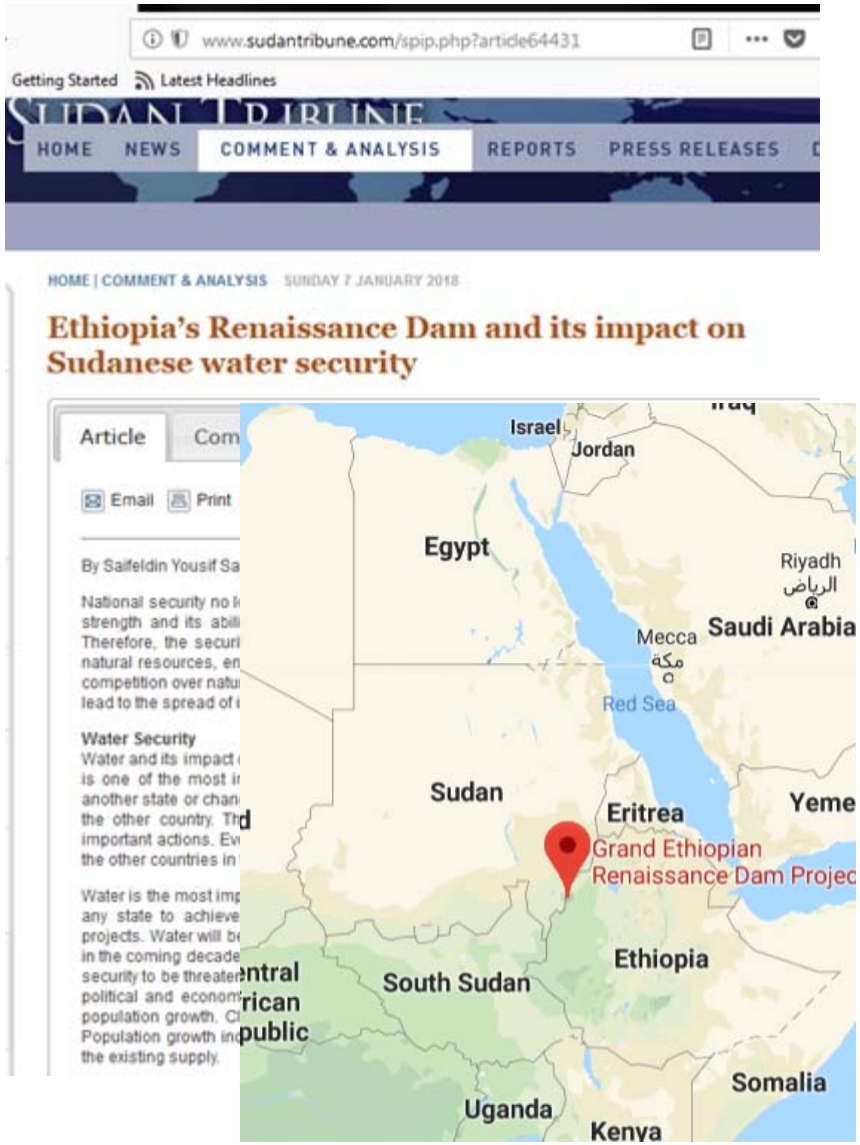
Unanticipated Impact/Consequence of Engineering

- Anticipated Consequences (**Nuclear Power Plant**)
  - Intended and Desired:
  - Undesired but common or probable:
  - Undesired and improbable:
- Unanticipated Consequences
  - Desirable:
  - Undesirable:

Unanticipated Impact/Consequence of Engineering

- Anticipated Consequences (**Microwave Ovens**)
  - Intended and Desired:
  - Undesired but common or probable:
  - Undesired and improbable:
- Unanticipated Consequences
  - Desirable:
  - Undesirable:

Unanticipated Impact/Consequence of Engineering



- **Anticipated Consequences**
  - **Intended and Desired:**
  - **Undesired but common or probable:**
  - **Undesired and improbable**
- **Unanticipated Consequences**
  - **Desirable:**
  - **Undesirable:**

Unanticipated Impact/Consequence of Engineering

wtop NEWS TRAFFIC WEATHER LISTEN

Home » Maryland News » Md. bill calls for...

Md. bill calls for end of synthetic turf use

By John Domen
February 10, 2018 2:38 pm

Google Patents

Find prior art | Discuss this patent | View PDF | Download PDF

Monofilament ribbon pile product
US 3332828 A

ABSTRACT available in

IMAGES (1)

Publication number	US3332828 A
Publication type	Grant
Publication date	Jul 25, 1967
Filing date	Dec 28, 1965
Priority date	Dec 28, 1965
Inventors	James M Faria, Robert T Wright
Original Assignee	Monsanto Co
Export Citation	BiBTeX, EndNote, RefMan

Patent Citations (9), Referenced by (102), Classifications (15)

External Links: USPTO, USPTO Assignment, Espacenet

- **Anticipated Consequences**
  - **Intended and Desired:**
  - **Undesired but common or probable:**
  - **Undesired and improbable**
- **Unanticipated Consequences**
  - **Desirable:**
  - **Undesirable:**

Environmental Concerns

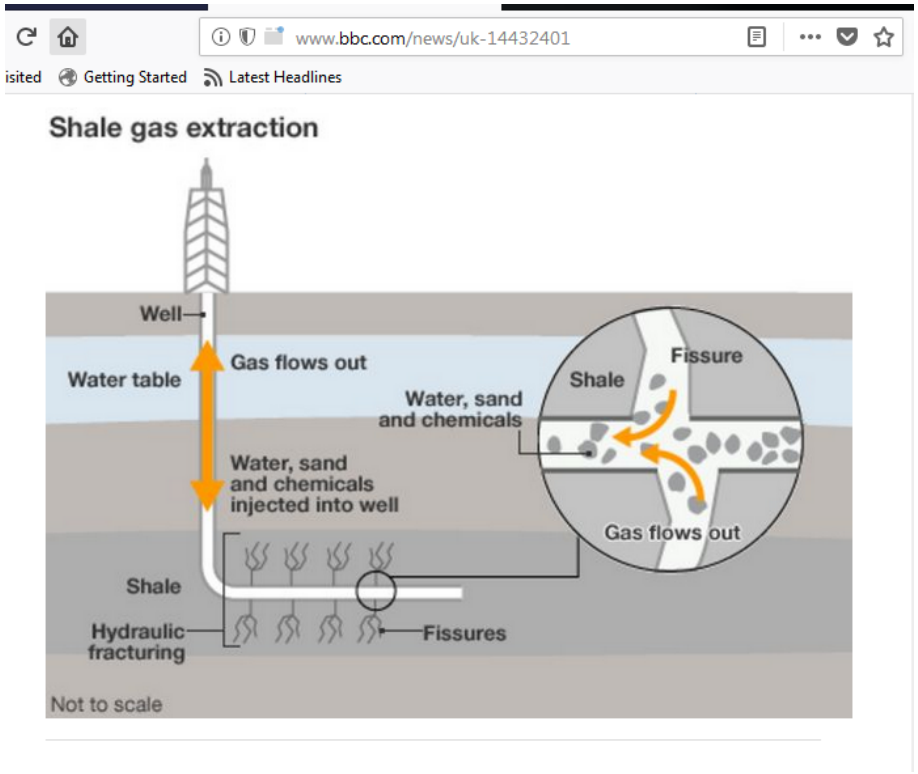
Unlike natural turf, synthetic grass does not absorb carbon dioxide or produce oxygen, and does not filter pollutants from air and water. When it is time to replace synthetic grass, the old turf usually goes into a landfill because the material is not recyclable. Synthetic grass releases greenhouse gasses into the environment. Harmful substances, such as zinc and nonylphenol, may leach from the recycled rubber granules and pollute water, according to the Washington Toxics Coalition.

Dirt and Odor

Synthetic grass needs regular cleaning with a bristle brush or broom to remove dirt, leaves, pet hair and other debris. Unlike natural turf, artificial turf does not promote decomposition of pet feces and urine, which can leave odors. Wash the turf with soapy water and a pressure washer or power washer to remove pet odors and any remaining small debris. Do not clean with undiluted bleach, which will damage synthetic turf.

Unanticipated Impact/Consequence of Engineering

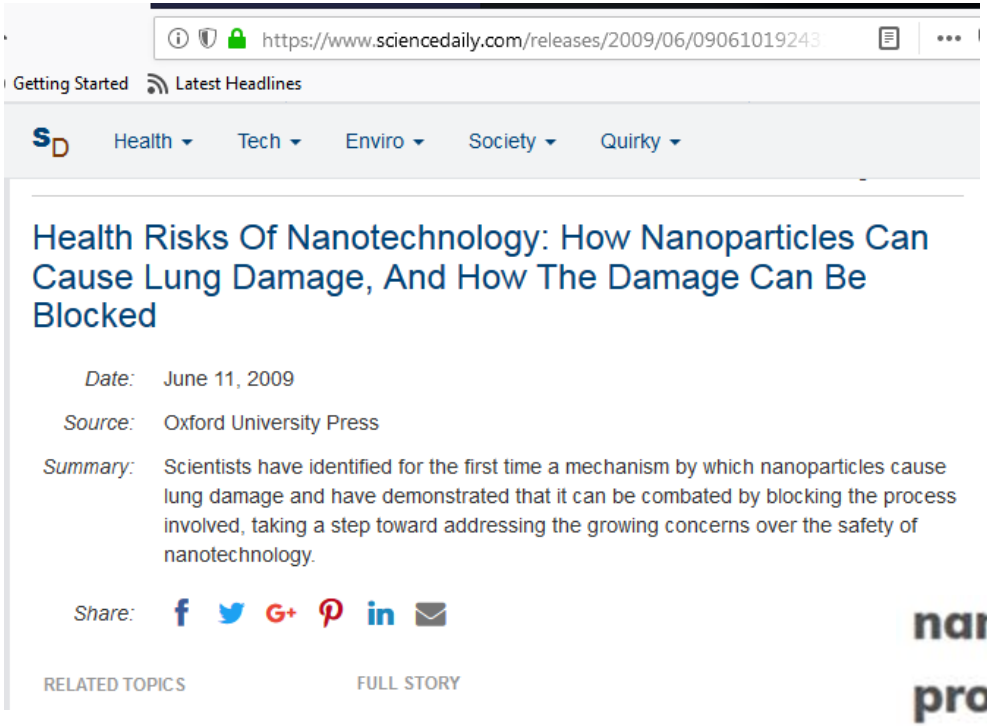
What is fracking and why is it controversial?



- **Anticipated Consequences**
  - **Intended and Desired:**
  - **Undesired but common or probable:**
  - **Undesired and improbable**
- **Unanticipated Consequences**
  - **Desirable:**
  - **Undesirable:**

Why is it controversial?

Unanticipated Impact/Consequence of Engineering



https://www.sciencedaily.com/releases/2009/06/090610192

Getting Started Latest Headlines

SD Health Tech Enviro Society Quirky

Health Risks Of Nanotechnology: How Nanoparticles Can Cause Lung Damage, And How The Damage Can Be Blocked

Date: June 11, 2009

Source: Oxford University Press

Summary: Scientists have identified for the first time a mechanism by which nanoparticles cause lung damage and have demonstrated that it can be combated by blocking the process involved, taking a step toward addressing the growing concerns over the safety of nanotechnology.

Share:

RELATED TOPICS FULL STORY

- **Anticipated Consequences**
  - **Intended and Desired:**
  - **Undesired but common or probable:**
  - **Undesired and improbable**
- **Unanticipated Consequences**
  - **Desirable:**
  - **Undesirable:**

nanoparticles in food

Nanoparticles are also already appearing in our food supply. They are used as preservatives, to keep foods fresh and bacteria-free for longer, and to act as thickening and coloring agents. Unfortunately, because the science is new, companies aren't yet required to reveal nano-sized ingredients on the label. (We hope that changes soon as new research comes to light illuminating the potential dangers.)

nanoparticles in personal care products

The health concern with nanoparticles is that the materials are small enough to penetrate the skin or to get inside the body via inhalation—when they're not intended to do so. Once inside of us, they could cause problems.

A recent study, for example, found that certain nanoparticles can harm DNA. Researchers from MIT and the Harvard School of Public Health looked at five types of nanoparticles—silver, zinc oxide, iron oxide, cerium oxide, and silicon dioxide. All of these are present in personal care products, toys, clothing, and the like, helping to improve texture, kill microbes, and enhance shelf life.

Unanticipated Impact/Consequence of Engineering

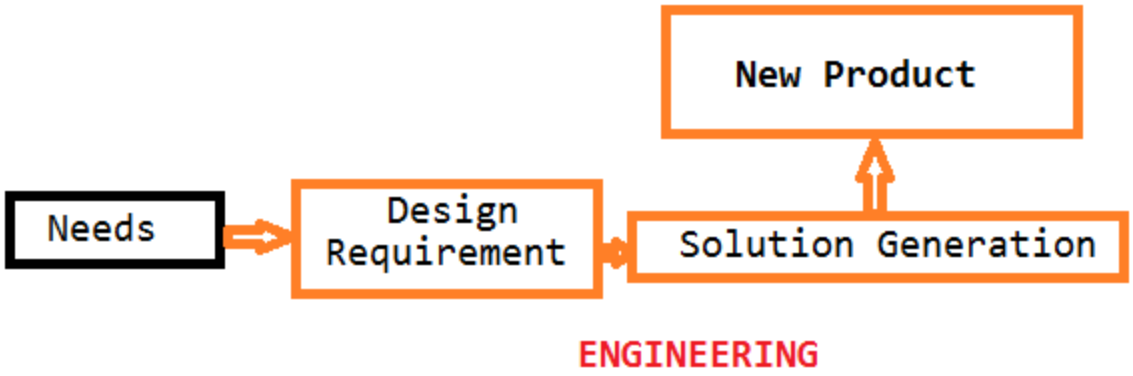
- Why do we have unintended (unanticipated) consequences?
- “Why engineered systems can be so difficult to understand, and hence why consequences are unanticipated?”
- Because, engineered systems are
  - a)
  - b)
  - c)
  -
  - d)

Social Responsibilities

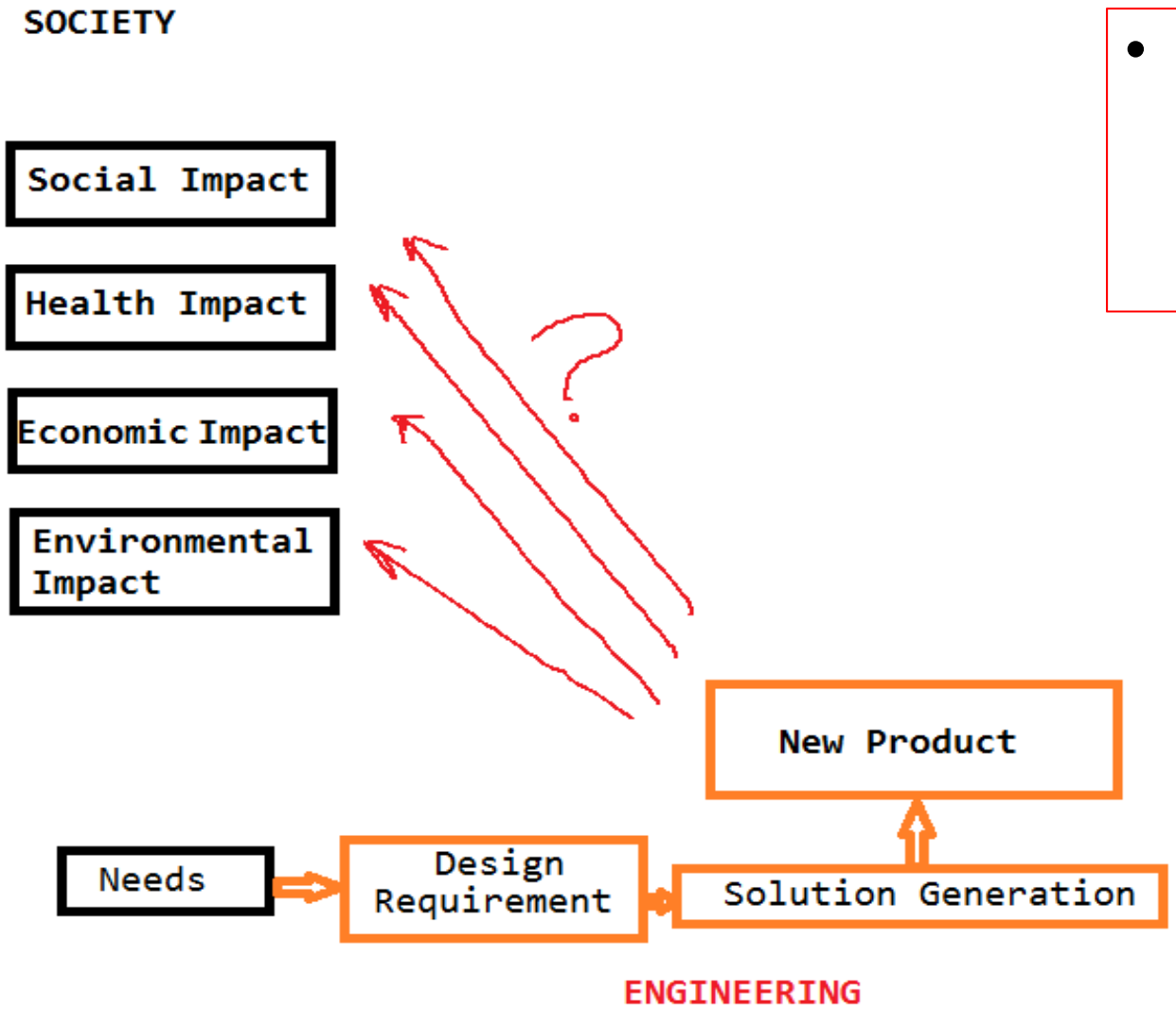
- Technology making changes in the organization of our society
- We engineers to **( )** ourselves how our new works (products) may ( ) social organizations and eco-systems, and **search and ( )** possible solutions
- From the findings, we may consider **changes and revisions** of our product to ( ) unanticipated undesired consequences

Practical Checking Chart for Citizen Engineers

- Technology Side

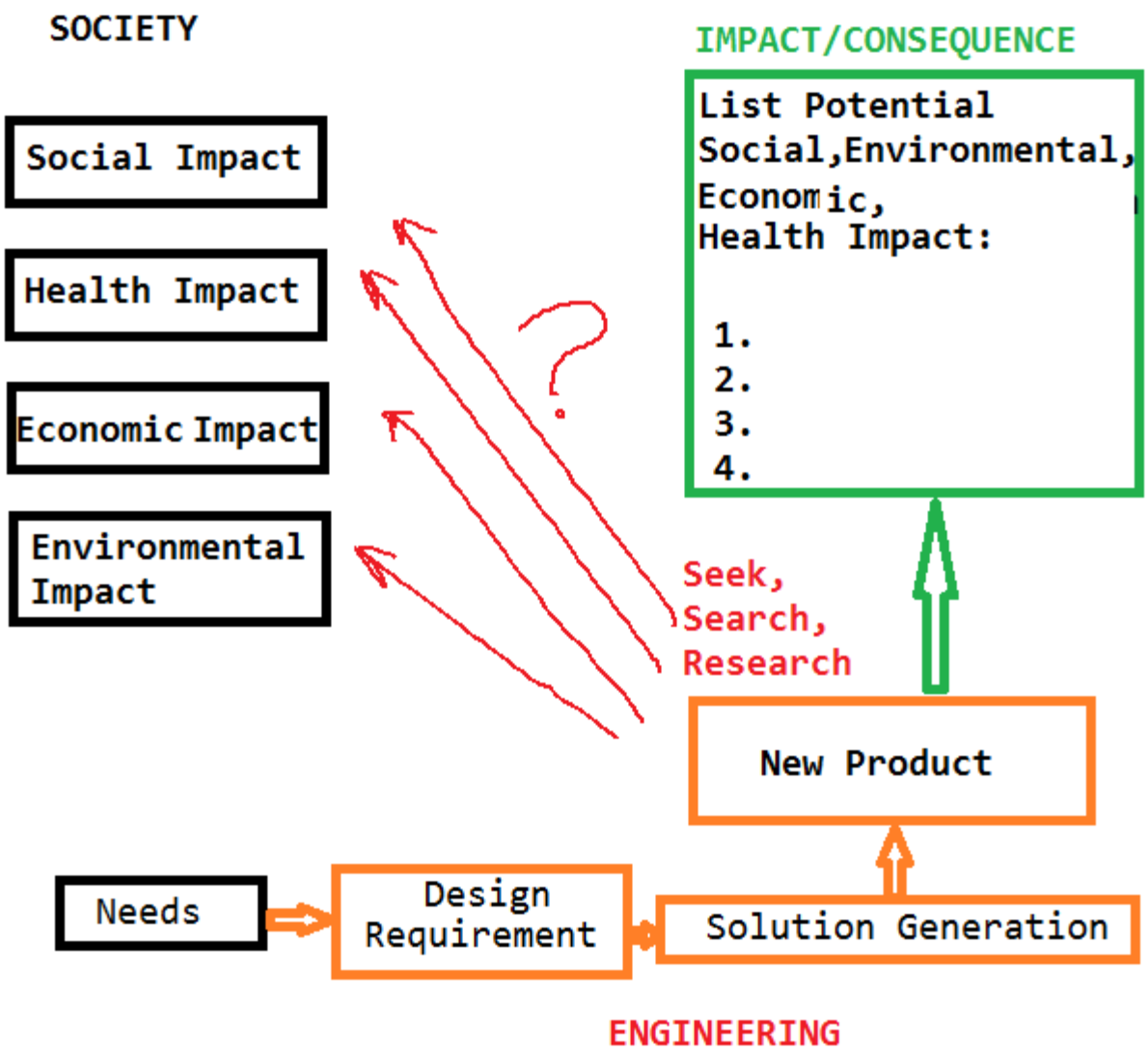


Practical Checking Chart for Citizen Engineers



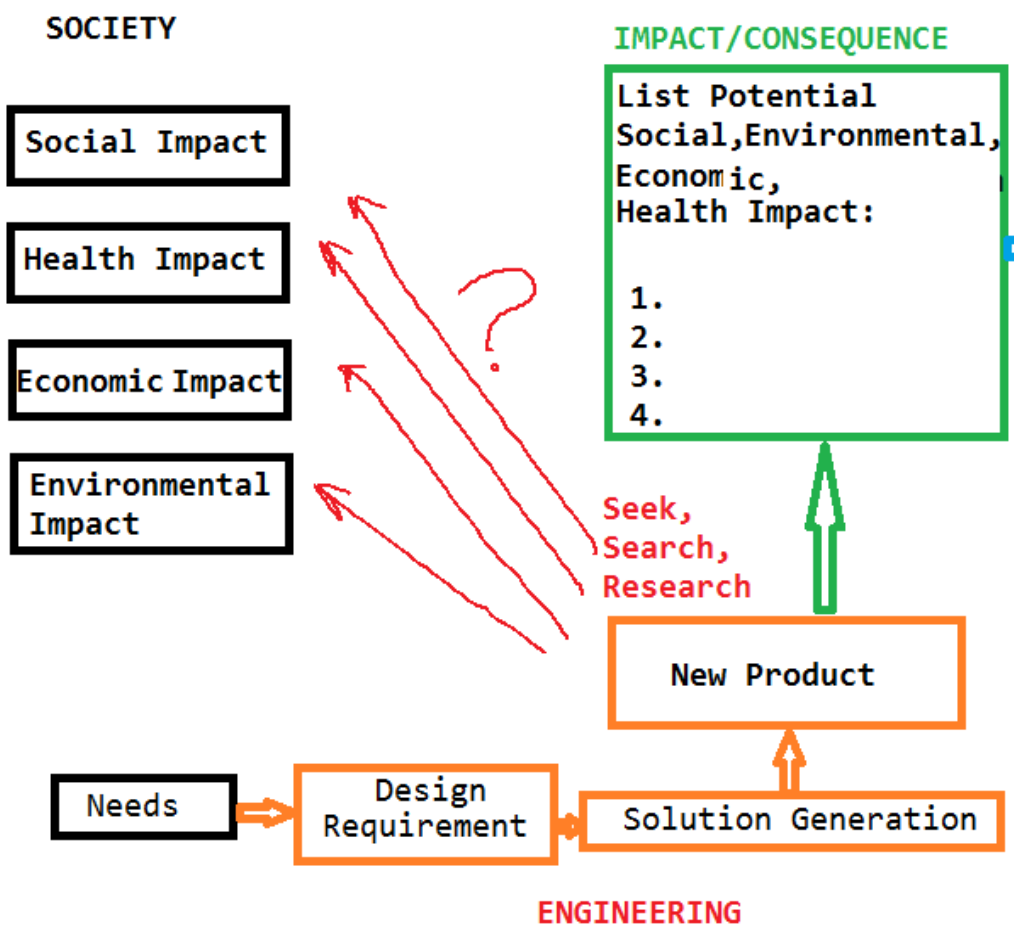
- Unintended Impact of Technology to Society ???

Practical Checking Chart for Citizen Engineers



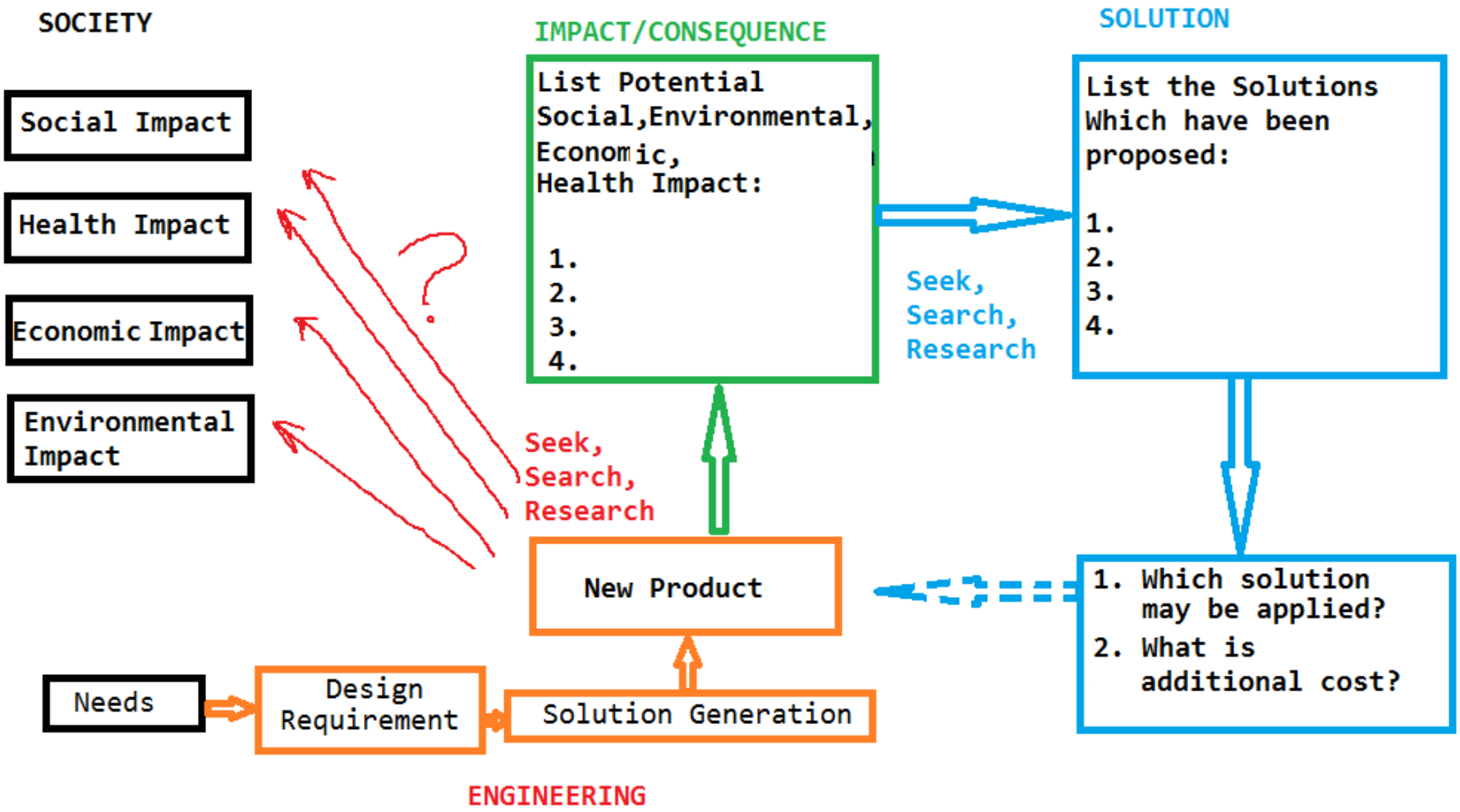
- Seek, Search, Research the Potential Unintended Impact
- List them

Practical Checking Chart for Citizen Engineers



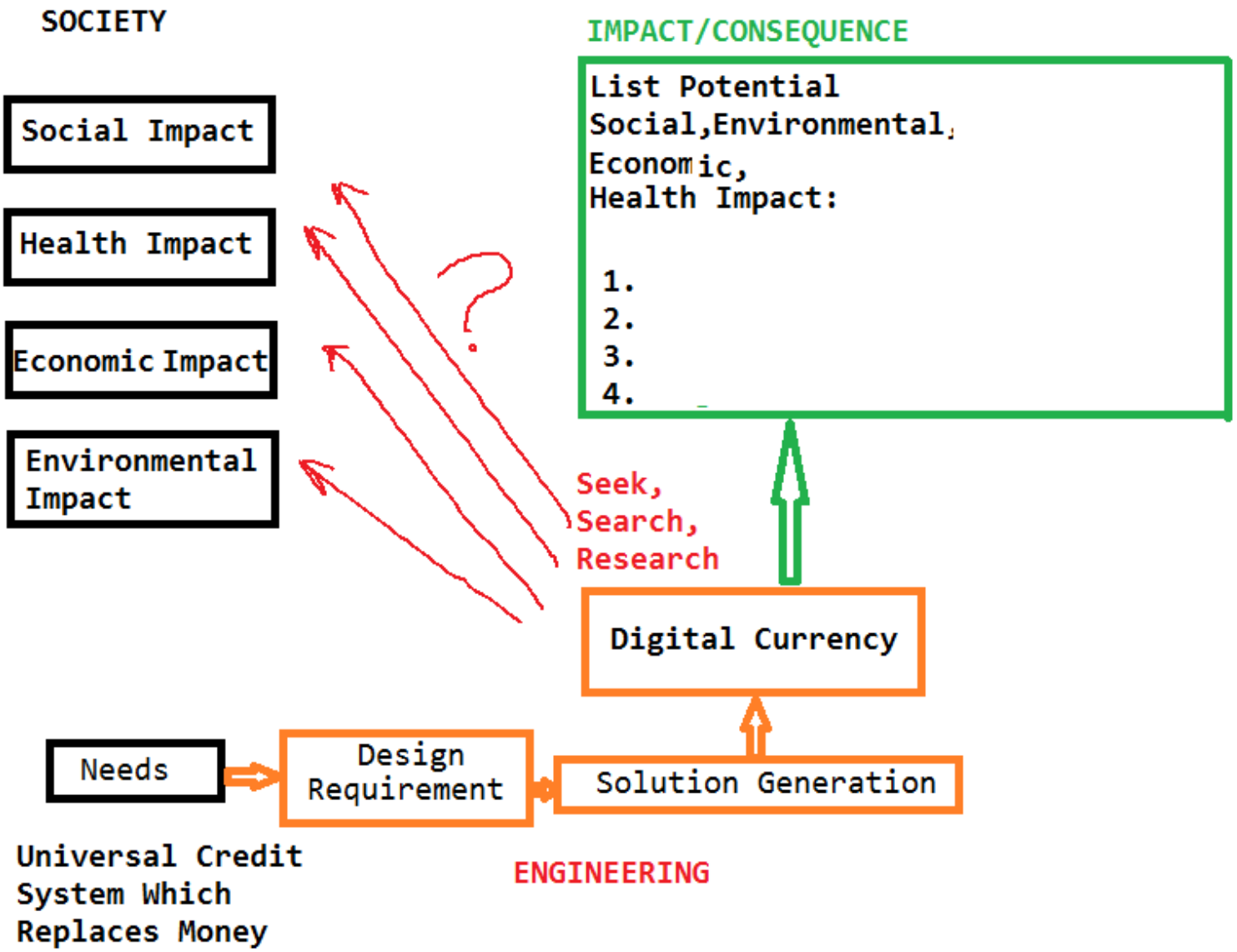
- Seek, Search, Research Solutions for the Unintended Potential Impacts
- List them

Practical Checking Chart for Citizen Engineers

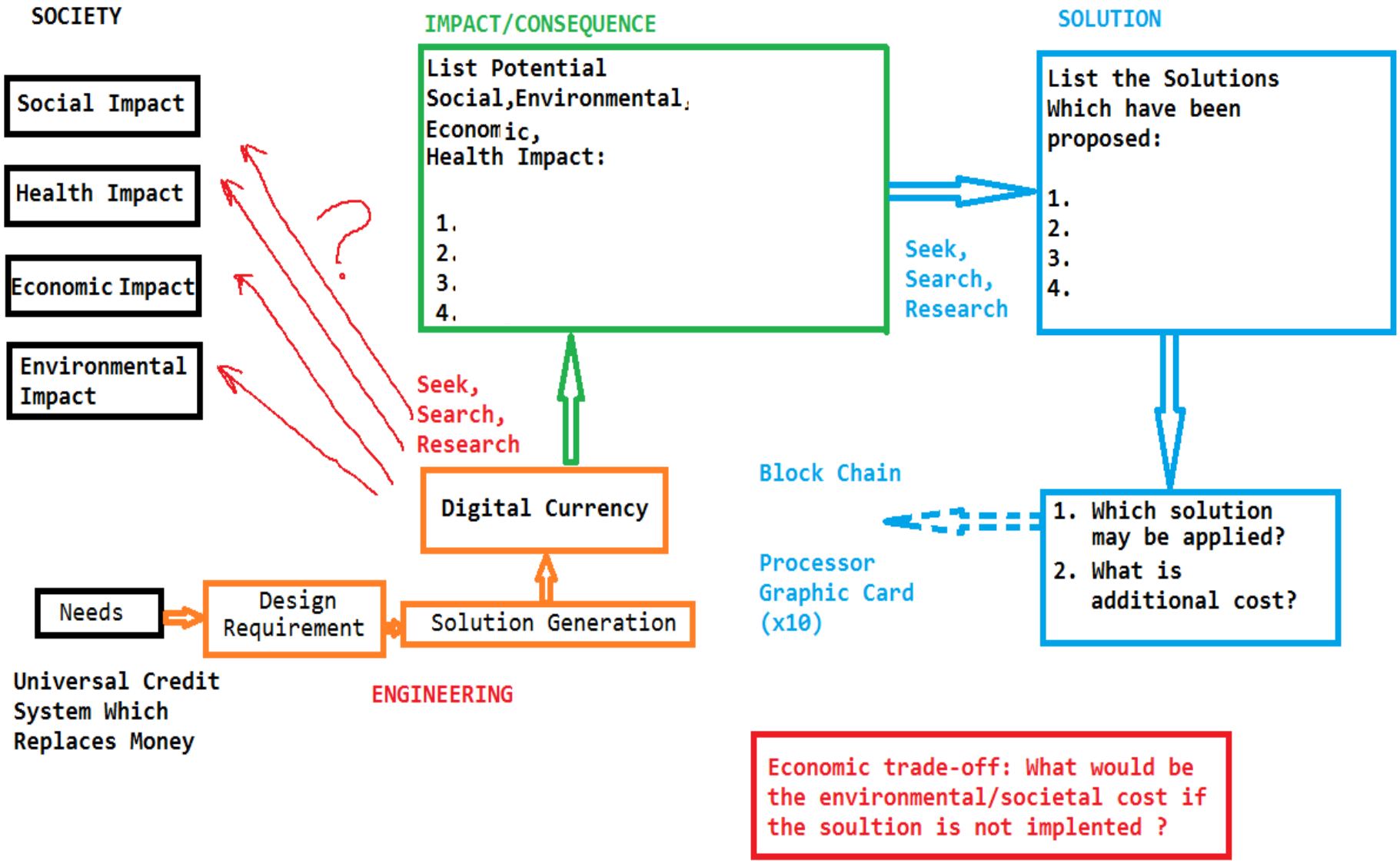


- Decide which solution approach to adopt
- Consider the additional cost for implementing the solution to the product.

Practical Checking Chart for Citizen Engineers - Example



Practical Checking Chart for Citizen Engineers - Example



Citizen Engineer LAB

- Report Writing: Fillable Form
- 3 Subjects (generic, not directly related with class projects)
- For each subject, 2 groups are assigned
- A total of 6 groups
- Each group members work together and produce 1 report

Subject	Groups
Electrified Transportation and Battery	eTrike (Group 1) EV (Group 2)
Robot and Autonomous Systems	Deliveroid (Group 3) AutoMoe (Group 4)
Networked Things	SensorNet + DOPES + Slate8 (Group 5) Terminator + HACK (Group 6)

Citizen Engineer - LAB

- **Section A: Name and Function of the New Product**
- **Section B: Anticipated Consequences**
    - Intended and Desired:
    - Undesired but common or probable:
    - Undesired and improbable
- **Section C: Unintended (Potential) Undesired Impacts**
    - Social Impact
    - Human/Animal Health Impact
    - Environmental Impact
    - Economic Impact
    - Other Impact
- **Section D: Solutions to Mitigate the Unanticipated Potential Impacts**
    - Solution 1
    - Solution 2
    - Solution 3
- **Section E:Additional Cost** for Applying one of the solutions (of Section D) to the Product (of Section A)
    - Cost of Solution implementation
- **Section F: Economic Trade-off**
    - Environmental Societal Cost (if the solution is not implemented)
- **Section G: Conclusions**

Citizen Engineer - LAB

- Use the fillable PDF form
- Report Due: