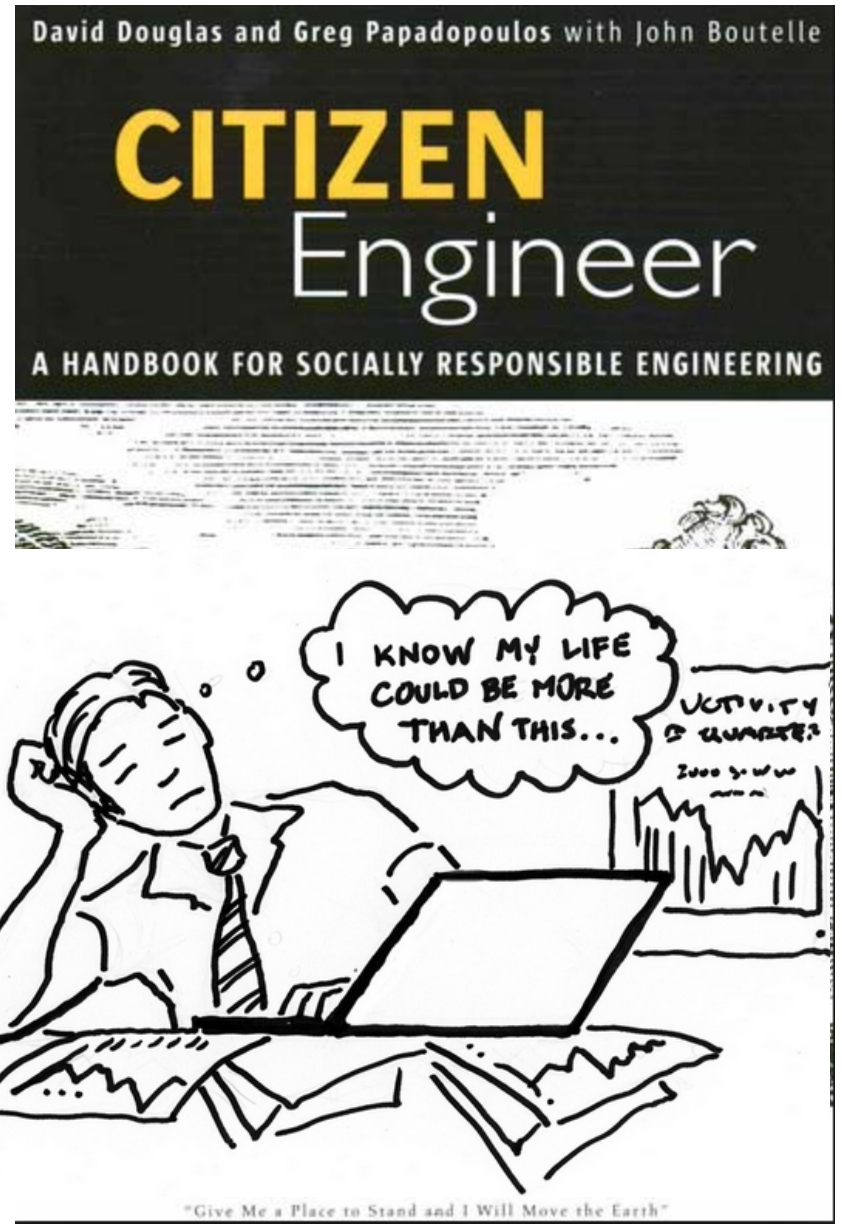


# Citizen Engineer



# 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 services 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.

D.C. Politics

# On patrol with the enforcer of D.C.'s plastic-straw ban



Zach Rybarczyk, who works for the D.C. Department of Energy and Environment, inspects restaurants in Union Station on Jan. 8 to see whether they are still using plastic straws after the city's ban went into effect this year. Cava passed its inspection. (Calla Kessler/The Washington Post)



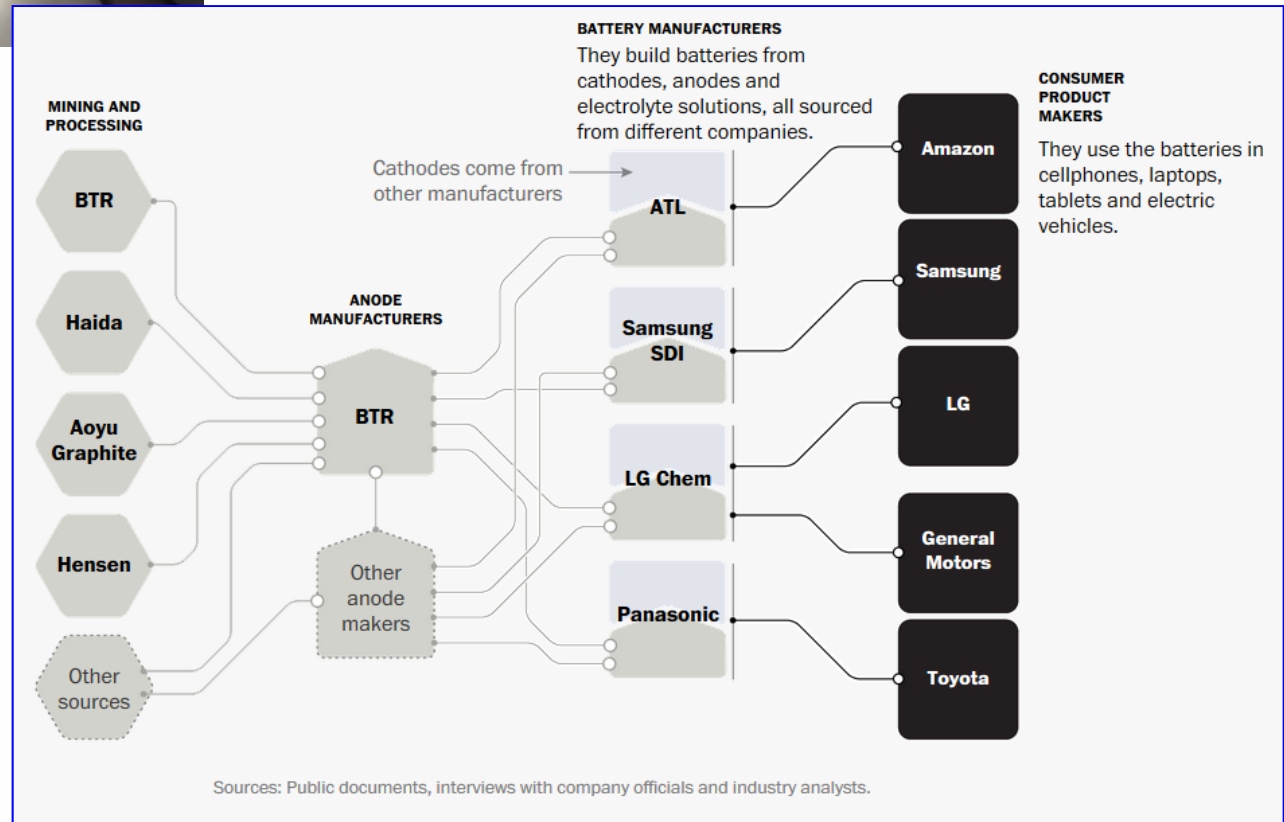
# Responsibilities of Engineers





# Responsibilities of Engineers

– Link

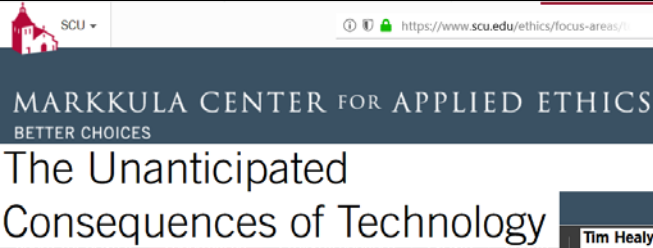




# Challenges of Socially Responsible Engineering

- 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



- **Anticipated Consequences**
  - i)
  - ii)
  - lii)
- **Unanticipated Consequences**
  - i)
  - li)

# Unanticipated Impact/Consequence of Engineering

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

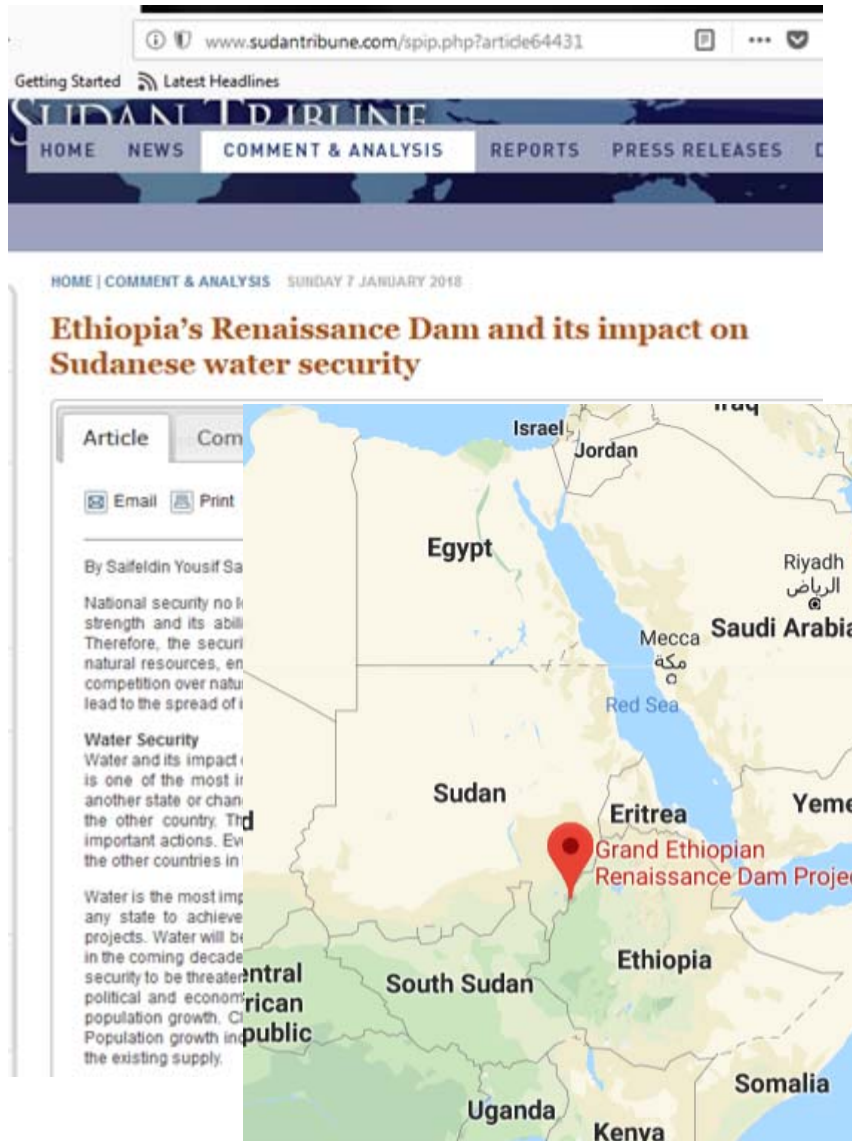
# Unanticipated Impact/Consequence of Engineering

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

# Unanticipated Impact/Consequence of Engineering

- Anticipated Consequences (**Diesel Cars**)
  - Intended and Desired:
  - Undesired but common or probable:
  - Undesired and improbable:
- Unanticipated Consequences
  - Undesirable:

# Unanticipated Impact/Consequence of Engineering



The image shows a screenshot of a news article from the Sudan Tribune website. The URL in the browser is [www.sudantribune.com/spip.php?article64431](http://www.sudantribune.com/spip.php?article64431). The article title is "Ethiopia's Renaissance Dam and its impact on Sudanese water security" by Saifeldin Yousif Sa. The article text discusses the impact of the dam on Sudan's water security, mentioning that water is a critical resource and that the dam's construction and operation could threaten Sudan's water supply. The article also mentions that the dam is a major project in Ethiopia and that it will have a significant impact on the region's water resources. The article is dated Sunday 7 January 2018.

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





# Unanticipated Impact/Consequence of Engineering

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 Wight      |
| 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**
  - Undesirable:

### Environmental Concerns

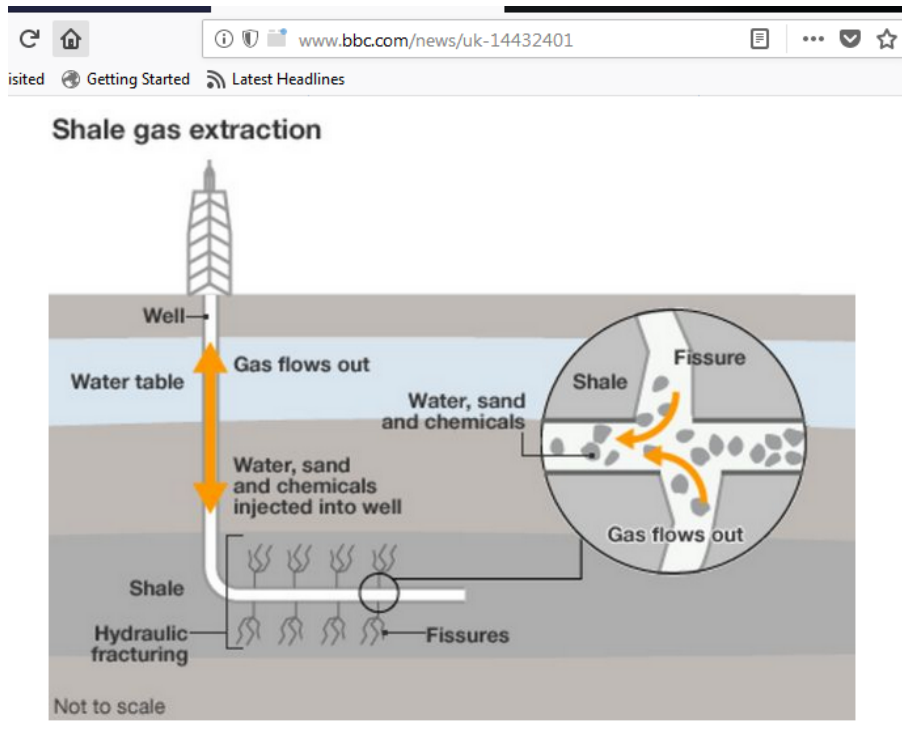
Unlike natural turf, synthetic grass does not absorb carbon dioxide or produce oxygen, and does not filter pollutants from air and water. When it is time to replace synthetic grass, the old turf usually goes into a landfill because the material is not recyclable. Synthetic grass releases greenhouse gasses 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**
  - Undesirable:

Why is it controversial?



# Unanticipated Impact/Consequence of Engineering

The screenshot shows a web browser window with the URL <https://www.sciencedaily.com/releases/2009/06/09061019243>. The page features a navigation bar with categories like Health, Tech, Enviro, Society, and Quirky. The main article title is "Health Risks Of Nanotechnology: How Nanoparticles Can Cause Lung Damage, And How The Damage Can Be Blocked". Below the title, it lists the date as June 11, 2009, and the source as Oxford University Press. A summary states: "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." There are also social media share icons and links for "RELATED TOPICS" and "FULL STORY".

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

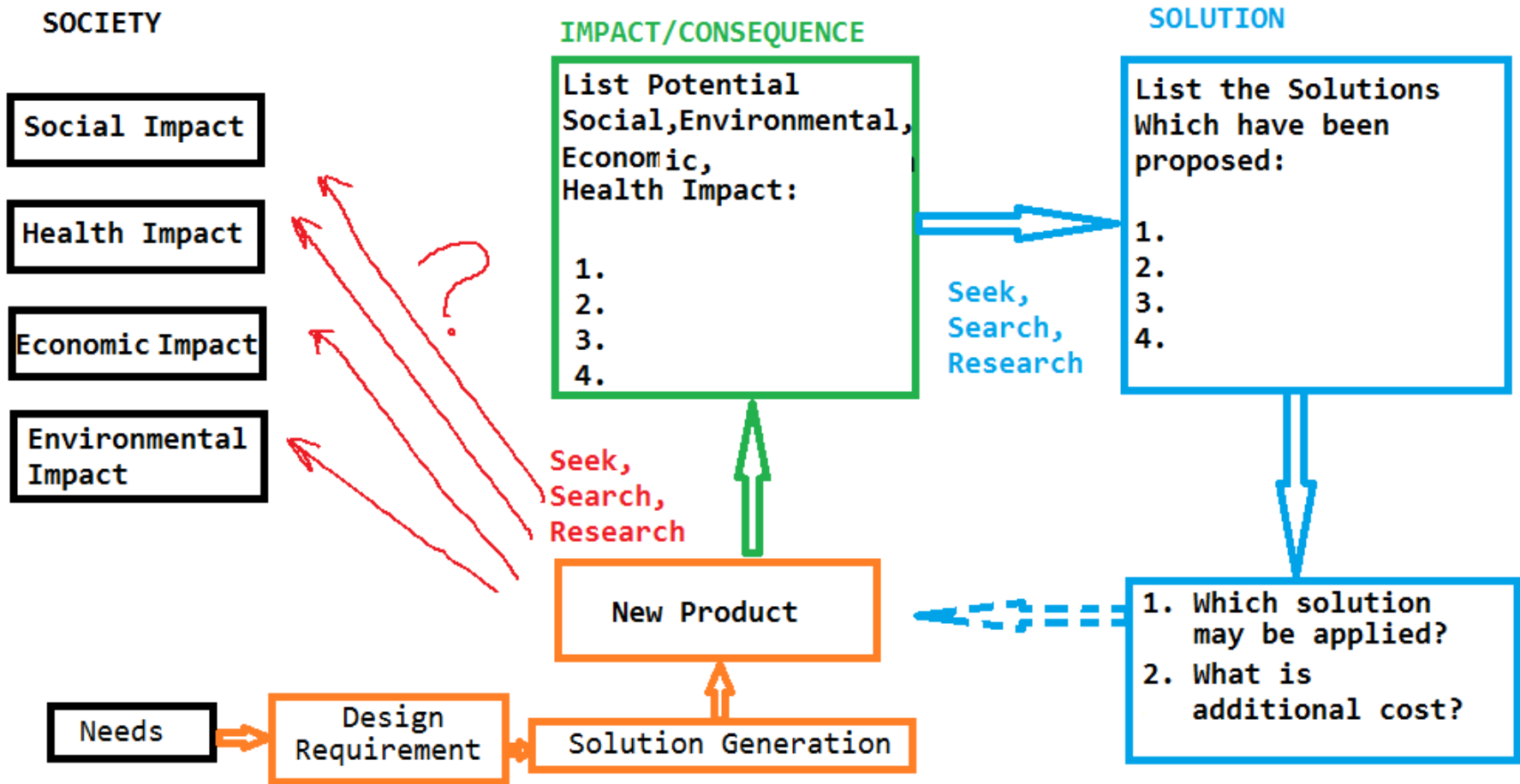
# Unanticipated Impact/Consequence of Engineering

- 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

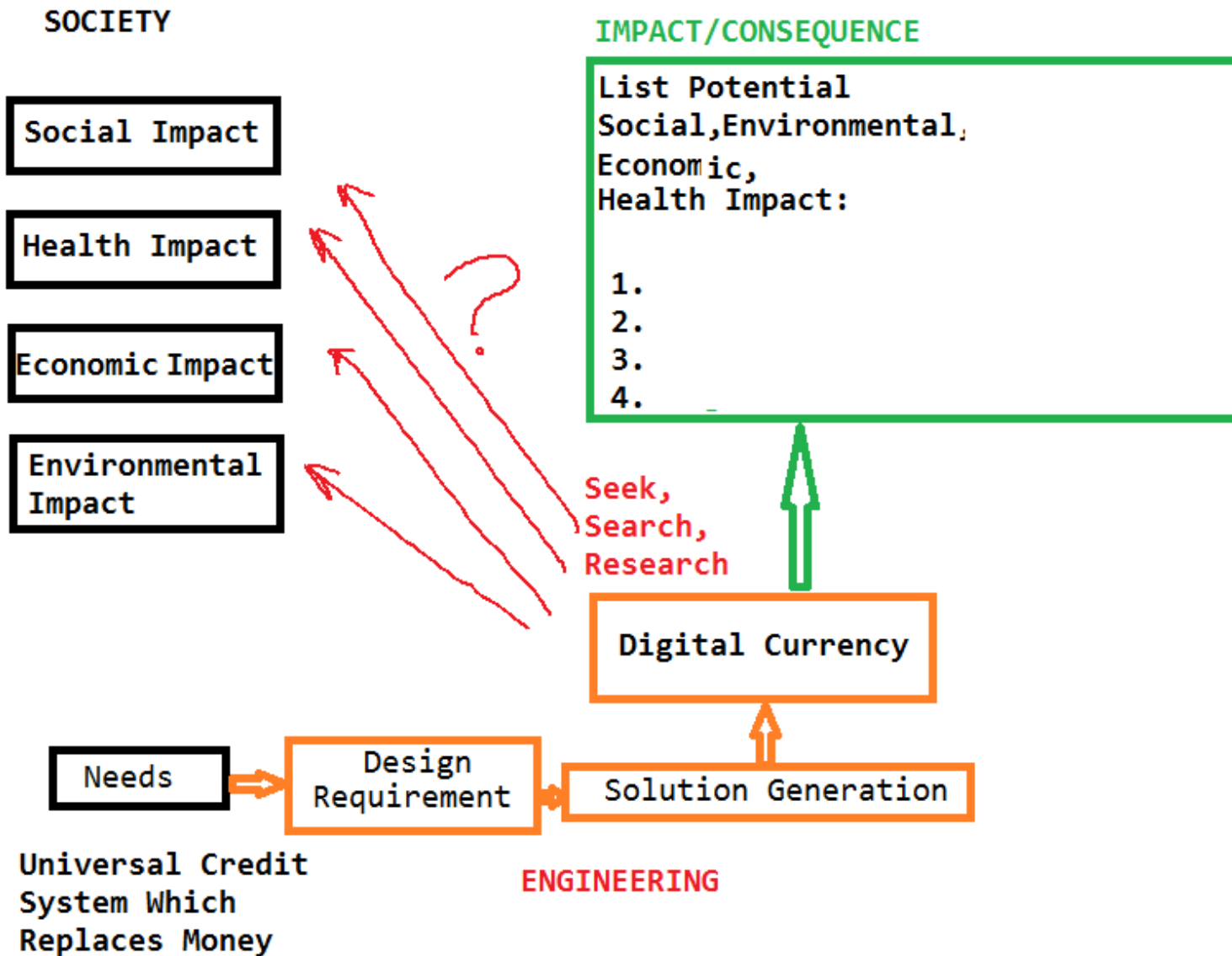


**ENGINEERING Environmental / Societal Cost if the solution is not implemented**

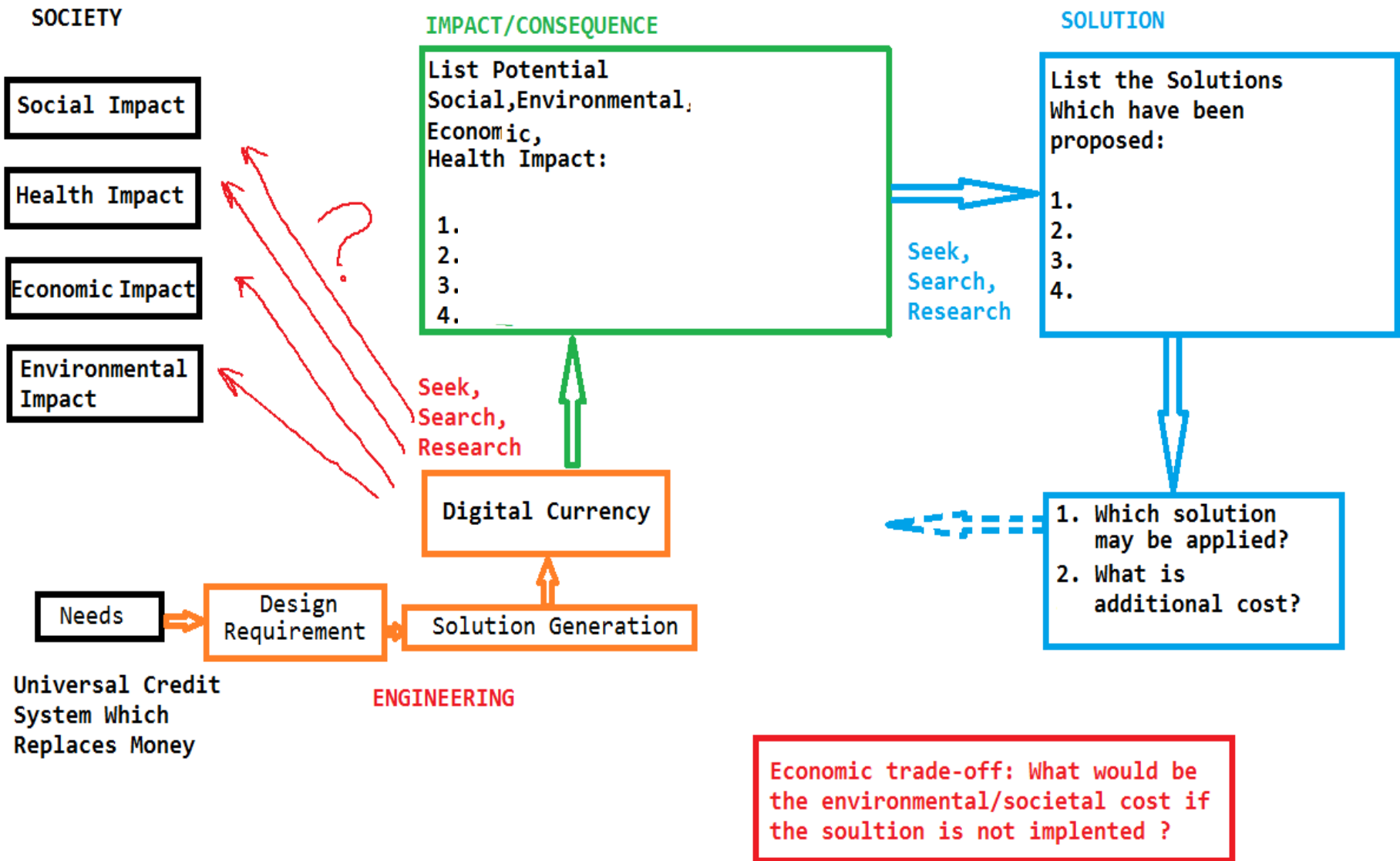
- Decide which solution approach to adopt
- Consider the additional cost for implementing the solution to the product.



# 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 teams are assigned
- Each team works together and produces 1 report
- Each team works independently and separately from the other team in the same subject

| Subject                                | Teams assigned to the subject |
|--|-------------------------------|
| Electrified Transportation and Battery | AutoMoe<br>eTrike             |
| Robot and Autonomous Systems           | SLAM<br>Terminator            |
| Networked Things                       | Graphone<br>Sandia            |

# 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:

T 4/2/2019