



“Δῶς μοι πᾶ στῶ καί τὰν γῆν κινάσω”

Citizen Engineer

- Connection point between **engineering** and **society**
- Connection between **product** and how it will be **used**



Socially Responsible Engineering

- demands to create better products which make a positive, lasting impact on our society and planet

Challenges of **Anticipating** Impacts

1. The number of possible social/environmental impacts is **large**, and each is **difficult to conceive before-hand**
2. Key impacts of our product may lie outside our company (or competency). Technology product → Biological Impact
3. Attempts to reduce impacts in one area result in impacts somewhere else. Carbon reducing wind-turbine → Animal Health.
4. Trade-offs often involve things that needs much deeper investigation and understanding (through product life-cycle. Plastic bag → paper bag



Unanticipated Impact/Consequence of Engineering

- Anticipated Consequences (**Nuclear Power Plant**)

- Intended and Desired: Production of Electric Power



- Unanticipated Consequences

- Undesirable: Evolution of a new species of predator fish in the warmed ocean water, which destroys existing desired species



Unanticipated Impact/Consequence of Engineering

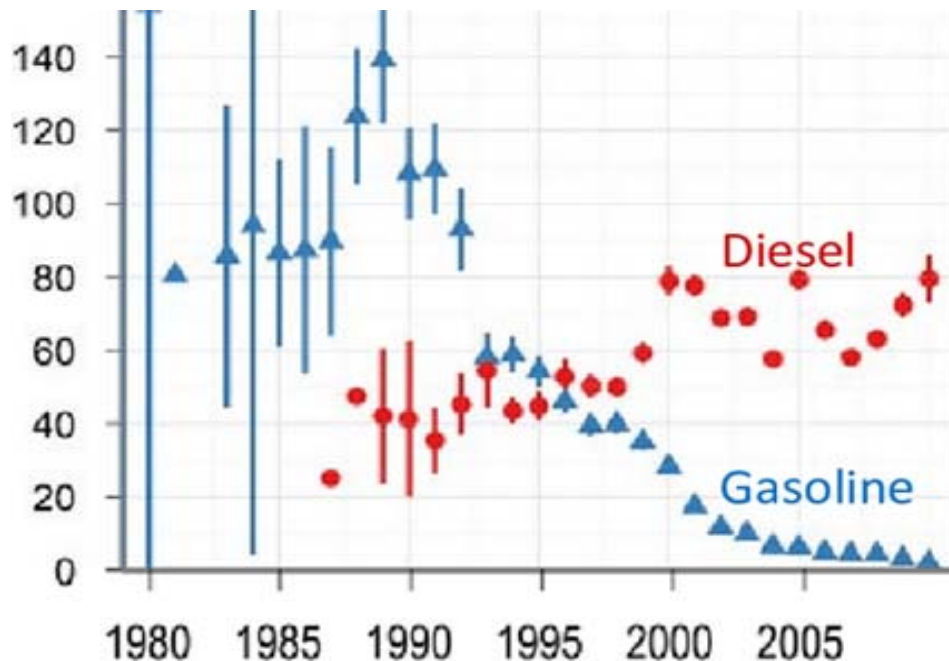
- Anticipated Consequences (Diesel Cars)

- Intended and Desired: Reduction of CO₂ emission (Diesel produces 15% less CO₂ than Gasoline)

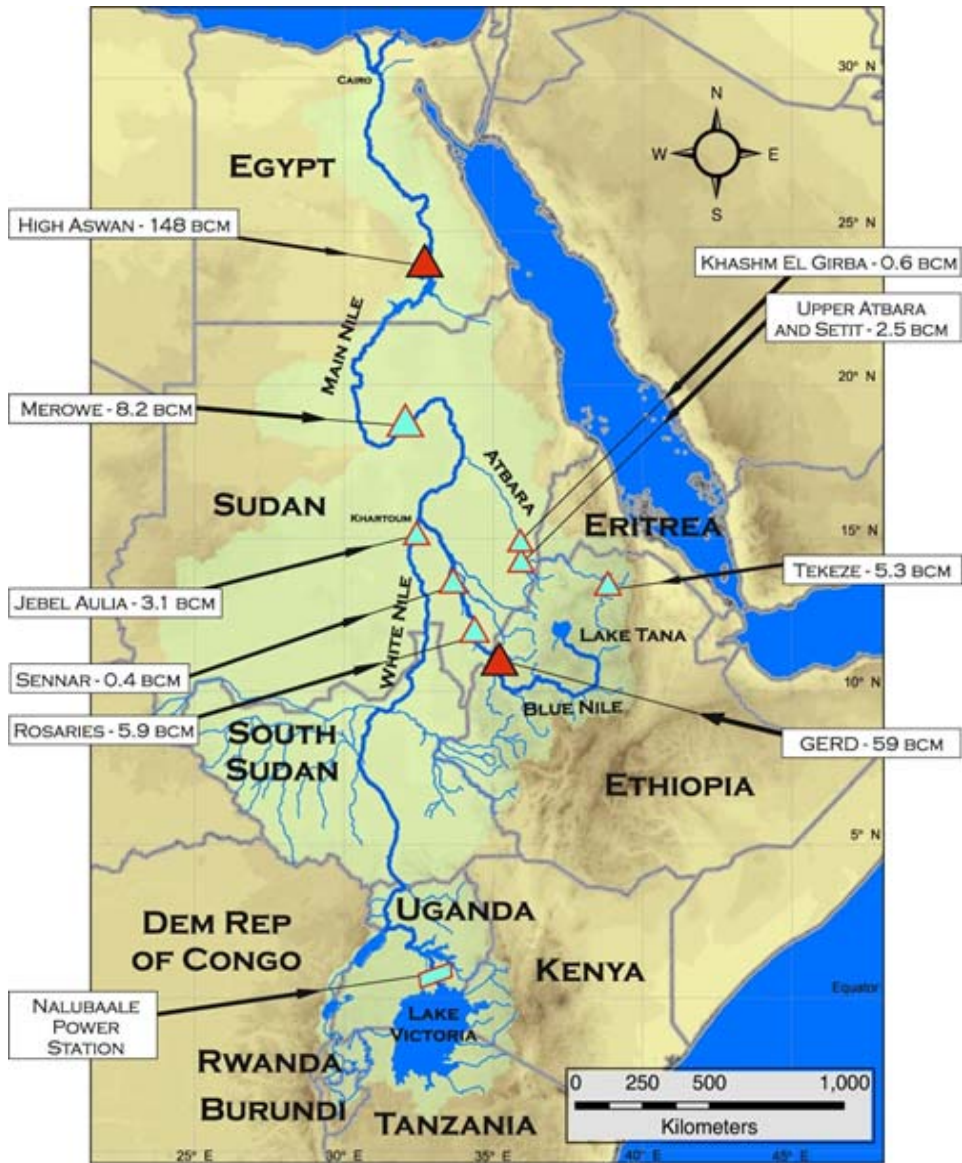
- Unanticipated Consequences

- Undesirable: 4 times for NO₂ and 22 times more particulate; more air pollution

NO_x emission factors



Unanticipated Impact/Consequence of Engineering



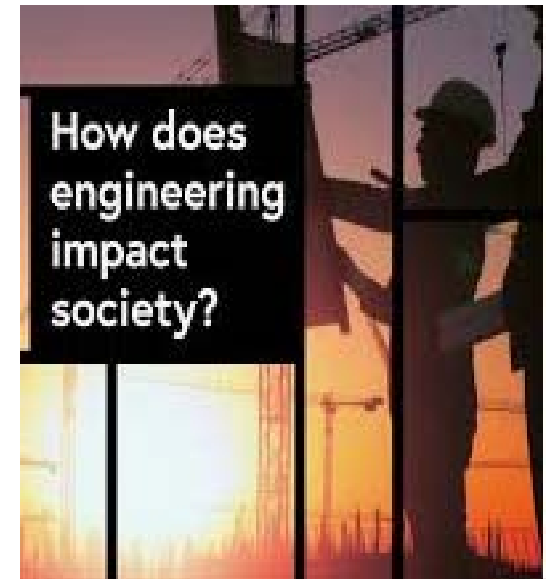
Ethiopia's Renaissance Dam and its impact on Sudanese water security

Intention: Water supply and Electricity Generation

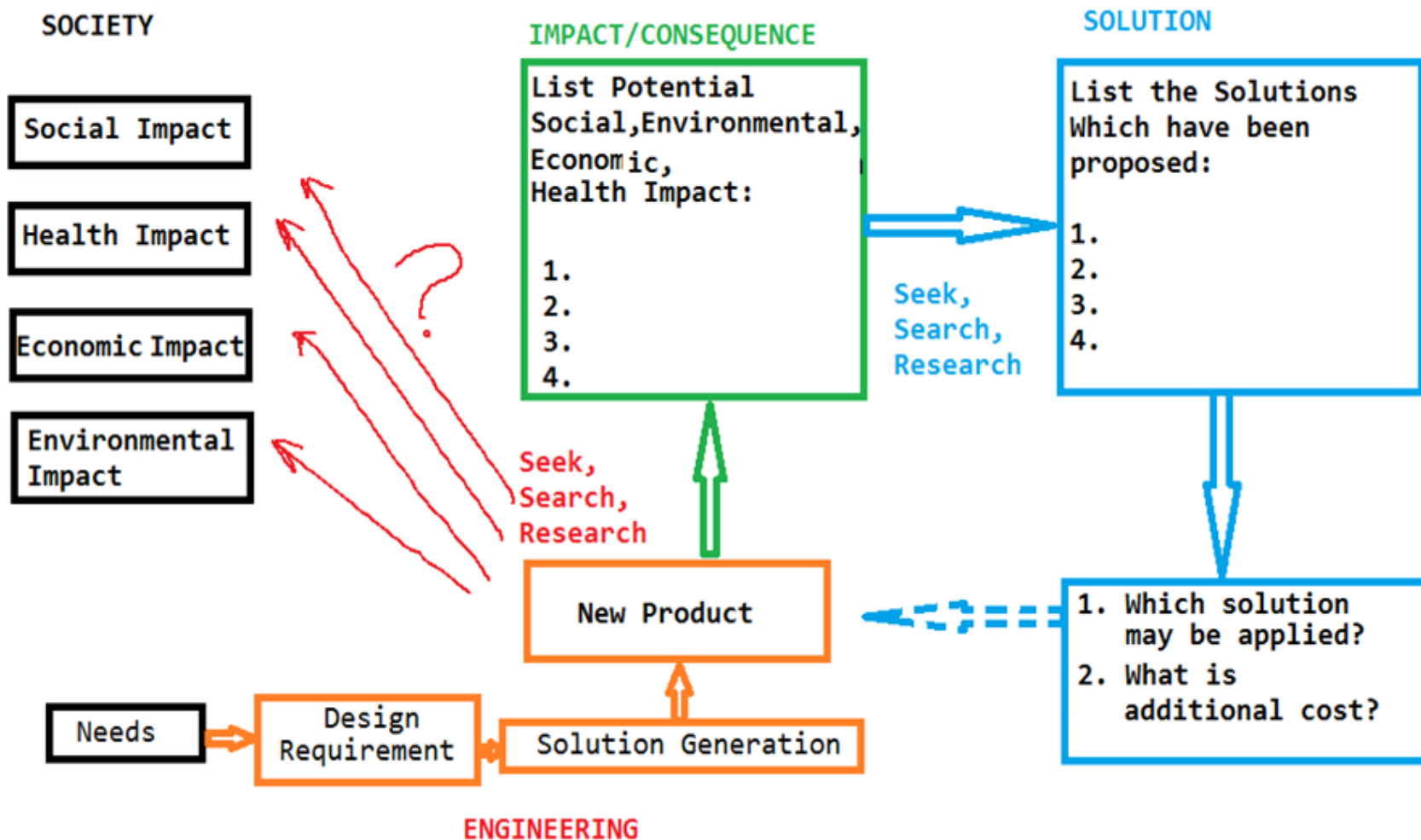
Unanticipated Consequences: Downstream water flow reduction

Social Responsibilities of Engineering

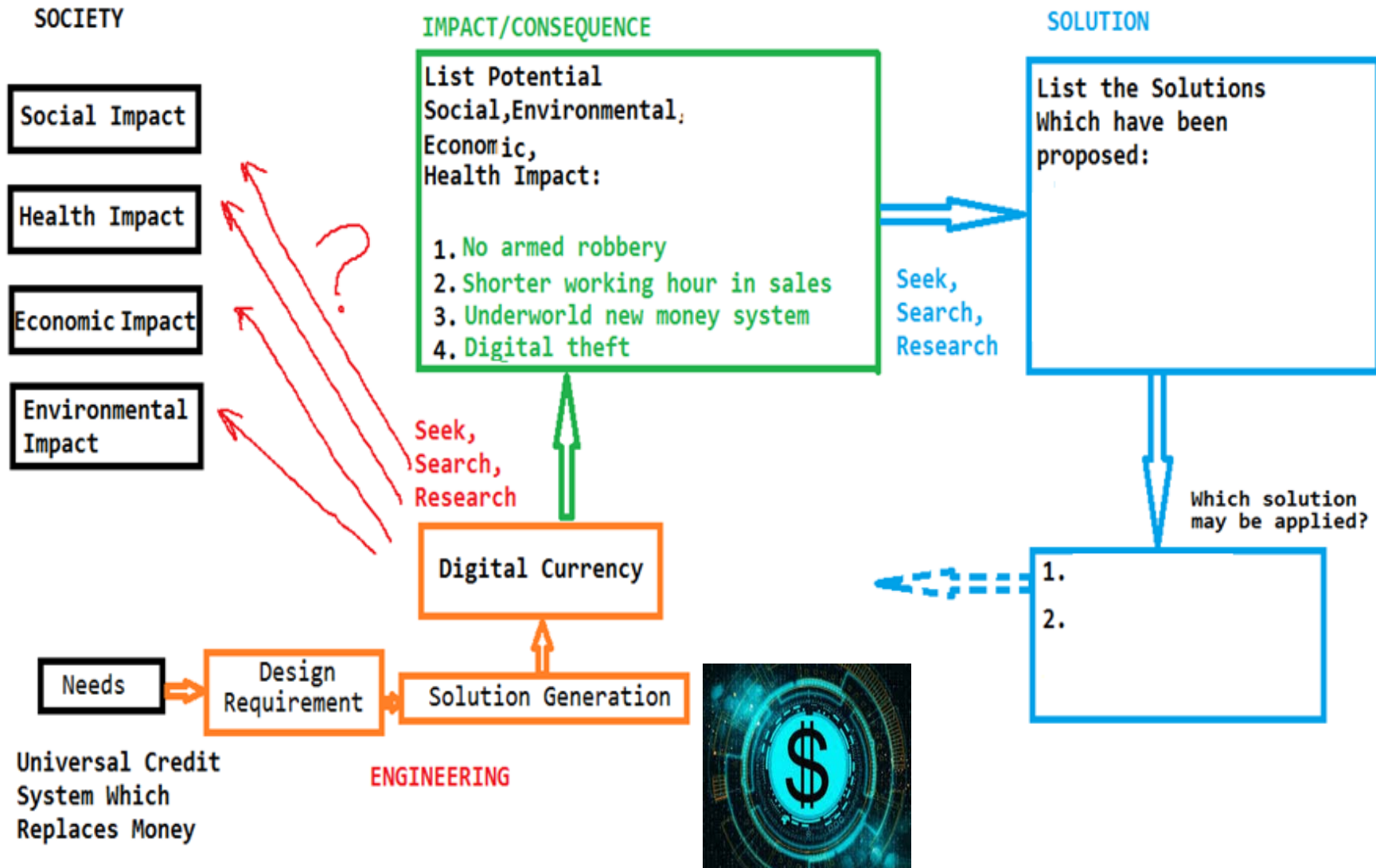
- Technology is making changes and impact in the organization of our society
- We engineers
 - (1) have to ask how our new products make impact and produce unanticipated undesired consequences on social organizations and eco-systems
 - (2) Then **search and find** possible solutions
 - (3) From the findings, we may consider **changes and revisions** of our product design to minimize unanticipated undesired consequences
- Any practical method to (a) find the impact of society and eco-systems and environment and (b) find solutions to mitigate the possible undesired impact?



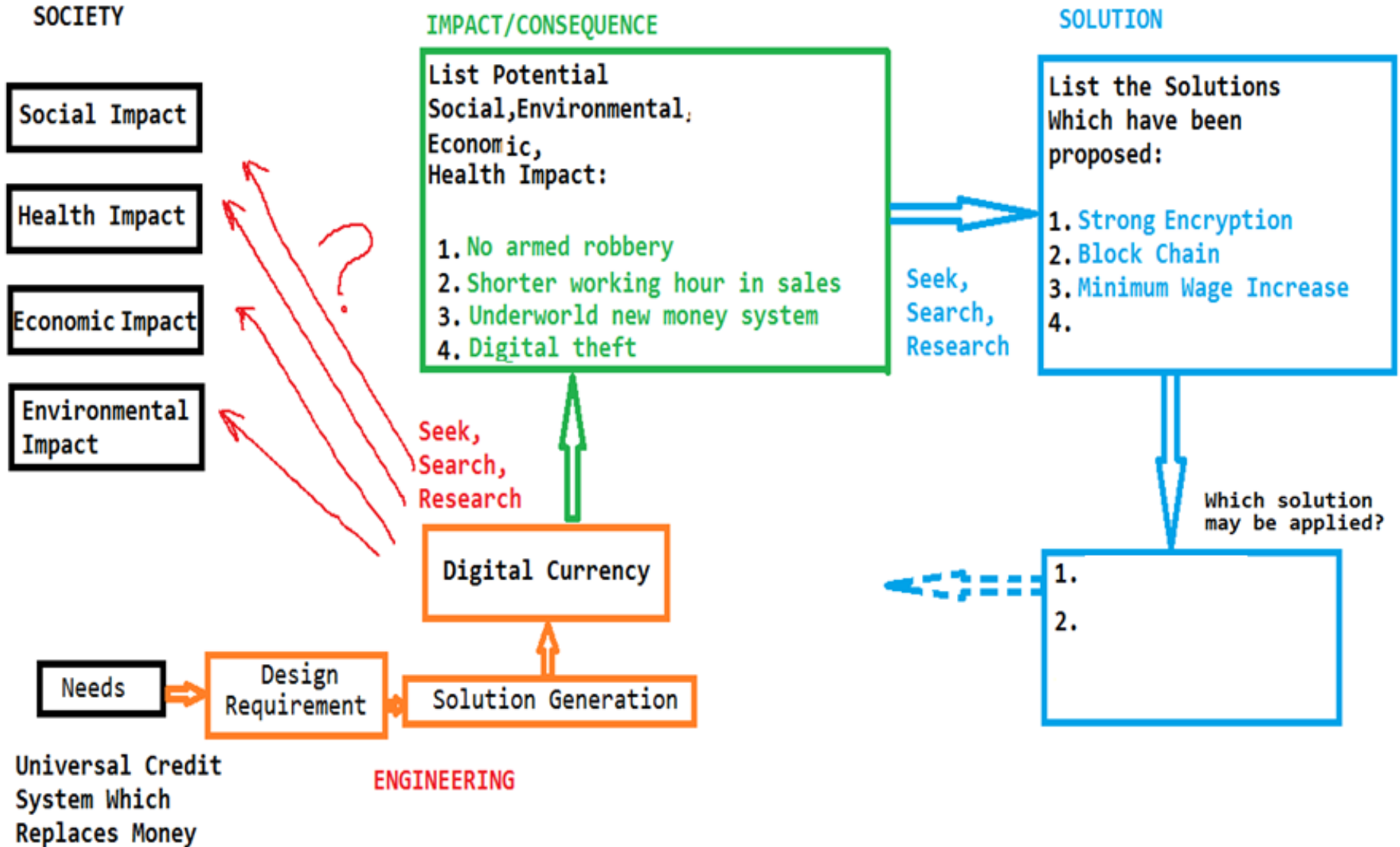
Practical Checking Chart for Citizen Engineers



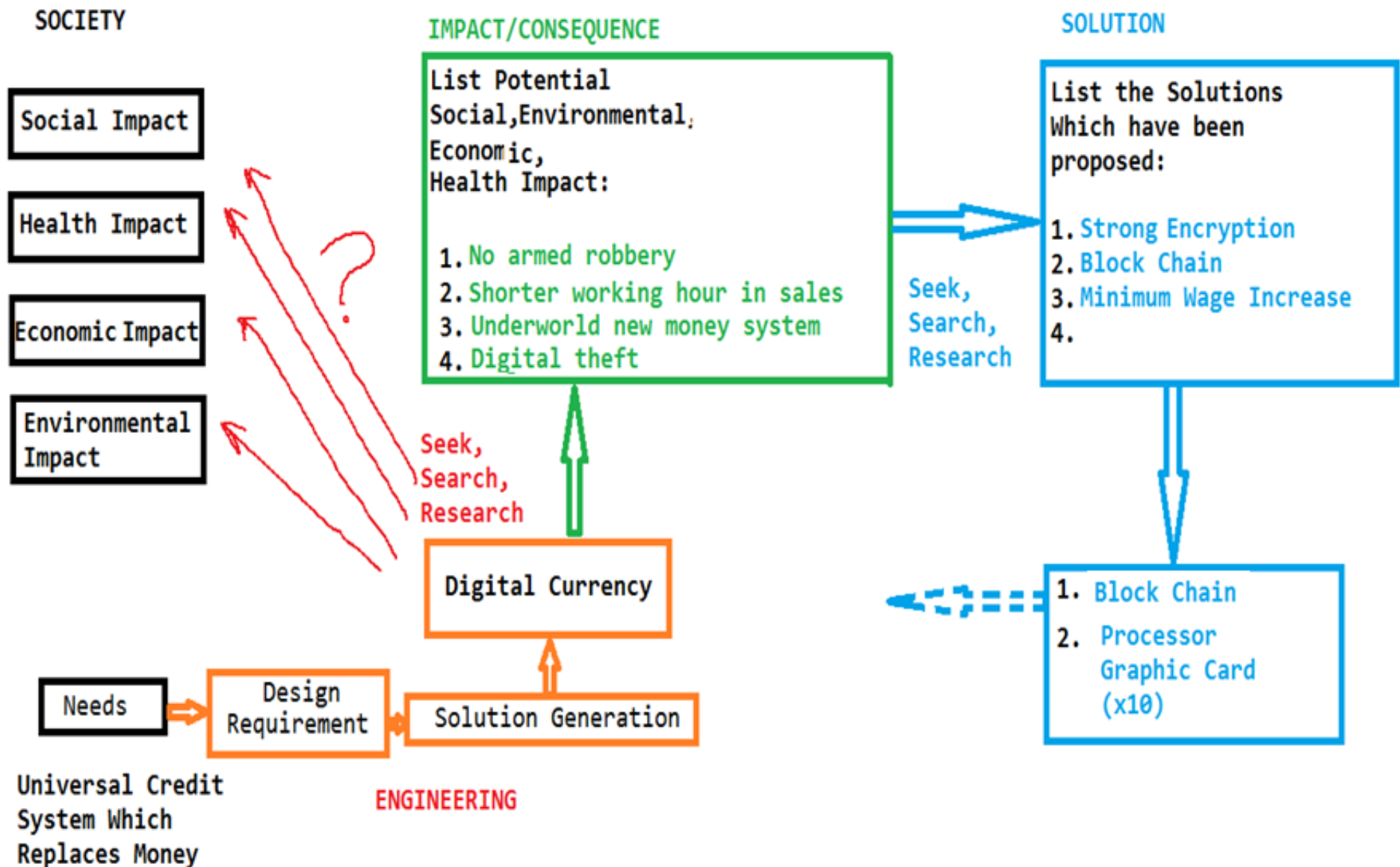
Practical Checking Chart for Citizen Engineers – Example p1



Practical Checking Chart for Citizen Engineers – Example p2



Practical Checking Chart for Citizen Engineers – Example p3



Citizen Engineer Lab - Individual Assignment

- Lab Report (a form provided) Writing:
 - Exercise the **practical chart** for socially responsible engineering
 - Specifically, anticipate the **unanticipated impacts** of the product
 - Find solution to mitigate the possible **unanticipated & undesired** impact of the product
 - Choose a product from the list below
 - Or pick any product of your interest for the assignment

- Example products

- Smart phone
- Single serve K-cup pod coffee maker
- Electric vehicle
- Synthetic Turf (for football or soccer field)
- Sunscreen or skin cream with nanoparticle ingredients



- Lab Report Submission due:

- 8:00pm Tuesday April 5 ([Check web site for more details](#))

- Lab Report Submission due: 8:00pm (T) April 5

(Socially Responsible) Citizen Engineer - Lab Report

| | |
|---|--|
| Date | |
| Name | |
| Section A: | |
| Name of the product: | |
| Section B: | |
| Intended and Desired Functions of the product: | |
| Section C: | |
| (Potential) Unintended and Undesired Impacts | |
| On society: | |
| On Human/Animal Health: | |
| On Environmental: | |
| Section D: | |
| Solutions to Mitigate the (potential) unintended & undesired Impacts | |
| Solution 1: | |
| Solution 2: | |
| Solution 3: | |
| Section E: | |
| Additional Cost for Implementing one of the Solutions of Section D: | |
| Section F: | |
| Economic Trade-Off - Environmental/Societal Cost if the solution of Section E is not implemented: | |
| Section G: | |
| Concise conclusions: | |