Technology somnambulism:

Adopting a new technology without knowing its complete impact

Technological somnambulism is a concept used when talking about the philosophy of technology. The term was used by Langdon Winner in his essay Technology as forms of life. Winner puts forth the idea that we are simply in a state of sleepwalking in our mediations with technology. This sleepwalking is caused by a number of factors. One of the primary causes is the way we view technology as tools, something that can be put down and picked up again. Because of this view of objects as something we can easily separate ourselves from we fail to look at the long-term implications of using that object. A second factor is the separation of those who make the technology and those who use the technology. This division causes there to be little thought and research going into the effects of using/developing that technology. The third and most important idea is the way in which technology seems to create new worlds in which we live. These worlds are created by the restructuring of the common and seemingly everyday things around us. In most situations the changes take place with little attention or care from us because we are more focused on the menial aspects of the technology (Winner 105-107).

**Determinism** means being able to predict the outcome by understanding the technology

Soft determinism: who gets to make the decisions about technology and who gets to decide who uses it – Winner

**Social construction of technology:** its not that the designers have biases, the fact is that there are so many different factors in play, you must look at the technology, who uses it, who gave access to the technology. This aspect puts more emphasis on the social aspects of technology. Example are the bridges in New York. The height of the bridges are not as relevant compared to who uses the overpasses, who built the overpasses, who has access to the overpass.

Social constructionism: states that its not technology shapes society, its society that determines how technology looks like. The most successful technologies are the technologies that society chooses.

Important notes:

* Technology assessment and technology policy are important to look over.

Why is technology assessment important in democratic societies?

* Triple helix model of technology policy (pg 9)
* One of the underlying themes is the mythological approaches we have are inefficient
* Technological optimisms: we have power of reasoning as humans, so we should use it to improve our societies. Technology is a positive force of change that generates progress, wealth (technocracy: technical progress is human progress, meaning that technology should continuously progress and improve- the better our technology the better socially advanced we are), equality (sociopolitical), determinism (we can create technology that improves aspects of society and environment, and we can create technology that destroys aspects of society and environment), romantics (biomimicry, technology that integrates humans back into nature with no waste)
* There are 4 moments in technology assessments: early paradigms, OTA, PTA, and CTA

**TECHNOLOGY**

* Tools – apparatus
* Method
* Technique (ability to be developed)
* Organization – organize tools & techniques (schools, factories, churches)

**NETWORK**

* Connections (people and/or things)
* Sharing of resources

Chimpanzees did not develop comprehensive system with their tools

* Rudimentary
* Not a technological species

Superfluous technology

* Not needed

Technology changes society and us

* Have social meanings
* Embody values and choices

Cargo cults – magical thinking to technology

* Copying science but not really knowing what they’re doing

If you don’t have insight into technology, you don’t really know what it is for

* You must learn how to use even the most basic form of tools, until it becomes second nature

Christian stones: fall from Eden, town of Babel, Greek mythology: Prometheus

* Skeptics of the power of technology
* Technology disrupts social order – HIEARCHY

**Attitudes of technology:**

1. **SKEPTISISM (ancient):** From religion, myth, rigid societal perceptions of norm – science and technology are trying to force the knowledge that belongs to Gods, if you disturb it, you will be punished. Discouraged innovation.
2. **OPTIMISM (enlightenment):** technology was possible means by people. It should be developed but for the improvement of society, not personal gain = progress. Technology created under certain set of values for the betterment of society.
3. **UNEASINESS (technology, romanticism):** adversarial progressive instead of romantic. Technology was beginning to give a lot mre power to a set of people (industrialists). Technology stopped being a means for common good, and started being means for personal wealth and personal gain. Society was being driven and managed be these people who were greatly benefitted.
   1. each has outlook, has view on:
4. **Value scale**
5. **Politics**
6. **Society**
7. **Environment**
8. **Progress**

**Technological utopia vs. Dystopia 🡪** generally engineered human beings, unachievable hierarchy, strong, tall, and gorgeous man with ultimate steps

**TECHNOCROMANTICISM**

* First aspect of romanticism:
  + More technology = more progress
  + Romantics opposed this as they did not believe that technology alone were the basis of progress – need more regulation
* Second aspect of romanticism:
  + Respect to environment

**HISTORICAL CONTEXT**

**Enlightenment:**

* Free themselves from 3 sources of oppression:
  + Monarchy
  + Church
  + Socioeconomics

**CONCEPTUALLY**

* People valued technology instrumentally
* Enlightenment: technology is only progressive if it is for the good of the people and liberated people from the three sources of oppression

Humans value things in two ways :

1. Instrumentally (i.e, money, car, etc…)
2. Inherently- value it for no reason/ cannot explain why (i.e, family, love, friendship, etc…)

We can value things bot instrumentally and inherently (i.e, I value my mom inherently because she is my mom, but I value her instrumentally because she buys me things)

**MANIFEST DESTINY**

**Technocratic:** technology being for inherent good

**Romantic:**  not all science and technology is good

**Counter enlightenment**

* Does improved technology mean progress?
* Progress toward what? We must evaluate the intention of the technology. We need to democratize science and technology

Technology determines structure of society:

1. Hard technological determinism (Karl Marx T🡪S):
   1. Society is nothing more than the technological infrastructure
   2. 100% of technology fully shaped society and society must abide
2. Soft technological determinism (T🡨🡪S):
   1. Technological momentum
   2. Technology has powerful role in society by shaping social forces (how you conceive yourself, how you communicate with others)
   3. Momentum says that in the beginning a technology is malleable. We can shape it as we want, but once it grows it starts to influence society

**SOCIAL CONSTRUVTIVISM:** two sides of same coin with technological determinism

**“All the way down”** – Flip of Hard Technological Determinism

* Technology is nothing more than the social values from which it is concerned
* Walmart:
  + Blame this technology for introducing this kind of unsustainable economy

Social order shaping technology

* + Walmart is not shaping the world according to its own creed, its born due to the social values of the communities
  + American capitalism: value the consumer over the worker
  + Rights of individual over collective

**Co-constructivism -** Flip of Soft Technological Determinism

* Most common
* Social choices that exist over some technologies, but some technologies
* We always have a choice

**All the way down 🡪 Co-constructivism🡪soft technological determinism🡪hard technological determinism**

Do artifacts have politics?

Discuss the three ways, with evidence, these artifacts may have politics

1. Shaping of social order:
   * Arguing against “all the way down”
   * Technology does shape our social order sometimes

Example: moses engineering of NYC- reduced height of the bridge to limit burses (black people) from whites; racism was integrated into the city.

Technological choices made long ago continue to shape NY and its boroughs today. Technology is exerting an influence. (even though Moses is dead)

Example: handicap services in public transportation and buildings

Technology shaping social order🡪 issue of equality. Not about an “evil person” like Moses.

1. High Compatibility

Example Solar power: it is decentralized

* Democratizes and individualizes
* In charge of own consumption and own production
* It can be centralized hence why it is necessary

Legitimate non-technical critiques of science and technology

HTD🡪 nuclear power? Hierarchical, non-democratic, highly centralized form of government (essentially it’s forecast therefore to use nuclear power is essentially engaging in forecast government), highly militarized (high level of security), etc.

1. Necessarily compatible with politics
   1. Nuclear power

Q: example of high compatible vs. necessarily compatible with politics:

A: difference is logical necessity

Loss of skills due to factories/mass production “deskilling”

* Lost with industrial revolution due to mechanization
* Shift from blue collar to white collar
* New managerial class

During 20th century, there is a reskilling of blue collar workers due to mechanization of white collar: “pencil pusher”

Cultural lag: society not knowing what to do with technology; not keeping up

* Society gets blamed for not keeping up with technology when disaster strikes. It is never the technology’s fault
* Cultureal lag assumes that if technology was at the helm , everything would be ok. (technocrats given power)

Question should not be whether a certain technology is good or bad, but rather should we bring this technology into our lives.

Technology does not do bad; it is the person behind it

* NAZI Germany: gas chambers, concentration camps, etc.
* Someone defined best most efficient technology to eradicate Jews
* Critique of efficiency of technology

**DO ARTIFACTS HAVE POLITICS?**

Certain technologies embody powers

A new machine is not neutral; it embodies an intention of its conception

Moses overpasses: low so that a bus may not fit

* Promotes racism
* Political statement about class and power

Nuclear power: must be kept in place by person of authority to protect it

* Centralized power structure
* Can be militarized: hierarchical structure
* Actively exclude individuals from decision process

**TECHNOLOGY AND GENDER**

**Intersection of Gender – Hopkins**

Sex🡪 biological (male or female)

Gender🡪 social construct

* Expectations of behavior towards men and women

Separations of Genders:

* Behaviour
* Expectations
* Work

Subversion of division of power in household

**Essentialism:**

* Gender is innate
* Nature cannot be changed
* Everything is predefined
* Culture cannot change gender
* Gender is purely biological

**Social constructivism:**

* Society shapes gender
* Representations change historically and culturally
* Attributes everything to nurture
* In its pure form, over states the role of culture

\*Establish a middle ground between above (essentialism, social constructivism)\*

Do artifacts have politics?

* Values get embedded into physical objects
* Technology played a role in emancipating women and other racial groups

Does technology diversify or universalise?

Although there exists a lot of diversity in product, the processes used are the same (i.e, food court)

Puts forth appearances of diversity under cover of marketing is shallow

Construction of our identity:

* + - * Gender
      * Individuality
* We are demonstrating how we are by showing what we think we are
* Our identity is created by making choices about our style, lifestyle, food, etc.

Massification and standardization of culture only asserted itself after industrialization

Cultural massification/homogeneity:

* Technology was the driver

People want to compete with each other, they want to be different

* They hate the idea of having the same thins and displaying them in the same way

Consumers require diversity and production systems allow for their change:

* More choice exists, but it is more or less established

**GLOCALIZATION:**

* Global + local
* Big globalized entities adapting to local tastes/traditions/designs etc.
* i.e, McDonalds:
  + spaghetti in Italy

**INIDIVIDUALISM**

* Production
* Consumption: 🡪 Conspicuous Consumption: Status
  + Buying clothes
  + Where you eat
  + Going to the opera

Being different comes with a price

Time Bank:

* Sharing resources and skills
* You provide four hours of work and you can have four hours of work back

**APPROPRIATION -** When users of technology make it their own

**Technological Missionaries –** People who believe that because a technology exists, they can simply bring it everywhere to make things better.

**Cultural Appropriation**

* We are integrating culture into our society by pillaging the cultural effects of other societies
* Assimilation of culture
* Example: banning headdresses from music festivals: degrading the meaning of culture.
* Cultural appropriation depends on the scenario: depends on the oppression of the culture one is appropriating

**Commodification:** appropriate something and then you try to package and sell it to make money

Selling a Native American headdress as a party favor = cultural appropriation and commodification

**Invention of tradition:**

* 18th, 19t century during modernization
* People tried to sell their own ancestral identity
* Industrialists in England and Scotland tried to sell the ideas of tartan (crisscross fabric pattern) representing family clans
* Tartans erected in 19th century

**Is technology predictable?** There is no way to predict whether a given technology will be successful

**Technological Prognostication:**

* The evolution of technology (not like a species)
* Predicting the future of technology
* Follows a certain path that is completely unpredictable
  + Too many variables

1. **INVENTION/PREDICTION** (**\*** any kind of change (economic, etc.) hinders the possibility of prediction\*)
   1. Something entirely new: a new technology
   2. Not related to anything else
   3. Possibilities of technologies: dreams and science fiction
   4. Example: AI (artificial intelligence) a true AI
   5. Deals with the implausible, but not always the impossible
   6. Trying to put an entirely new technology in the context where it might exist
   7. DREAMERS
2. **INNOVATION/FORECASTING** 
   1. Trying to adapt to already existing technologies
   2. Making changes to what already exists
   3. If social conditions are stale, forecasting becomes better and more reliable
   4. It is easier than prediction because one may look at prototypes etc.
   5. This is business of engineers and consultants (no need to be a dreamer)
   6. Based more in concrete evidence
   7. However, forecasting can go badly
      1. Example: IBM who completely dominated the market but did not envision the transition of a new technology to completely revolutionize their business
3. **DIFFUSION/PROJECTION**
   1. About trends
   2. About understanding/creating trend to see what the market will be
   3. Combination of economics/marketing and design
   4. “Cool Hunting”: youth culture, seeing what is cool based on the trends adolescents buy into

Any form of prognostication is a narrative for the future:

* What will come
* What will happen

Consumers hold the power

Markets are not necessarily driven by technology alone

* Driven by desire
* Driven by consumer priorities

Technologies become appropriated into technologies

Some technologies are used in ways that are completely different then its intended purpose.

Factors of technology rise:

* Does it give rise to new, unexpected economic factors
* Does it give rise to dynamic technologies that are based on it

Diffusion of innovation follows the following curve:

Early Adopters

Technological prognostication is like astrology:

* Everyone reads their horoscope every once in a while, but not many truly believe in it 100%
* Similarly, prognostication is used, but it is not a sure science: one cannot predict future technologies

**TEXT: beyond engineering (choices)**

* Unpredictable events that shape a path that technology takes
* Modern economic theory states that there is rationality in choices:
  + Rational choice theory (RCT)
  + Individuals make their choices by weighing pros and cons and then deciding
  + In order to make a rational choice, one requires information (data)
* Unpredictable events alter the course of technology by shaping/changing our choices

**TEXT: Public Policy:**

* + laws are reformed in public policies
  + regulations
  + set of rules that pertain to a given subject they are put in place in order to solve a given problem

2nd wave of adopters that really spread the technology

* + needs to be coherent with the rest of laws and regulations but you need a set of input from specialists related to a certain field
* Life is framed with a set of regulations which are put in place for a given purpose
* Regulating agencies and governmental structures are put in place to uphold regulation and public policies
* Public policy is made by the interaction of governing bodies:
  + Require input from corporations, think tanks, private individuals, professional organizations, etc. (experts)
* Bureaucracy and public-policy making systems are seen as inefficient due to the way they are run.
  + But people cease to realize that this mechanism requires time and information from specialized individuals

**DECIDERS:**

Public servants

Politicians

**STAKEHOLDERS:**

Opinion making

**COMPLAINTS:**

Policy proposals

Recommendations

**DECISIONS:**

Public policy

**AFFECTABLE FACTORS:**

Political priorities

Budget availability

Stakeholders are interested in decisions because it affects

their work.

Public mistrusts experts because: Authority (legitimacy)

|  |  |
| --- | --- |
| **EXPERT LEGITIMACY** | **POLITICAL LEGITIMACY** |
| Derived from professional expertise   * Independent * Conflict of interest * Bias * Risk | Derived from the public   * Appeal to emotion * Reference to “gut” feeling as opposed to logic |

Science communication is difficult because one cannot simply rely on facts and numbers. This opposes political communication

Science communication🡪 sticks to facts

Political communication🡪 can afford to stride into territory of emotion and manipulation

In order to effectively communicate science to a non-technical audience, one must become empathetic and understand the multiple models of policy-making.

**TECHNOLOGY ASSESSMENT**

A set of techniques that allow us to look into the decisions of effects of technology

Very useful tool to make sure that political deciders have best info needed to make decisions on technology

Ideal world: assessment would gather info from everyone involved in tech making decisions

**FUNCTIONS (1-8):**

1. Aid decision making, strengthen decision making capabilities of policy makers
   1. Providing better sources of information
2. Policy score: support short and medium terms of policy making
   1. What kind of regulations should be put in place
   2. What kind of tech models exist
   3. Strength policy-making with better info
3. Contribute to long-term policy
   1. Supply info on what’s in technological horizon
   2. Which technological are in development
4. Early warning: anticipating risk
   1. Providing some options on how to minimize risk/danger by having early warning
5. Provide knowledge, decision making capabilities, to stakeholders and citizens
   1. Creating bureau/departments that would provide info to other stakeholders (other than political system)
   2. Or also society at large (citizens)
6. Try to accomplish design tasks by accompanying useful design applications
7. Encouraging general public to accept technology
   1. Creating awareness generating information could educate the public in making informed decisions in technology-making
8. Promote social responsibility among stakeholder, developers and policy makers

Technology assessment was initially set up to assist political government

Design

**TA**

- Stakeholders

- Society

Parliament

A method to analyze and direct technological advances

More information = better decisions

WANT: advisors that are as neutral as possible (for policy making advisory committee)

**PARADIGMS (4)**

**Classical:**

* Embedded this notion that early warning system was needed to understand 2nd wave of technology
* 2nd sense of early warning: provide insight on social effects of technology
* Tried to address mostly functions 4+7

**Office of Technology (OTA)**- parliamentary model🡪 office of technology association model

* Office of technology assessment in America attached to house of representatives (1972-1993)
* First major technology assessment office in the world
* Relates to functions 1-2-3-4
* They were tested to evaluate the impact of large scale technological projects
  + What are best policies to make this happen?
  + What should we do/not do?
* Consisted of inner-team of specialists external advisors
  + Everything needed to be reviewed by scientists

Idea was to link political system with scientific system

**Public Technology Assessment (PTA)**

**Constructive Technology Assessment (CTA)**

Did not just rely on connections with parliament, but relied heavily on connections with society

**PTA**

* Tried to emphasize functions 5, 7, 8 while contributing strengthening policy-making
* Did not require direct funding from the government. They were contracted by government but not under its wing.
* More legislative independence
* Actually concerns everyone in society, so required more effort and contribution from everyone

**CTA**

* More participatory
* Constructing technology
  + Design, etc.
  + Other aspects other than policy making
* Creates system where institutional choices, societal concerns and political policies work in tandem
* It does not assume that info provided is neutral
  + It needs people to bring their own views and importability come into the conversation

Bridges gap between

PTA 🡪

Society

TA: Technology Assessment

PS: Political System

political body and society

(scientists, citizens,

stakeholders, etc.)

**COLLINGRIDGE DILEMMA**

1. Difficult to forecast future of technology (**prognostication)**
2. Only one thing more difficult than predicting technology’s changing it once it has been implemented. (technical momentum)
   1. **Classical +OTA** models broke down because could not ensure neutrally/all information
   2. **CTA + PTA** do not solve neutrality issue, just try to implement a democratic solution
   3. In Europe, CTA and PTA are still alive
   4. STOA like OTA for European parliament
      1. Not as committee focused as OTA

**Do we need Technology policy?**

**Technology Policy:** actions by government aimed at assisting or stimulating delivery of competitive goods and services

What’s wrong with DEP’N?

* Technology policy is not just about regulation
* Technology policy is government responsibility
* Government steps in to bridge gap between society’s inefficiencies
* Technology policy makes it seem like its only about technology when it’s not; it’s about how to set up entire policy making system to not fall behind
* Technology policy is not just about delivering of goods and services its about societal organizations

**RCT 🡪** when given true and complete info, people will make rational decisions

* Classical/Neo-classical economic theory encompasses RTC

**Schumpeter:** (economics)

* An economist: wrote a book about how innovation comes up in society
* Creative destination
  + Expression to explain how innovation occurs
  + Each innovation replaces something (i.e. creative destruction, e.g. UBER replaces taxi)
  + Makes labor market more useful: take out old skills, bring in new skills

**Von Hippel:** (economics)

* Innovation is about the ensemble of society
  + It does happen in a vacuum
  + It exists because some societies make it happen
* Need to introduce a more communitarian approach to innovation
  + The benefits of innovation should be recycled to the people

**4 FUNCTIONS OF TECHNOLOGICAL POLICY**

1. **Climate setting (climate for business):**
   1. Lower taxes corporations
      1. Canada tries to attract more investment
      2. Tax policy but also test policy
   2. setting business climate in countries
      1. Interplay between these policies (tax, labor, education, etc.)
      2. try to create a hospitable environment for these corporations
   3. innovation occurs in societies where work force is highly skilled
   4. climate setting🡪 trying to bring all these factors together

E.g. flex security: balance welfare state with neo-classical economic theories innovation

1. Flexibility: deciding who to hire and fire

2. Security: those fired are recycled in terms of skills and put back to work quickly

1. **Surveying:** 
   1. Trying to prognosticate
      1. Also seeing what the competitors are doing: assess global situations
2. **Coordination:**
   1. Try to make economic and technology agents come together to innovate together, instead of pursuing their own agendas.
3. **Gap Filling:**
   1. About the way government can step in and “fill the gaps” in the economic and technological system
   2. Instead of leaving everything to the market, the government steps in
   3. Stimulate economy
   4. 3 approaches:
      1. Direct🡪 takes charge of a situation
      2. Indirect🡪 does not take charge of a situation
      3. Long term🡪 cooperative gap filling

e.g. arc net predecessor to internet (gap filling)

**TRIPLE HELIX MODEL:**

* Government funds research in *universities*
* Universities create innovation: the intellectual property will be spun off into *private sector*
* Private sector also funds research

Intellectual property must be patented, licensed and manufactured

**GLOBALIZATION**:

The interconnection of global networks

**Global economy:** economy depending on global/international community

* Economic interlocking creates imbalance because more influential countries give to others in forms of goods and services

e.g. “Leap frogging”: skipping ever a given stage of technological development with the hopes of avoiding a detrimental social and technical impact.

e.g. of how newer technology can help avoid bigger negative impacts of technology innovation by avoiding intermediate steps that are inefficient

**DEMATERIALIZATION:**

1. Quantity of input economy needs requires less materials to produce same thing (more efficiency in material consumption)
2. Growing dependence of our economy of human capital (human knowledge) skills (in order to achieve that we need to invest more in human knowledge)

A lot of main companies deal in ideas: research, design, sophistication to technology/economic system) reduces dependency on material goods

**GLOBALIZATION:** the inter connection of global networks.

**GLOBAL ECONOMY:** Economy depending on global/international community.

* Economic interlocking creates imbalance because more influential countries give to others in forms of goods and services.

*Jose Goldenberg* → **LEAP-FROGGING**: Skipping over a given stage of technology development with the hopes of avoiding a detrimental social and technological impacts.

e.g.: of how newer technologies can helps avoid bigger negative impact of technological innovations y avoiding intermediate steps that are inefficient.

**DEMATERIALIZATION:**

1. DIRECT: Quantity of input economy needs less materials to produce same thing.
   1. More efficiency in material consumption
2. TRIPLE\_HELIX: Growing dependence of our economy or human capital (human knowledge) skills.
   1. In order to achieve that we need to invest more in human knowledge.

* A lot or main companies deal in ideas: research, design, sophistication to technology (economic system) reduces dependency on material goods.

**SOCIAL JUSTICE:** building capacity; what technology they need and require instead of giving them something they don’t need.

**APPROPRIATE TECHNOLOGY**: addresses (directly) need of uses and does not want development. Make use of available resources/use local trade skills.

**LOCALIZED vs GLOBALIZED** → trying to translate skills in contexts that have very little to do with context that are so different from what you’ve learned in.

e.g.: Nicaragua

**LEAPFROGGING:** Skipping over unsavoury aspects of technology.

* ADVANTAGE: presents a better choice of technology. Allows developing nations to avoid worst parts of technology.

As economies develop/grow → more energy input is required.

* Technology becomes more efficient
  + Need for resources is less
  + Application of energy becomes more efficient/less input needed
  + Footprint is reduced after reaching peak levels in developing nations
* Countries that develop later never quite reach the same footprint/peaks that already developed countries have already undergone.
* Leapfrogging should be put in place with policies that promote the right kind of its application.
* More profitable to use older technologies because they are cheaper, they are not the most ecologically or all-around efficient.
* Open trade/clear policies/commitment to current generations technologies help
* PROBLEM
  + Trying to extract more out of old technologies with cheap labour allows us to offset costs of using new technologies with properly paid wages.

**ESTABLISHED WISDOM:** Exchange expensive labour with cheap labour instead of investing in newer more efficient technologies. (i.e. making products in China instead of Canada

Establishing correct environment for technology growth.

*Emmanuel Kant:* Humans should be treated as a means in and of itself, not a means to an end.

Engineer’s disease → Expert’s disease

**BIOMIMICRY:** Technology and industry mimics nature. In nature there is no waste.

* Technology Fix: Technology trying to solve a problem with changing things. Add to existing technologies to eliminate waste.
  + Appropriate technology
  + Easiest solution
    - They solve the problem now, they do not think long term
  + CRITICISM → Appropriate Technology Movement: Focus more on scaled-back technology applications that are a better fit with biophysical + psychosocial.
* Technology Ecology: Not to fix problem. To mimic nature and the sustainability. No waste.

Aim to reduce toxic output to the point where ecological system → Human + ecological system

e.g. Domesticating animals

As humans approach on ecological systems, we need to change them to echotechnological systems. *Thomas Hughes*

Metro Resources have Limits → Earth is not enough to sustain us if everyone on earth lives like an American.

**HOW TO ENSURE SUSTAINABLE DEVELOPMENT**

* Renewable energy reduces the amount of inputs and outputs
  + Better technology
* Reducing our energy/resource intensity 1/10k
* Reutilization → ensuring more efficiency

e.g. Nuclear technology:

* + Using 50 year old technologies
  + Update procedures
  + Reuse/recycle waste

**ABATEMENT TECHNOLOGY:** Try to minimize by reducing the amount of noxious gases → Clean up.

**POLLUTION PREVENTION TECHNOLOGIES:**

* Biodegradable materials
* Clean products (biomimicry)

Design process takes into account the desirable outcomes of not needing abatement

1. Sustainable
2. Pollution Prevention
3. Abatement
4. Remediation

These are the four horsemen of environment; order of “Perfectness”

e.g. Dupont synthetic materials for Teflon

**TECHNOLOGICAL PARADIGM:** Design challenge

**INDUSTRIEL ECOLOGY:** Exchange of materials where waste stock of one industry becomes feed stock of another.

**SCIENTIFIC PARADIGM** *Thomas Kuhn*

**APPROPRIATE TECHNOLOGY** *E.F. Schumacker*

**DEMOCRACY IN ENGINEERING**

Political system → Political legitimacy

People hold power in system set up as a democracy

* Cannot rule without consent
* Citizens vote plus participate

Political system → produce decisions

**THEOCRACY:** Legitimacy does not flow from the people, but god.

**TECHNOCRACY:** Legitimacy stems from technological expertise.

**CITIZENS:** Ancient Greece

* Private: Rome, your own property (economics)
* Public: occurred in courts, assemblies …
  + Politics: Everyone could participate

**Expert vs Lay person** (General public/citizens)

* Better science communication in order to bridge expertise and lay people.

In order to make an informed decision, one needs information:

* Media needed to relay information
* Ancient style (direct democracy) is not feasible due to great population in cities (millions)
* We have representative democracy because media acts as buffer to relay information.

**RATIONAL CHOICE THEORY** (economics): perfect citizens is one who takes initiative to make best decision.

A democracy makes a lot of decisions not from an informed state → They come from gut feeling or ideology.

**CRISIS OF LEGITIMACY:** Growing gap between lay people and experts

Ex. Panama releasing data of $36 Trillion in tax haven, culprits around the world, therefore consumption is ubiquitous. Unites us all

**CONSENT**

* Nuclear Waste: We act as proxy’s for the future generations. The future generations have no say; they cannot give their consent.

Our consent (even if we vote) is useless for future generations

* Future Generations: Why did past generations make these decisions and now we have to deal with them.

Future generations have no regrets because they are not born yet because they do not exist.

Certain problems

* Nuclear
* Climate change
* Genetic mutation
* And more

Cannot be avoided for future generations

Informed consent is not a thing for future generations. They cannot provide it and we have no model to accordingly project what 300000 years in the future would look like.

**ETHICAL FRAMEWORK:** more rigid, more concrete aspects to follow, more restrictions. Lays out basic ethical laws you are trying to preserve.

**SCIENCE COMMUNICATION:** Key to connecting lay people (public) with science and technology.

1. Deficit Model: Experts → Info →Public
   1. Only in one direction, there is no feedback
2. Dialogue Model: Experts ↔ Info ↔ Public
   1. Encourages scientists to listen to questions. Makes science “dump down”. Better communication but not better science.
3. Empowerment
   1. Giving people the tools to challenge certain technologies and science.