

Global Environmental Policy 2015
The University of Tokyo

Environmental Management

-A Socio-technical Approach -

Dean Poland
(aexdlp@nottingham.ac.uk)

CONTENTS

Part 1: **Concept**- What is a Socio-technical Approach?

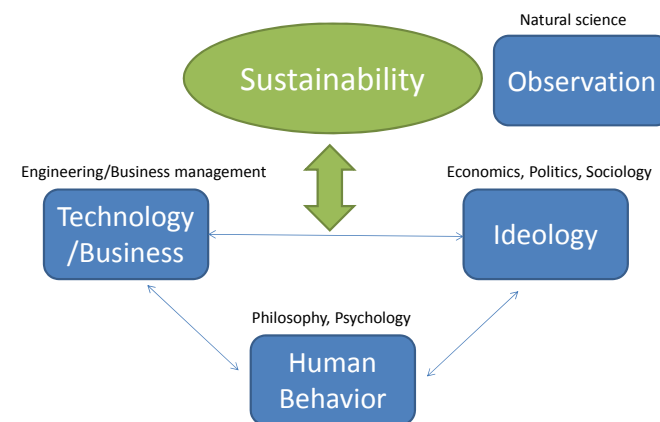
Part 2: **Application**- Sustainability of Electronic Products

Part 3: **Practice**- Service-Oriented Product innovation (SOPi)

A Holistic Vision

- **Environmental Problems can not be solved only through Technological Innovation**
- **Environmental Problems/Solutions must be seen in the CONTEXT of all areas of human life**
ex. **Socio-economic, Psychological, Philosophical**

What is Sustainability?



Part 1: **Concept**

**A SOCIO-TECHNICAL APPROACH:
MULTI-LEVEL PERSPECTIVE (MLP)**

MULTI-LEVEL PERSPECTIVE

SOCIO-TECHNICAL
LANDSCAPE



Broad factors that indirectly influence a variety of regimes, ex. environmental, social, economic, philosophical factors.

SOCIO-TECHNICAL
REGIME



Specific systems: shared cognitive routines, ex. **transport** regime, **recycling** regime, **product** regime. Often stops engineers looking beyond their discipline.

NICHE
INNOVATION

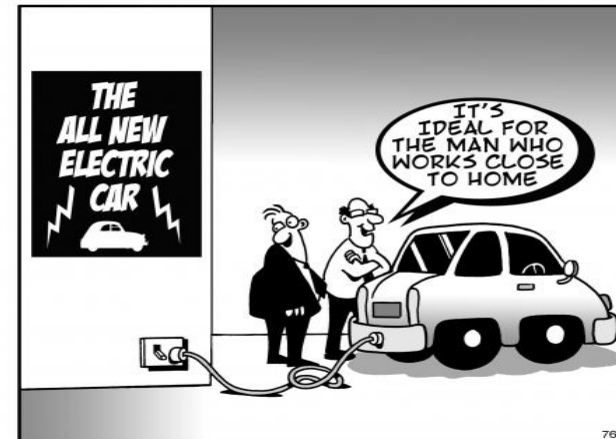
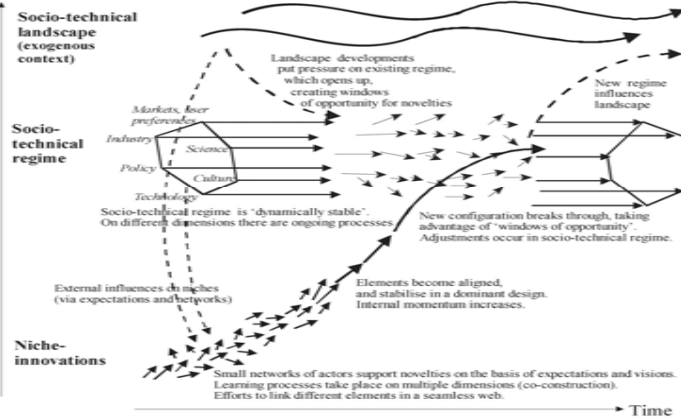


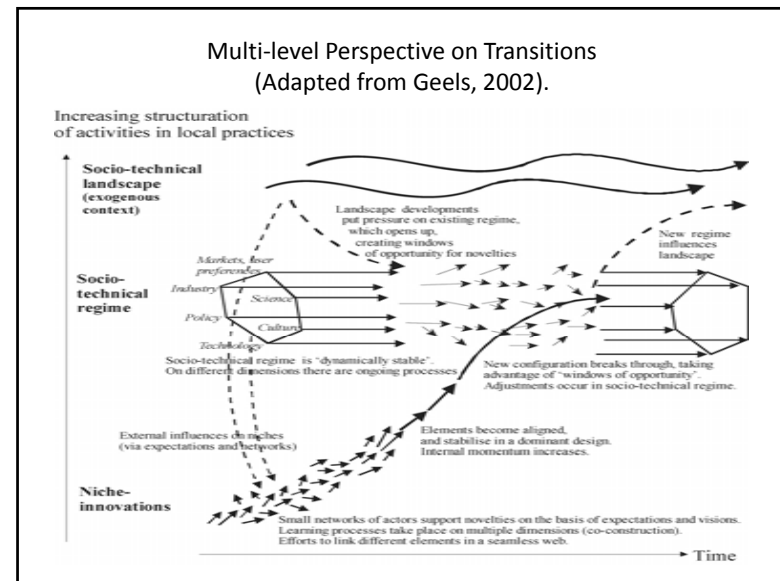
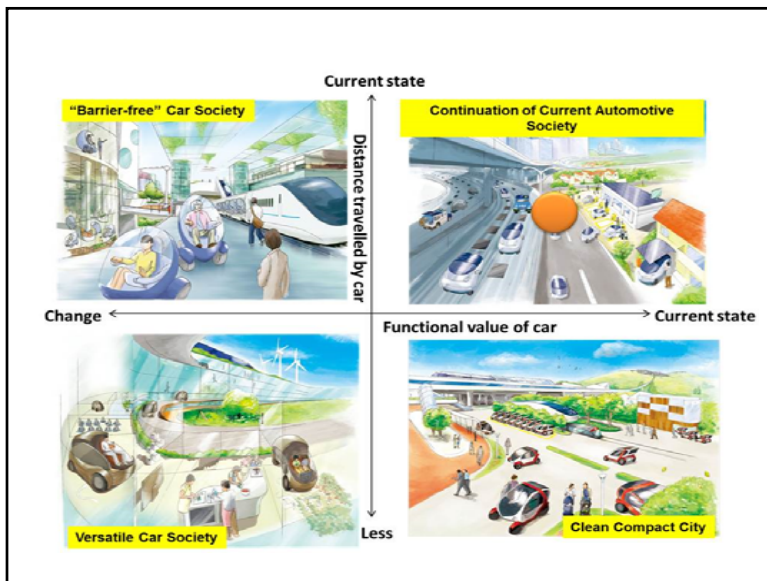
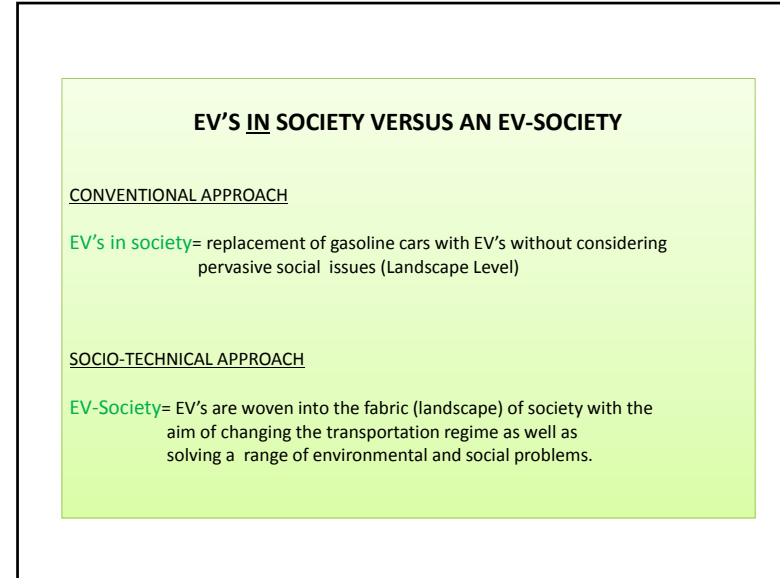
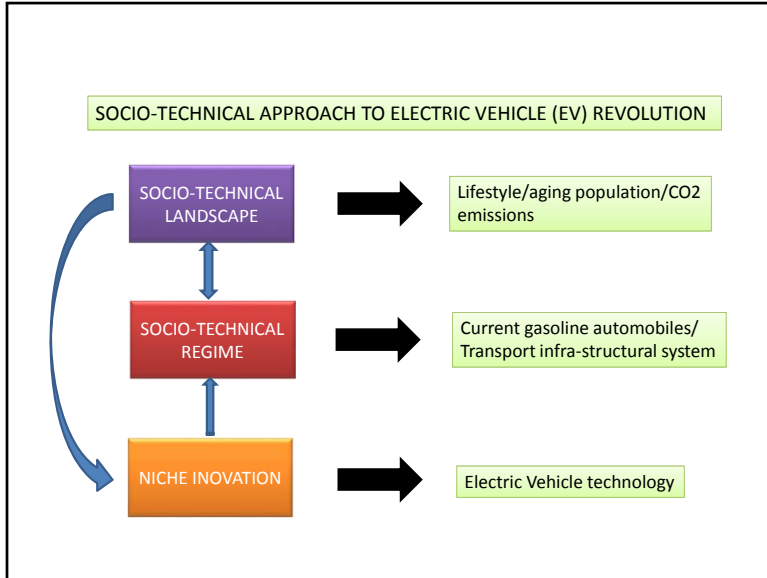
The place where radical ideas/ technologies emerge.

Multi-level Perspective on Transitions

(Adapted from Geels, 2002).

Increasing structuration of activities in local practices





Part 2: **Application**

A Socio-Technical Approach to Improving Sustainability of Electronic Products

A Social-Technical Approach to Improving Sustainability of Electronic Products

Step 1

Analyze Issues Related to **REGIME** of the System or Product

Step 2

Consider Possible **LANDSCAPE** Issues

Step 3

Create an **INNOVATION** that considers both **REGIME** and **LANDSCAPE**

REGIME

- Product Design
 - Product Manufacturing
 - Product-usage
 - Product End-of-Life
- Most Challenging Issue-

The 3 R's

- *REDUCE*

- *REUSE*

- **RECYCLE**
(Most complex challenge!)



- REGIME: Key Issues Lying Behind Current Recycling Systems of Electronic Products**
- 1-Recycling QCD
 - 2-Recycling and Energy Saving Conflict
 - 3-Invisible Flow

RECYCLING QCD

Q= QUALITY Quality and Cost of recycled materials must be

C= COST competitive with virgin materials.

D= DELIVERY Recycling process must keep up with consumer demand.

MANUFACTURING= QUICK RESPONSE DELIVERY

Recycling Systems Depend on **Push Mechanism**
(i.e., amount of disposed and collected products.)

Manufacturing Systems Depend on **Pull Mechanism**
(i.e., market needs/demands.)

=Mismatch Between:

PUSH MECHANISM/PULL MECHANISM

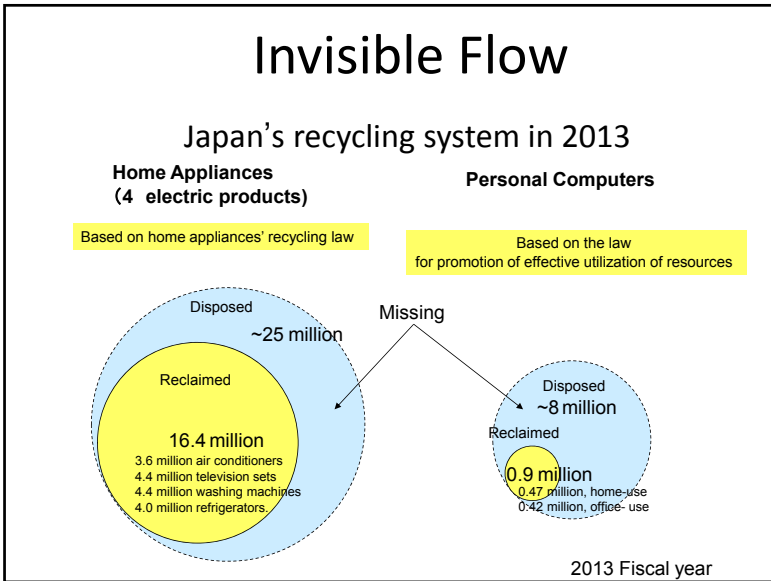
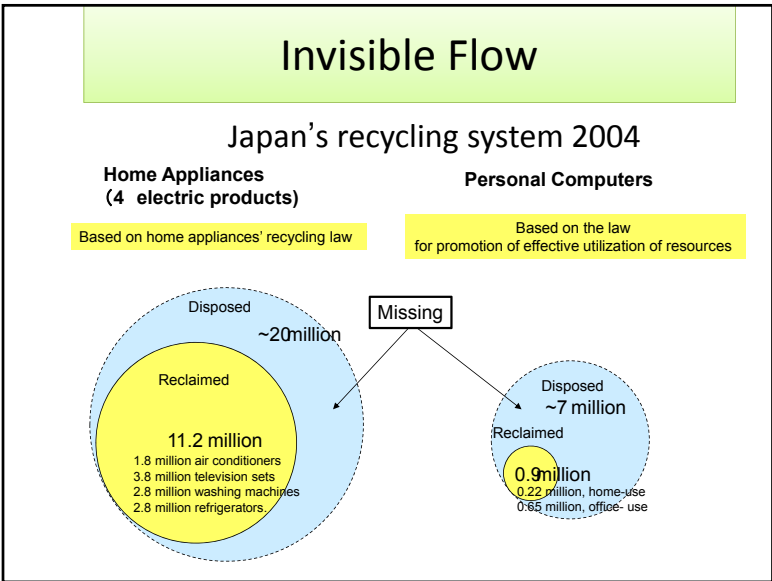
The “Dropped Sausage”

Can you pick it up and eat it?

The illustration shows a silhouette of a person in a business suit crouching on a green patch of grass. They are reaching for a large, pink, segmented sausage that has fallen from a building labeled 'Supermarket'. The word 'NEW' is written in red above the sausage.

OUT OF MANAGEMENT

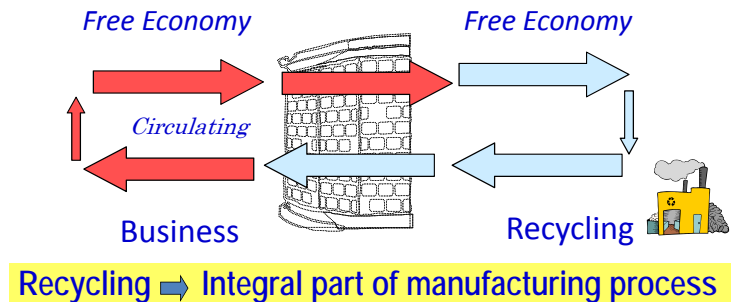
- Products have not been “quality managed” during Usage-Stage
- Nobody has information regarding the quality of products when discarded (End-of-Life stage)



Break Down the "Wall"

- Recycling Systems and Manufacturing Systems must be integrated
- Therefore the QCD of a Product must be controlled/managed

Well-Matched Economic System (barrier broken down)



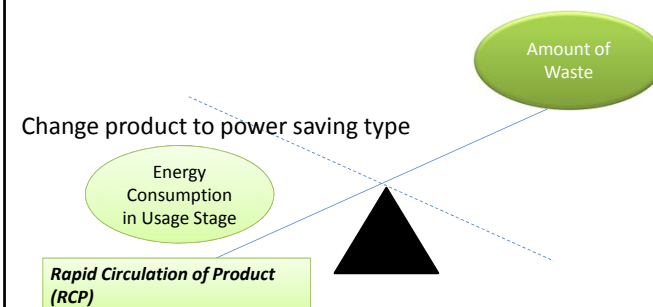
Recycling QCD

QUALITY MANAGEMENT

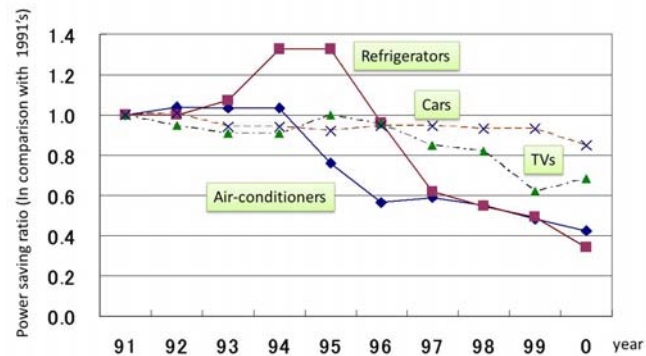
- Businesses must keep control of a products QCD
- A product needs to remain within the management system

CONFLICT BETWEEN RECYCLING AND ENERGY SAVING

Conflict existed in some products which required high energy consumption at usage stage.....



Energy saving for assumed product type



Rapid Circulation of Product (RCP)

A Product Management System that:

- Encourages RCP
- Makes it easier for customers to upgrade products

Owning versus Leasing

- **Customer ownership= Out of Management**
- **Customer leasing= Product remains within the management system at both:**
 - User-Stage
 - End-of-Life Stage

Recycling QCD

Recycling QCD: Can we get the required **quantity** of recycled parts and materials which still have the necessary **quality** level when we need them?

	Products Owned by Customers			Products Leased to Customers
	Conventional	+Recycling Regulations	+Recycling Regulations + IT System	
Quality	Poor	Poor	Acceptable	Good
Cost	Poor	Acceptable	Acceptable	Good
Delivery	Poor	Acceptable	Acceptable	Good

SUMMARY

Current recycling system (regime) of electronic products can be effective.

BUT a number of issues have to be dealt with:

- RECYCLING QCD
- INVISIBLE FLOW
- RECYCLING/ENERGY SAVING CONFLICT

Conclusion

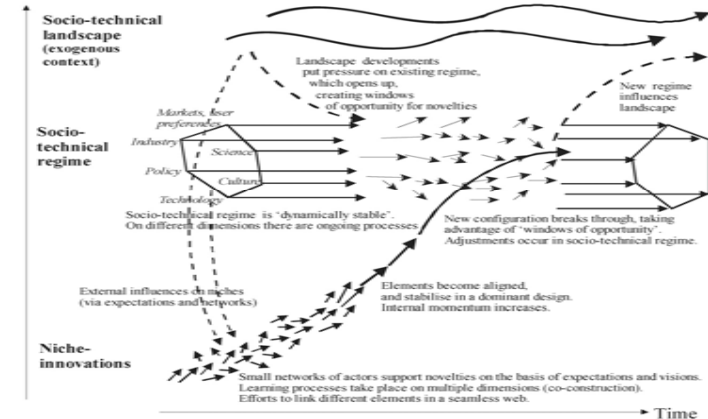
To achieve recycling **QCD** we must modify entire product life-cycle systems by introducing:

- 1- Innovative Product Design**
- 2- New Sales and Service Patterns (Leasing)**
- 3- Innovative Reuse and Upgrade Strategies**

Multi-level Perspective on Transitions

(Adapted from Geels, 2002).

Increasing structuration
of activities in local practices



LANDSCAPE: Sample of Philosophical, Psychological, Social Issues Related to Product Usage

- 1- Philosophical: What is garbage?
- 2- Social: An aging society
- 3- Psychological: A culture of overconsumption
- 4- Environmental/Economic/Business/Education

PHILOSOPHICAL QUESTIONS

- 1- At what point does an object stop being what it 'is' and start being 'garbage'?
- 2- Does the concept of recycling encourage a 'disposable culture'?

ONTOLOGY OF GARBAGE

To Be or Not To Be.
That is the
question.



You're
talking
garbage!

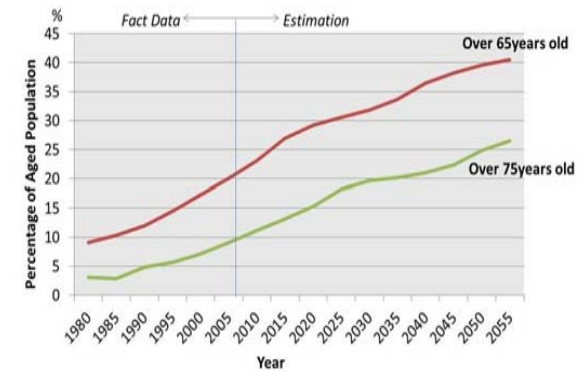


SOCIAL ISSUES

AGING SOCIETY



Percentage of Aged Population in Japan 1980-2055



PSYCHOLOGICAL ISSUES

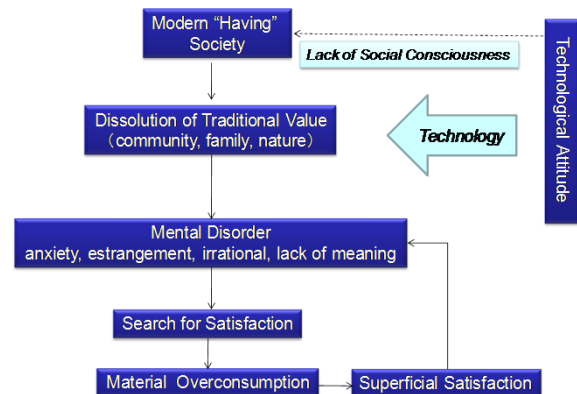
Why do we over-consume?

- Much of irrationality of our environmentally unsustainable behavior could be attributed to a **'false-self system'** (Winter & Koger, 2004).
- Social/Psychological mechanisms drive consumer behavior that is irrational and unsustainable (Boven, 2003).

FALSE-SELF SYSTEM: I Am What I Consume



Overconsumption Mechanism



NICHE INNOVATION

SOLUTIONS MUST ADDRESS THE FOLLOWING ISSUES

- **LANDSCAPE**- Consumer behavior, aging society, environmental, economic, psychological and ontological mechanisms...
- **REGIME**- Current problems related to product recycling: QCD, energy saving, invisible flow...
- **NICHE INNOVATION**- ??????????

NICHE INNOVATION=

**SERVICE-ORIENTED PRODUCT innovation
(SOPi)**

-A creative style of leasing-

What are Service-Oriented Products?

(an analogy with the restaurant industry)

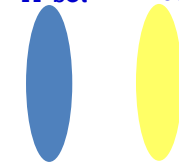
Service (food)



Hardware (dishes)

*Hors D'oeuvre
Appetizer
Soup
Main dish
Dessert*

Fixed course
A set B set



Customers pay money not for the dishes (hardware) but for the food and service. Dishes are used many times by many people. Customers choose a fixed course from the menu. The choices on the menu and quality of food are of primary importance for the customer.

An Approach to SOP Business (Servicification of a Product)

1. Choose a product

2. Create services and fixed courses or
'menus' that have a positive impact on
Regime and **Landscape** issues

An Approach to SOP Business (Servicification of a Product)

3. Make attractive/creative service menu
appealing to customers

- Customers: New benefits they couldn't get by owning the product. For example:
 - Product can be exchanged/updated easily
 - No responsibility that comes from ownership, such as recycling at the product's end-of-life stage
- Company: Increase profitability
Product stays within 'management system'

Comparing SOP innovation with Conventional Products

		Conventional products	SOPi's
Customer	choose	product specifications	"service" menu
	purchase	hardware	service(hardware rental)
	replace	buy a new one	exchange for updated model
Business	profit	product sales	service provision
	manufacture	assembling parts	combining module
	Post-use	disposal/recycling (low QCD)	reuse/recycling (acceptable QCD)
Relation between business and customers		<u>weak (in post-sales periods)</u>	<u>strong (until use -period ends)</u>

SOPi and LANDSCAPE

- The concept of SOPi is not just 'product leasing'
- SOPi's can have a significant impact on LANDSCAPE issues:
 - Aging population
 - Lifestyle mobility
 - Consumer behavior
 - Environmental impact

SOPi's impact on REGIME and LANDSCAPE

SAMPLE OF SOCIO-TECHNICAL REGIME ISSUES:

Quality Cost Delivery:

An SOPi will always be under **company management**

Energy Saving:

Products can easily be exchanged for new energy saving models (RCP)

Invisible Flow:

Financial benefit for the companies and customers to reclaim products

Sample of Socio-technical Landscape Issues

Purchasing behaviour:

Attractive **service menus** can change the consumer behavior of customers

- Provide new 'sales' opportunities for businesses
- Stimulate the economy

Demographic Factors:

Companies can create '**service menus**' that provide extra support for an aging population, modern lifestyle choices...

Philosophical:

SOPi encourages consumers to question what is means to own something, i.e., '**ownership=responsibility**'

CONCLUSION

- 1) To improve sustainability we need to think holistically
- 2) Being locked in Socio-technical REGIMES can prevent innovation
- 3) An awareness of the Socio-technical LANDSCAPE can open 'windows of opportunity' for more radical innovations
- 4) From a Socio-technical Multi-Level Perspective, SOPi's can improve the sustainability of electronic product consumerism on multiple levels

Related Publications

- Fujimoto, Jun; **Poland, Dean**: 'Sustainable Approach To Automobile Society', *Sustainability: Science, Practice and Policy*, Proquest 2013.
- Fujimoto, J; **Poland, Dean**: 'Sustainable Car Society Scenarios: A Game-Changing Approach.' *Proceedings of Ecodesign Symposium 2011*, Publisher: Springer 2012.
- Poland, Dean**; Fujimoto, J: 'ICT Solutions to Energy and Resource Consumption Disorder in Modern Society.' *Proceedings of Ecodesign Symposium 2009*, Sapporo.
- Fujimoto, J; **Poland, Dean**: 'Japanese Low Carbon Scenarios -Meso-Level Models- Towards 2050.' Presented at 'Sustainable Innovation 2008' 13th International Conference, Malmö, Sweden.
- Fujimoto, J; Shinsuke, Kondoh; **Poland, Dean**: 'Ecodesign of Multilateral Recycling Systems in Asia.' *International Journal of Environmental Technology and Management*, Vol.11, No. 4, 2009. Inderscience Publishing.
- Poland, Dean** and Fujimoto, Jun (2012). *Concept of Dual Traceable Ownership System (DTOS) as a Sustainable Design for Product Recycling*, Damanhuri, Enri (ed), *Post-Consumer Waste Recycling and Optimal Production*, (pp 81-98) Croatia: Intech Publishing.
- Fujimoto, J; **Poland, Dean**; Mitsutaka, M: 'Low Carbon Society Scenario Towards 2050.' Presented at 'Going Green 2006', Sixth International Symposium, Vienna, Austria.

Fujimoto, J; **Poland, Dean**; Mitsutaka, M: 'Low Carbon Society Scenario Towards 2050.' Presented at 'Going Green 2006', Sixth International Symposium, Vienna, Austria.

Fujimoto, J; **Poland, Dean**; Mitsutaka, M: 'EcoDesign of ICT(Information Communication Technology) Society'. *Information Society: An International Journal*, Vol. 25, No.2, March-April 2009. Routledge.

Fujimoto, J; Shinsuke, Kondoh; **Poland, Dean**: 'Ecodesign of Multilateral Recycling Systems in Asia.' *International Journal of Environmental Technology and Management*, Vol.11, No. 4, 2009. Inderscience Publishing.

-Fujimoto, J; **Poland, Dean**; Mitsutaka, M: 'Low Carbon Society Scenario Towards 2050.' Presented at 'Going Green 2006', Sixth International Symposium, Vienna, Austria.

-Fujimoto, J; **Poland, Dean**; Mitsutaka, M: 'EcoDesign of ICT(Information Communication Technology) Society'. *Information Society: An International Journal*, Vol. 25, No.2, March-April 2009. Routledge.

-Fujimoto, J; Shinsuke, Kondoh; **Poland, Dean**: 'Ecodesign of Multilateral Recycling Systems in Asia.' *International Journal of Environmental Technology and Management*, Vol.11, No. 4, 2009. Inderscience Publishing.

Poland, Dean and Fujimoto, Jun (2012). *Concept of Dual Traceable Ownership System (DTOS) as a Sustainable Design for Product Recycling*, Damanhuri, Enri (ed), *Post-Consumer Waste Recycling and Optimal Production*, (pp 81-98) Croatia: Intech Publishing.

After the lecture, the class will be divided into 4 groups. Each group will be given a product.

PART 1:

AIM: Apply the Multi-Level Perspective (MLP) to the product and create a Service-Oriented Product innovation (SOPi)

PART 2:

AIM: One group tries to persuade another group to use their SOPi

PART 1: GROUP WORK

Step 1:

Consider/discuss each group member's 'experience' of using your group's product:

- Where do you buy such a product?
- How does the product impact your life-style?
- What feelings do you have towards the product?
- What do you do at the product's 'end of life'?

Step 2:

Transform your chosen product into a 'Service-Oriented Product innovation' (SOPI)

-Develop an innovative and attractive '**Service Menu**'

Your **SOPI 'Service Menu'** must address the environmental/socio-technical issues outlined in the lecture.

-Consider how your SOPI will impact issues related to the **REGIME** level of the Multi-Level Perspective (MLP):

-QCD, Invisible Flow, Energy Consumption (RCP), New Technologies

-Consider how your SOPI will impact issues related to the **LANDSCAPE** level of the Multi-Level Perspective (MLP).

How do these issues open '**windows of opportunity**' for the success of your SOPI?

-Aging population, Modern Consumer Lifestyle/Behavior, Economy, Environment...

-Consider any other **social, psychological, philosophical** issues that may be related to your product.

PART 2: INTER-GROUP ACTIVITY**Step 1:**

Present your SOPI to another group. Persuade the other group to adopt your SOPI by promoting your '**Service Menu**'.

Step 2:

Give critical feedback on each group's SOPI

Consider how your SOPI benefits the **company, customer** and **environment** and **society**?

*****WHEN DEVELOPING YOUR 'SOPI', BE AS CREATIVE AND IMAGINATIVE AS POSSIBLE*****

Group Discussion/Task

- Individual group discussion:

develop SOPI



- Intergroup presentation:

Compare: which SOPI is feasible



Compare: which SOPI is feasible



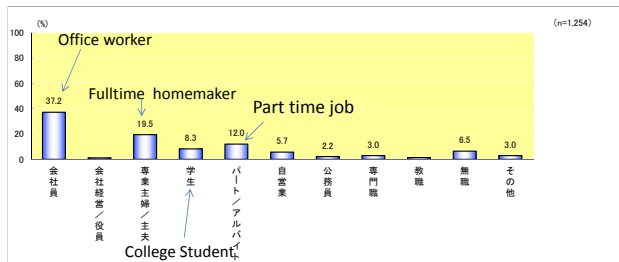
(Critical feedback)

SURVEY:

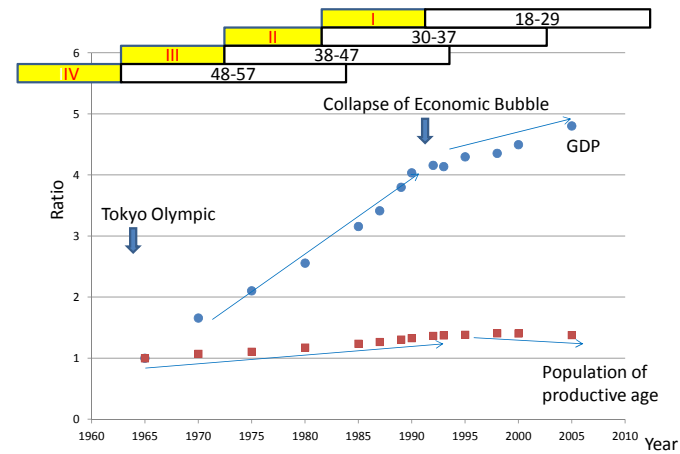
PURCHASING BEHAVIOR IN JAPAN

Methodology of Survey

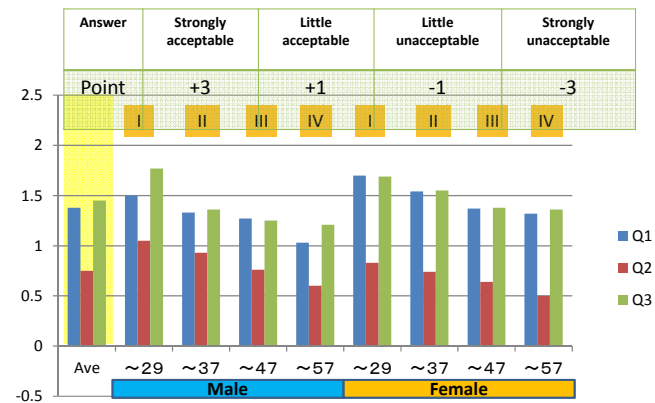
- February 2010
- Through Internet (web survey)
- Conducted on over 1,200 people



Questionnaire & Demographic Age

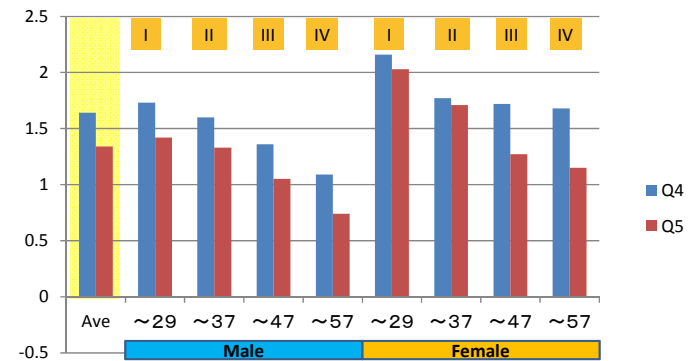


Purchasing Behavior (I)



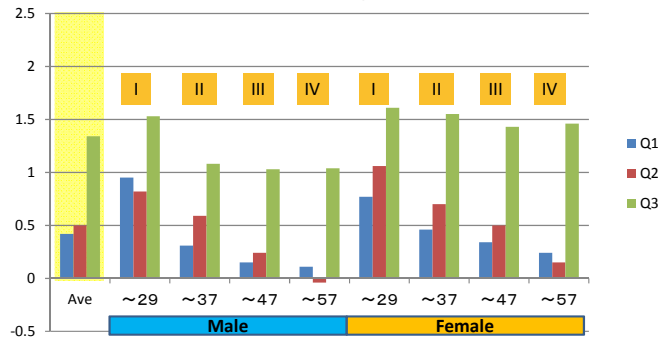
- Q1 Do you want to buy something which you feel emotional attachment?
 Q2 Even if a price is high, do you want to buy something which you can use for a long time?
 Q3 Do you buy something suited to your hobby and your sensitivity?

Purchasing Behavior (II)



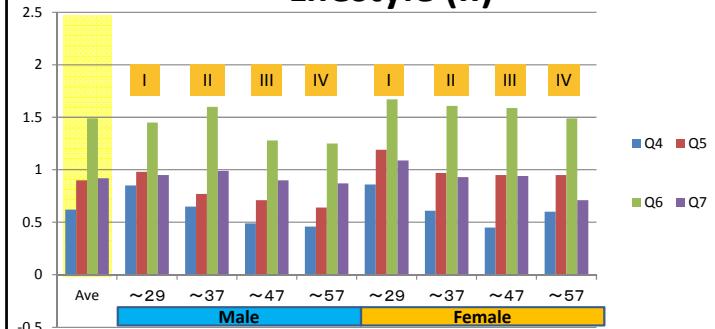
- Q4 Do you want to avoid a loan and a debt when shopping?
 Q5 Are you happy to increase your savings.

Attitude Towards Consumption and Lifestyle (I)



- Q1 Do you want to extend the human relations and to associate with various kinds of people?
- Q2 Do you sometimes act according to seeing others' facial expression?.
- Q3 Do you want to have a high regard for old friend?

Attitude Towards Consumption and Lifestyle (II)



- Q4 Do you act considering the future?
- Q5 Do you want a risk free lifestyle?
- Q6 Do you want to live at your own pace, without straining yourself?
- Q7 Do you want to have laid-back life, if you have enough income to live on?

Top 10 What Goods & Service People Want to Have

	-29M	-29W	-37M	-37W	-47M	-47W	-57M	-57W
1	PC 4.4	Fashion 6.4	PC 5.5	Domestic Travel 5.9	Domestic Travel 5.8	Domestic Travel 6.2	PC 5.6	Domestic Travel 5.9
2	Domestic Travel 4.2	Domestic Travel 5.7	Domestic Travel 4.7	Fashion 5.5	PC 5.3	Eating Out 5.7	Domestic Travel 5.5	Eating Out 4.8
3	Game 3.4	Eating Out 5.3	Eating Out 3.8	Eating Out 5.2	Eating Out 4.2	Fashion 4.7	Eating Out 3.5	Fashion 3.6
4	Music(CD, Concert) 3.1	Music(CD, Concert) 3.3	Game 3.1	International Travel 3.0	Car 3.3	Watching Movie 3.5	Car 3.1	Watching Movie 3.5
5	Animation, Manga 2.8	Cosmetics 3.2	TV 2.7	Furniture, Interior 2.7	TV 3.1	International Travel 3.1	International Travel 3.0	International Travel 2.9
6	Fashion 2.7	International Travel 3.1	Investment 2.7	Domestic Appliance 2.7	AV Equipment 2.7	PC 2.8	TV 3.0	PC 2.8
7	Eating Out 2.6	Book 2.6	Watching Movie 2.6	Book 2.6	Watching Movie 2.4	Book 2.8	Watching Movie 2.7	Book 2.7
8	Book 2.6	Watching Movie 2.4	Music(CD, Concert) 2.5	Cosmetics 2.6	International Travel 2.0	Cosmetics 2.5	Book 2.6	Music(CD, Concert) 2.7
9	Car 2.6	PC 2.0	Car 2.5	Watching Movie 2.4	Music(CD, Concert) 2.0	Music(CD, Concert) 2.4	Visiting Famous Spot 2.3	TV 2.5
10	Watching Movie 2.2	Animation, Manga 1.9	AV Equipment 2.5	Music(CD, Concert) 2.4	Book 1.9	Domestic Appliance 2.4	AV Equipment 2.2	Cosmetics 2.4

SURVEY SUMMARY

- **Characteristics of young Japanese people**
 - Value “communication” over “money”.
 - Prefer to purchase ‘services’ rather than purchasing goods such as car, TV, and AV equipment
- **Reasons for these characteristics**
 - Grew up surrounded by an abundance of material goods.
 - Born into the “Internet and Mobile” era.

Questionnaire Survey: Purchasing Behavior

SAMPLE OF SURVEY QUESTIONS

Purchasing Behavior

N	Question	Answer			
		Strongly acceptable (+3)	Little acceptable (+1)	Little unacceptable (-1)	Strongly unacceptable (-3)
1	Do you want to buy something which you feel emotional attachment?				
2	Even if a price is high, do you want to buy something which you can use for a long time. ?				
3	Do you buy something suited to your hobby and your sensitivity?				
4	Do you want to avoid a loan and a debt when shopping?				
5	Are you happy to increase your savings. ?				

Q. No	Total points of individual group
1	
2	
3	
4	
5	

Attitude towards Consumption and Lifestyle

N	Question	Answer			
		Strongly acceptable (+3)	Little acceptable (+1)	Little unacceptable (-1)	Strongly unacceptable (-3)
1	Do you want to extend the human relations and to associate with various kinds of people?				
2	Do you sometimes act according to seeing others' facial expression?				
3	Do you want to have a high regard for old friend?				
4	Do you act considering the future?				
5	Do you want a risk free lifestyle?				
6	Do you want to live at your own pace, without straining yourself?				
7	Do you want to have laid-back life, if you have enough income to live on?				

Q. No	Total points of individual group
1	
2	
3	
4	
5	
6	
7	

Goods & Service Desirability

Goods & Service	Top 10	Point	Total
Fashion (clothes)			
Domestic travel			
Eating out			
Book			
Music (CD, concert)			
Watching movie			
Car			
Personal computer			
Watch			
Foreign language learning, licenses getting			
Mobile music player such as iPod and Walkman			
Asset management (stock, financial product)			
Museum (art, history, ethnographic, transportation, science) travel			
Game (Soft, equipment)			
Tableware			
AV equipment such as blue-ray recorder			
Bicycle including one with electric assist			
International travel			
Audio equipment such as amplifier, speaker and player			
Camera			
Television set			
Manga (comic book), animation			
Jewelry, accessory			
Sporting goods			
Cosmetic, estheticque			
Motorbike			
Music instrument			
Stationery			
Communication equipment such as mobile phone and smart phone			
Travel place of scenic beauty and historical interest			
Furnishings, interior decorating			
Gardening, vegetable garden			
Home electrical appliances			
Antiques			

Creating Innovative Systems for SOP's:
EX.

**DUAL TRACEABLE OWNERSHIP SYSTEM
(DTOS)**

OWNERSHIP=RESPONSIBILITY

Dual Traceable Ownership System (DTOS)

1. **Individual** consumer has complete ownership of the product
2. **Company** has complete ownership and the consumer rents the product

CONSUMER OWNERSHIP

1. An identification number corresponding to the owner.
2. When transferring ownership during product use, the owner has to follow a set of procedures laid down by law.
3. When discarding the product, the owner takes responsibility for the recycling process. For example choosing an appropriate recycling trader..
4. If the product is discovered in an illegal situation, such as a 'black market' recycling process, the owner will receive a severe penalty.

COMPANY OWNERSHIP

1. The consumer pays money not for the product itself, but for the services or functions which the product provides.
2. The consumer can enjoy the product without worrying about its disposal. The company or 'seller' will take responsibility for all the recycling duties that come with 'ownership.'
3. Through an identification code system, the product and its parts can be easily traced back to the company.
4. It may be possible for the consumer to receive new services quickly and at minimal or no extra cost