Global Environmental Policy 2013

Environmental Management

-Socio-technical Approaches to Recycling Systems -

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CONTENTS

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

Part 2: Application- Recycling System

Part 3: Practice- Service Oriented Products (SOP's)

<u>Student Presentation Guidelines</u>

Choose a product!!!

Research:

-Product lifecycle (especially 'end-of-life').
-Environmental impact of the product, ex, how is it recycled, energy consumption…
-Consider issues related to 'invisible flow', QCD.

-Consider any social, psychological, philosophical issues that may be related to product usage, ex, demographics (who uses the product, why do they use it…)
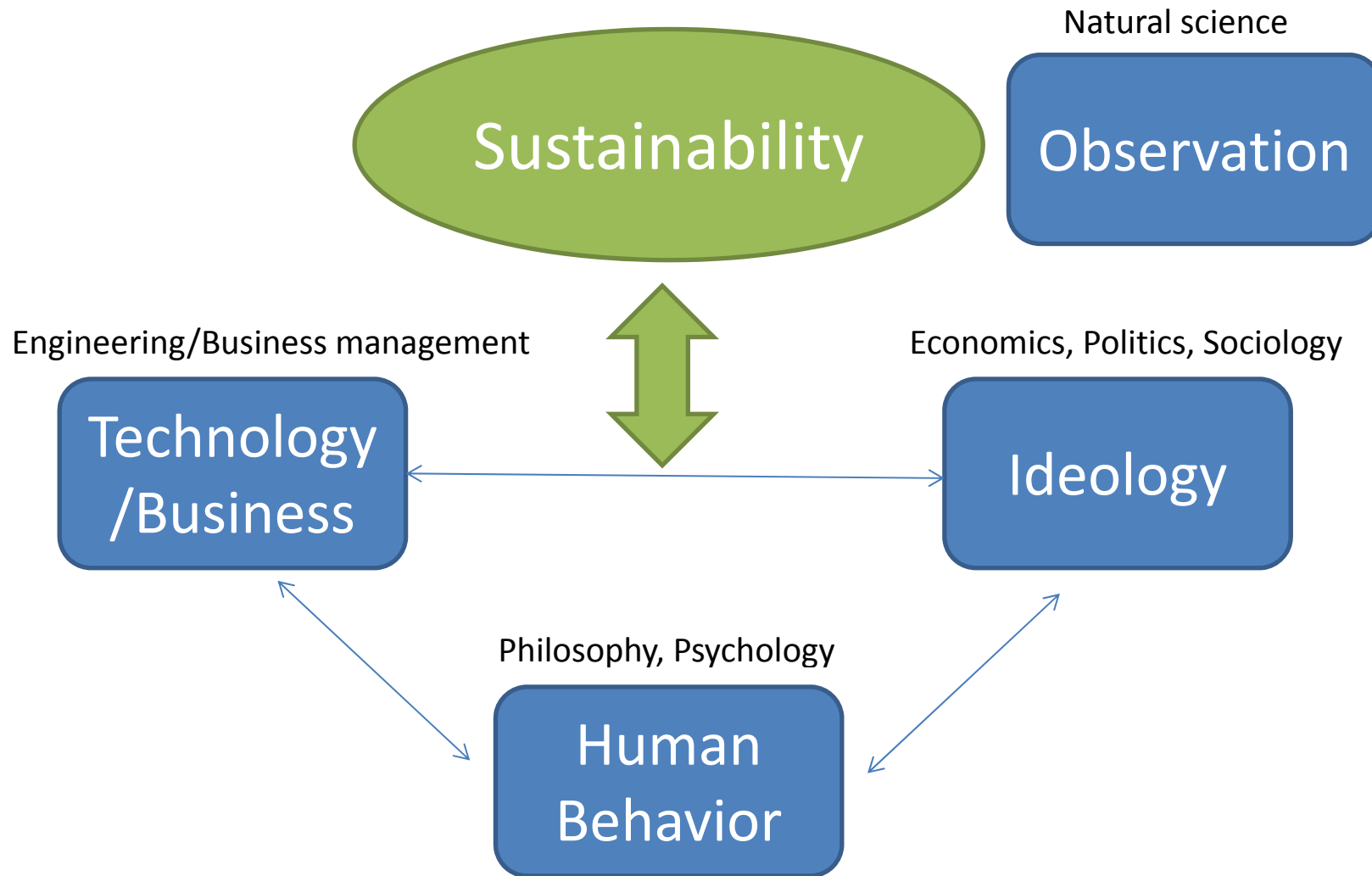
Transform your chosen product into a 'Service Oriented Product' (SOP).

-Develop an innovative and attractive 'service menu'.
-Show how your SOP addresses the environmental/socio-technical issues above. Explain the impact your SOP could have on the environmental/socio-technical landscape.

-Use ideas/methods presented in the lecture (the power point slides will be uploaded on the university website)
- Read the handout: "Concept of Dual Traceable Ownership System (DTOS) as a Sustainable Design for Product Recycling"
- Conduct your own research.

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

What is Sustainability?

Natural science

Sustainability

Observation

Engineering/Business management

Economics, Politics, Sociology

Technology /Business

Ideology

Philosophy, Psychology

Human Behavior

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. Often stop engineers looking beyond their discipline.
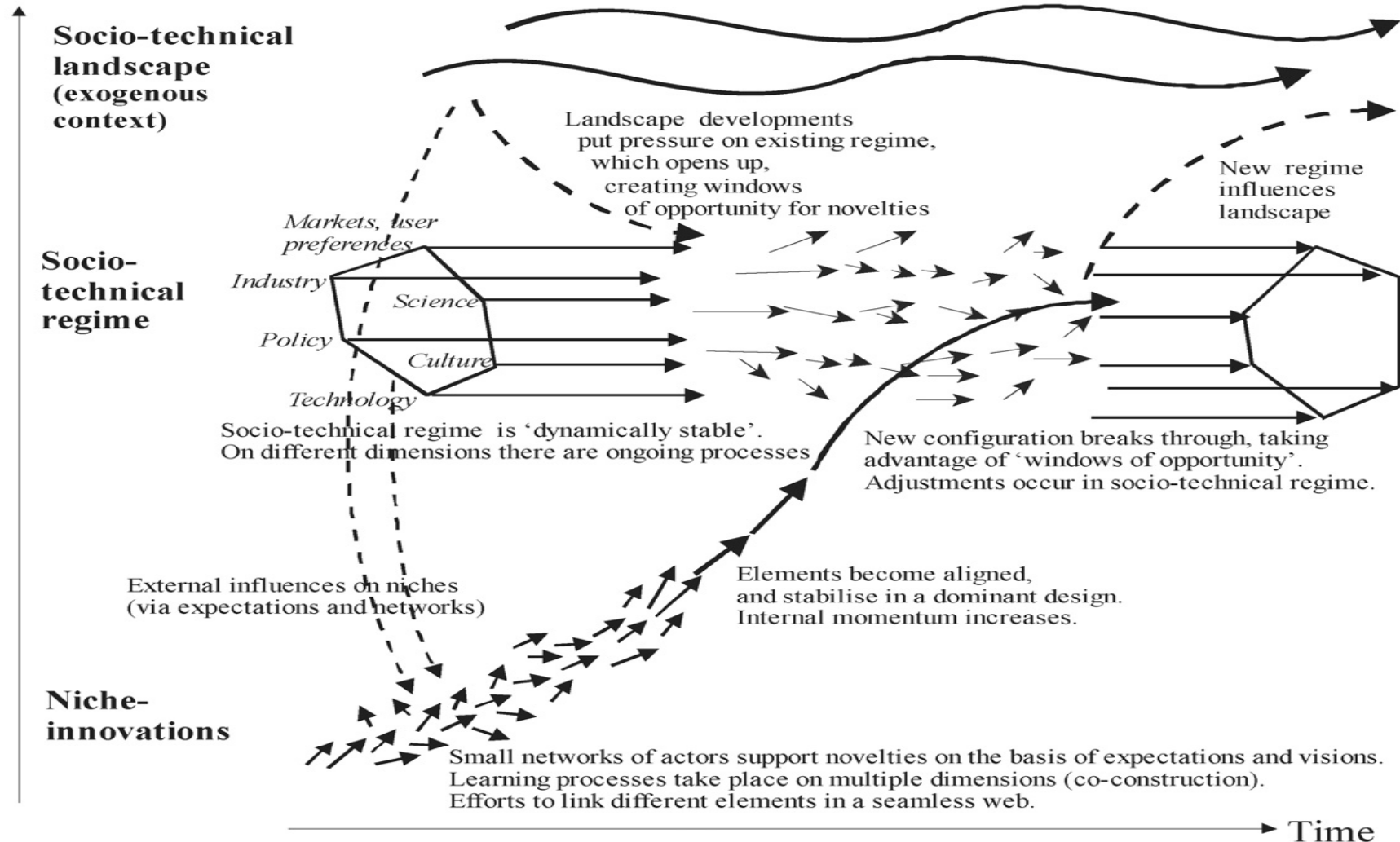
NICHE INNOVATION ➤ The place where radical ideas/ technologies emerge.

Multi-level Perspective on Transitions
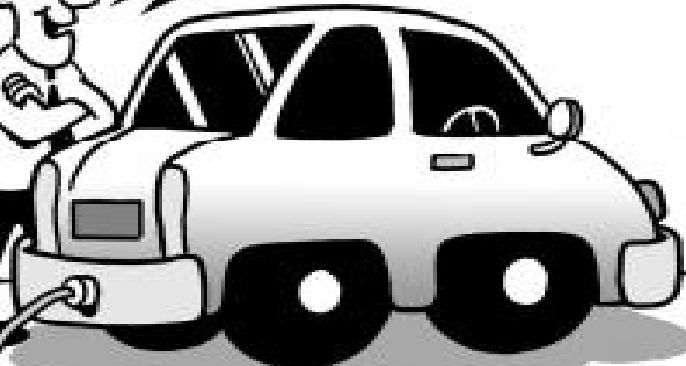
(Adapted from Geels, 2002).

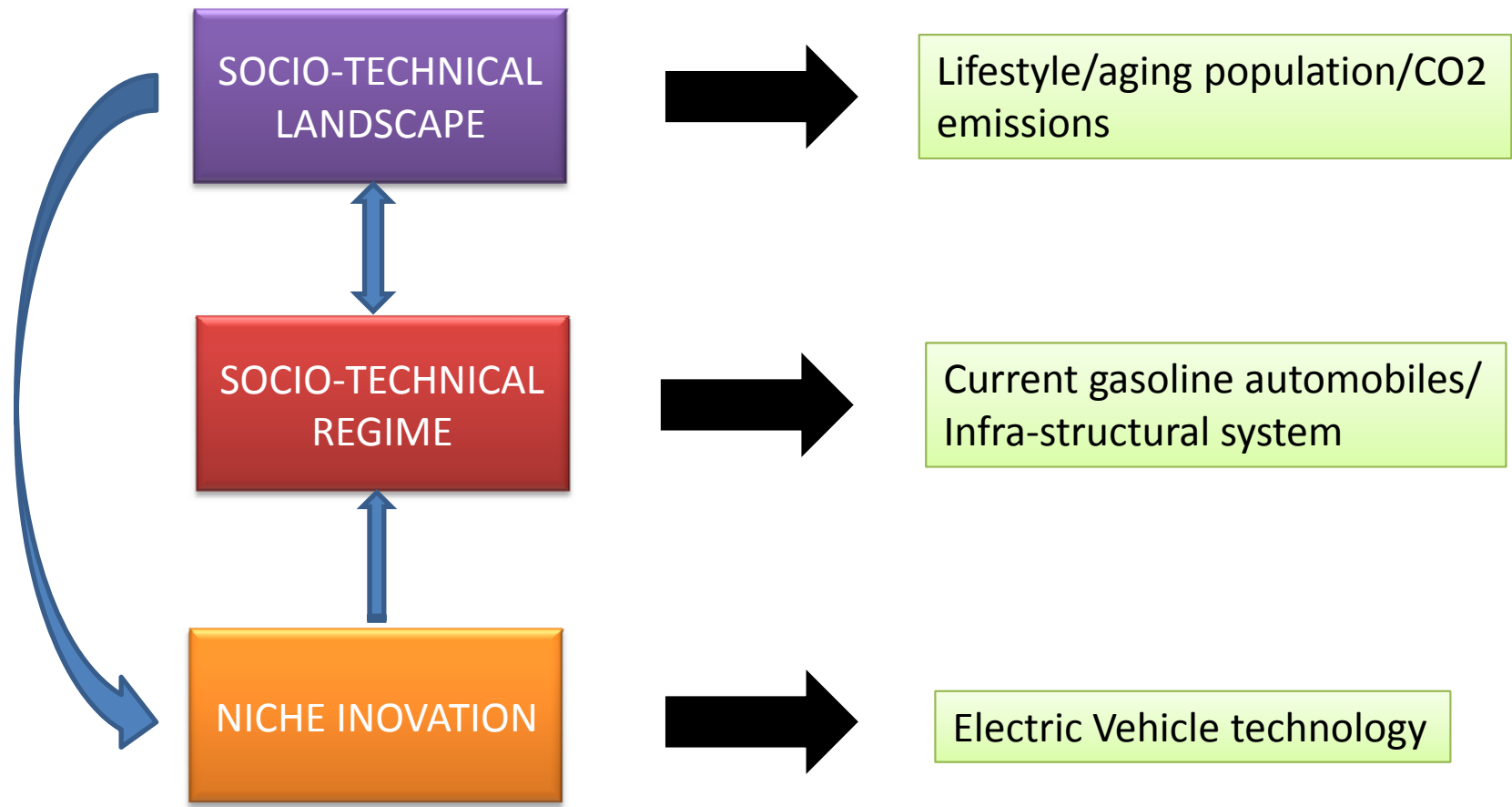Increasing structuration
of activities in local practices

Socio-technical landscape (exogenous context)

Landscape developments put pressure on existing regime, which opens up, creating windows of opportunity for novelties

New regime influences landscape

Socio-technical regime

Markets, user preferences

Industry

Science

Policy

Culture

Technology

Socio-technical regime is 'dynamically stable'. On different dimensions there are ongoing processes

New configuration breaks through, taking advantage of 'windows of opportunity'. Adjustments occur in socio-technical regime.

External influences on niches (via expectations and networks)

Elements become aligned, and stabilise in a dominant design. Internal momentum increases.

Niche-innovations

Small networks of actors support novelties on the basis of expectations and visions. Learning processes take place on multiple dimensions (co-construction). Efforts to link different elements in a seamless web.

Time

SOCIO-TECHNICAL APPROACH TO ELECTRIC VEHICLE (EV) REVOLUTION

SOCIO-TECHNICAL LANDSCAPE → Lifestyle/aging population/CO2 emissions

SOCIO-TECHNICAL REGIME → Current gasoline automobiles/ Infra-structural system

NICHE INOVATION → Electric Vehicle technology

EV'S IN SOCIETY VERSUS AN EV-SOCIETY

CONVENTIONAL APPROACH

EV's in society= replacement of gasoline cars with EV's without considering
pervasive social issues.

SOCIO-TECHNICAL APPROACH

EV-Society= EV's are woven into the fabric (landscape) of society with the
aim of changing the transportation regime as well as
solving a range of environmental and social problems.

Current state

"Barrier-free" Car Society

Continuation of Current Automotive Society

Change ← | → Current state

Distance travelled by car

Functional value of car

Versatile Car Society

Less

Clean Compact City

Part 2: **Application**

A SOCIO-TECHNICAL APPROACH

TO RECYCLING SYSTEMS

The 3 R's

-REDUCE

- REUSE

- RECYCLE

MULTI-LEVEL PERSPECTIVE

SOCIO-TECHNICAL LANDSCAPE → Broad factors that indirectly influence a variety of regimes, ex. environmental, social, economic factors.

SOCIO-TECHNICAL REGIME → Specific systems: shared cognitive routines, ex. transport regime, recycling regime. Often blind engineers to issues outside their focus.

NICHE INNOVATION → The place where radical ideas/ technologies emerge.

REGIME: Key Issues Lying Behind
Current Recycling Systems

1-Recycling QCD

2-Recycling and Energy Saving Conflict

3-Invisible Flow

RECYCLING QCD

Q= QUALITY

C= COST

D= DELIVERY

Economic "Berlin Wall" between Business and Recycling
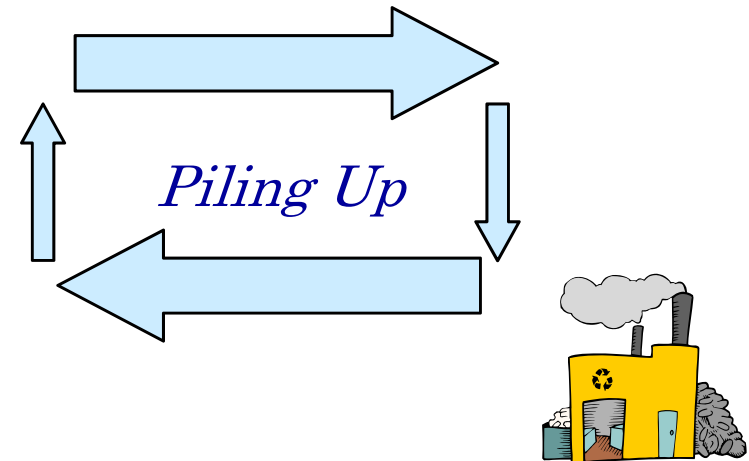
(an analogy with economic systems)

"Free Economy"

"Socialist Economy"

Not Circulating

Piling Up

Business

Berlin Wall
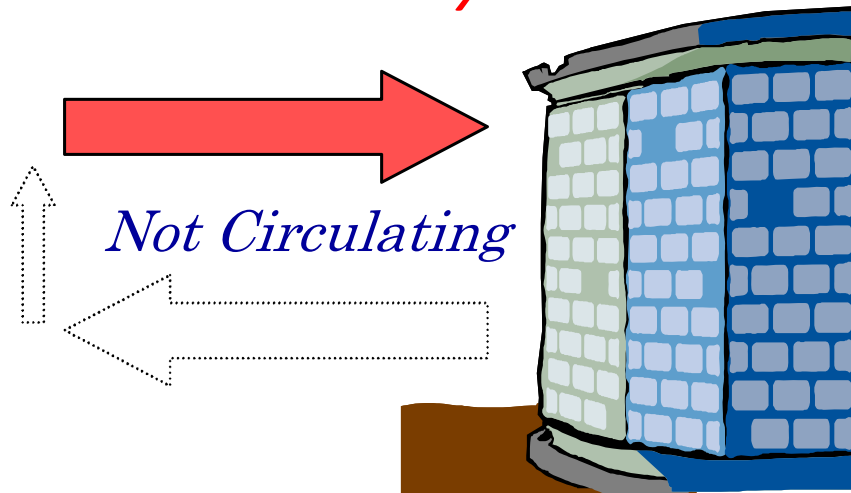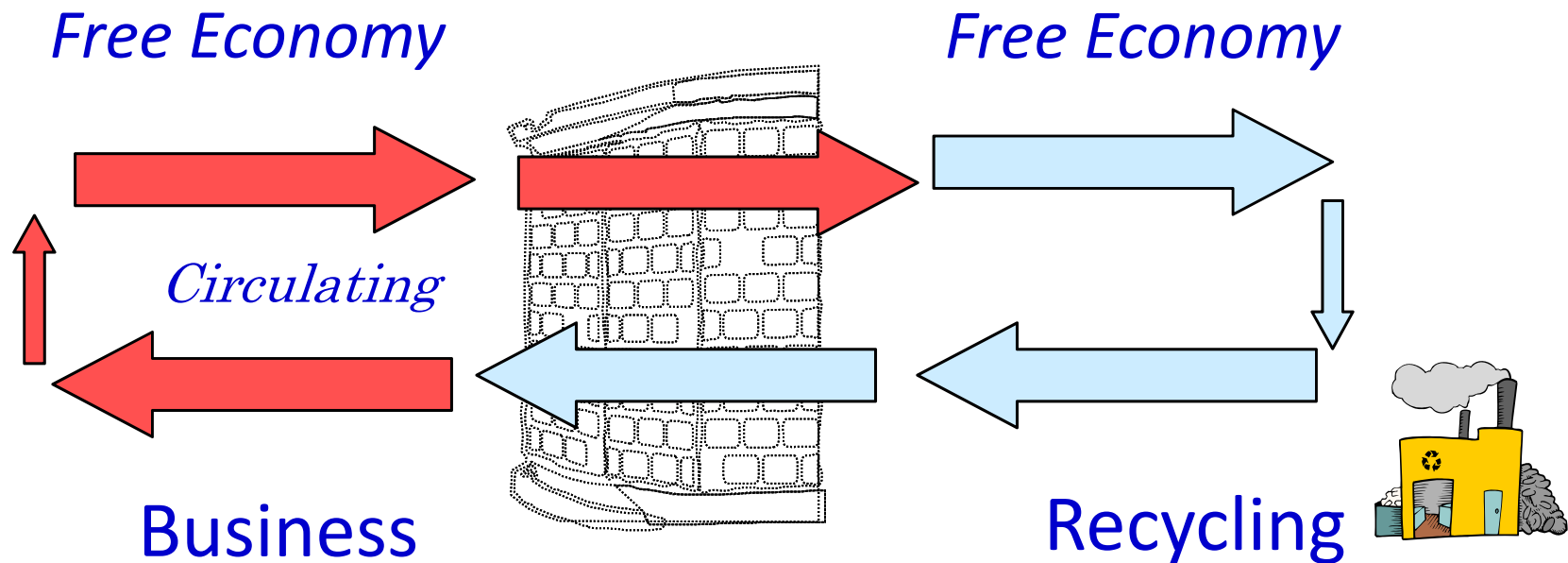
Recycling

(Resource Procurement Manufacturing- Sales)

(UsageRecycling)

No recycling technologies can function effectively.

Well-Matched Economic System
(barrier broken down)

Free Economy   *Free Economy*

Circulating

Business   Recycling

Recycling ➡ Integral part of manufacturing process

Recycling QCD

MANUFACTURING= QUICK RESPONSE DELIVERY

Recycling Systems Depend on **Push Mechanism**

(i.e., amount of disposed and collected products.)

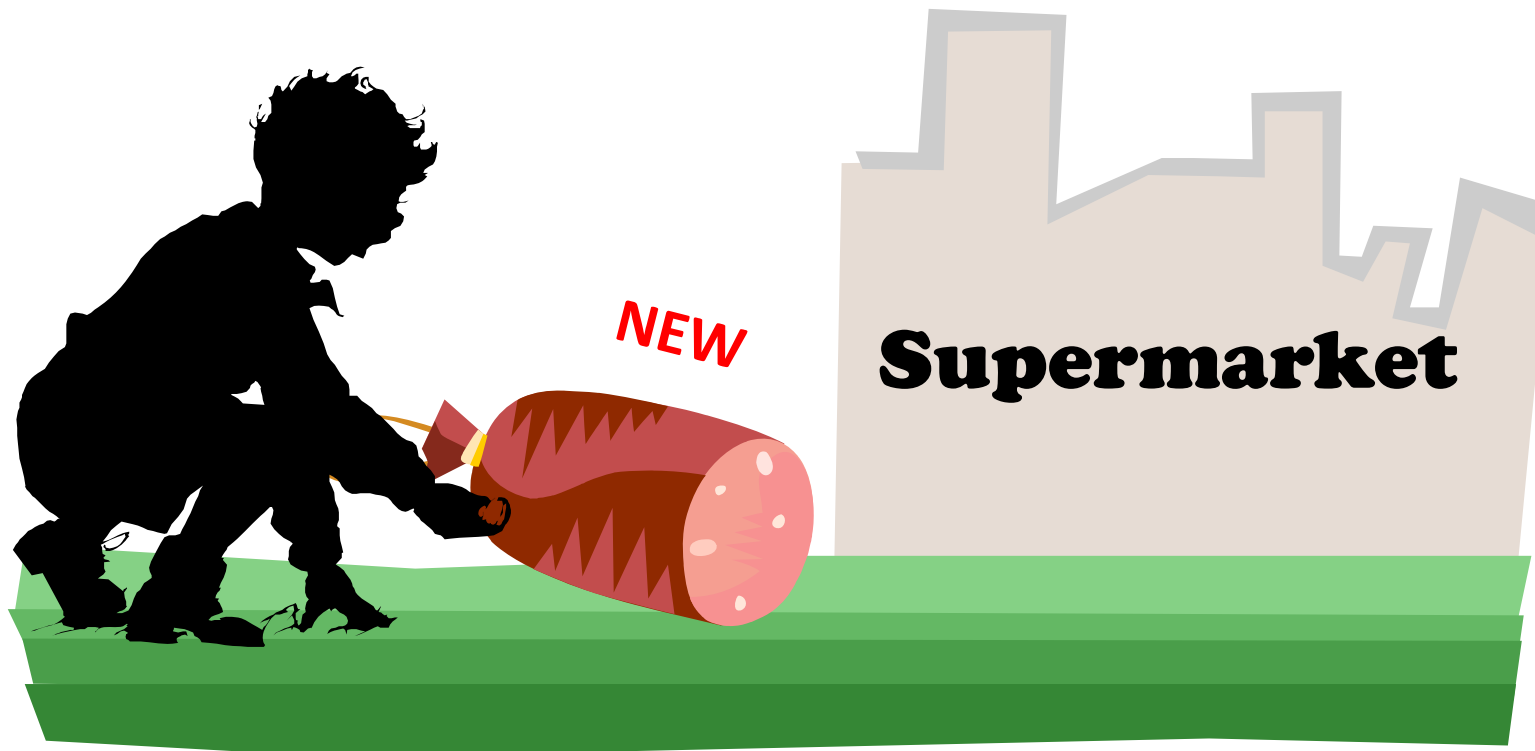Manufacturing Systems Depend on **Pull Mechanism**

(i.e., market needs/demands.)

=Mismatch Between:

PUSH MECHANISM/PULL MECHANISM

The Dropped Sausage

Can you pick it up and eat it?

NEW

Supermarket

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?

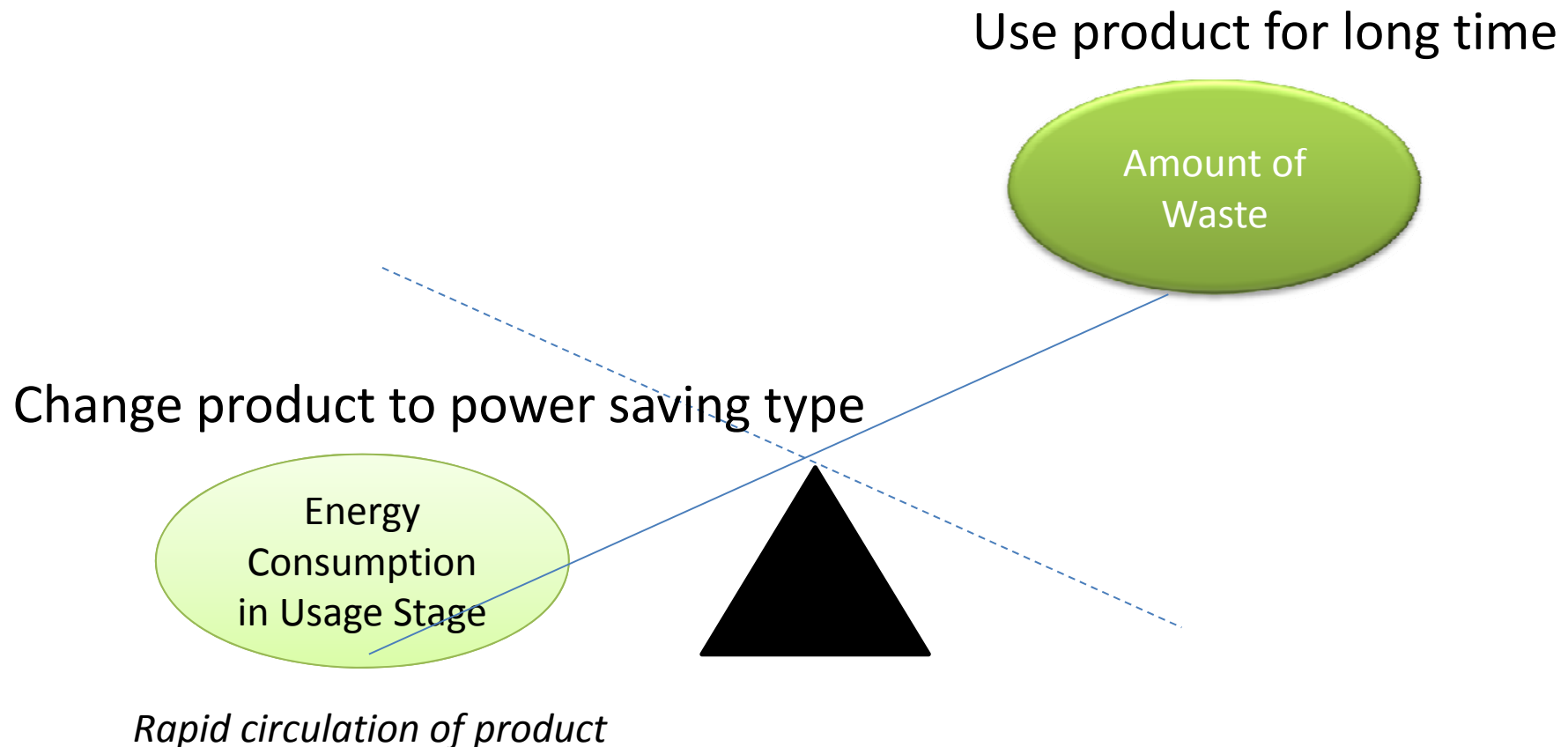|	Products Owned by Customers			Products Leased to Customers
	Conventional	+Recycling Regulations	+Recycling Regulations + IT System	
Quality	Poor	Poor	Acceptable	Good
Cost	Poor	Acceptable	Acceptable	Good
Delivery	Poor	Acceptable	Acceptable	Good

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

3- Innovative Reuse and Upgrade Strategies

CONFLICT BETWEEN RECYCLING AND ENERGY SAVING

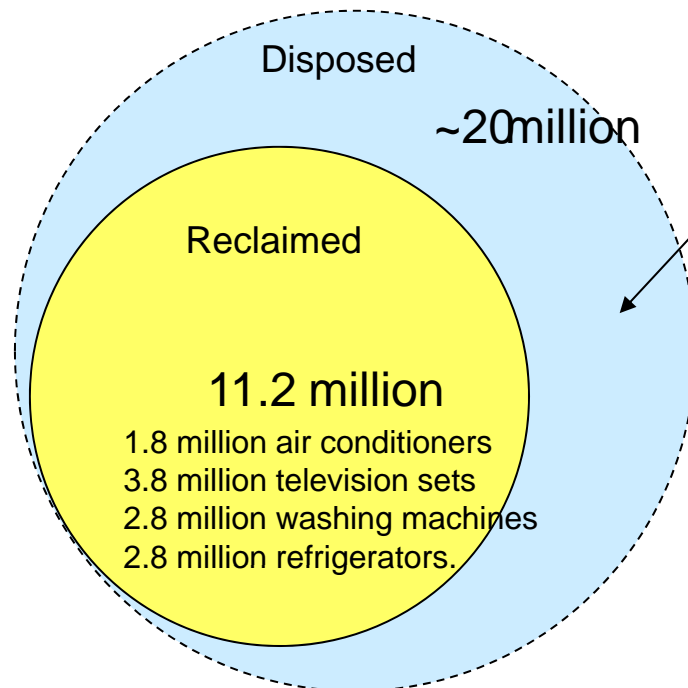Conflict existed in some products which required high energy consumption at usage stage…….

Use product for long time

Amount of Waste

Change product to power saving type

Energy Consumption in Usage Stage

Rapid circulation of product

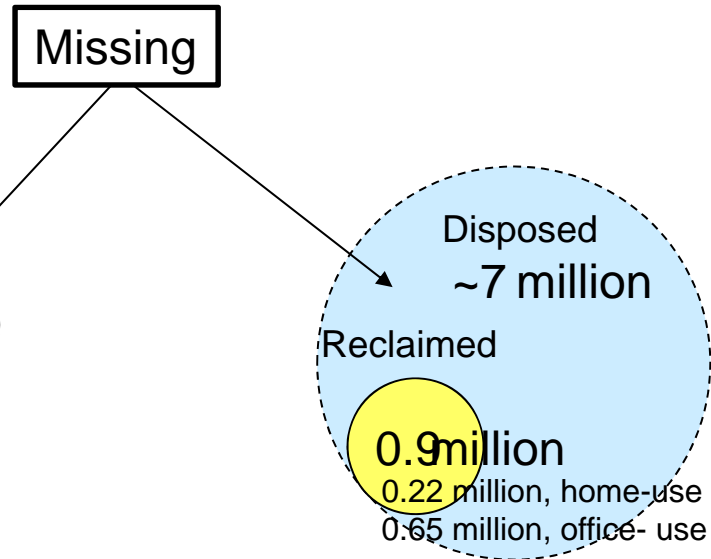# Invisible Flow

Japan's recycling system

Home Appliances
（4 electric products)

Based on home appliances' recycling law

Personal Computers

Based on the law
for promotion of effective utilization of resources

Disposed

~20million

Missing

Reclaimed

11.2 million

1.8 million air conditioners
3.8 million television sets
2.8 million washing machines
2.8 million refrigerators.

Disposed

~7 million

Reclaimed

0.9million

0.22 million, home-use
0.65 million, office- use

SUMMARY

Current recycling system (regime) can be effective,

BUT a number of issues have to be dealt with:

- RECYCLING QCD

- RECYCLING/ENERGY SAVING CONFLICT

- INVISIBLE FLOW

LANDSCAPE: Sample of Philosophical, Psychological, Social Issues

1- <u>Philosophical</u>: What is garbage?

2- <u>Social</u>: An aging society

3- <u>Psychological</u>: A culture of

overconsumption

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'?
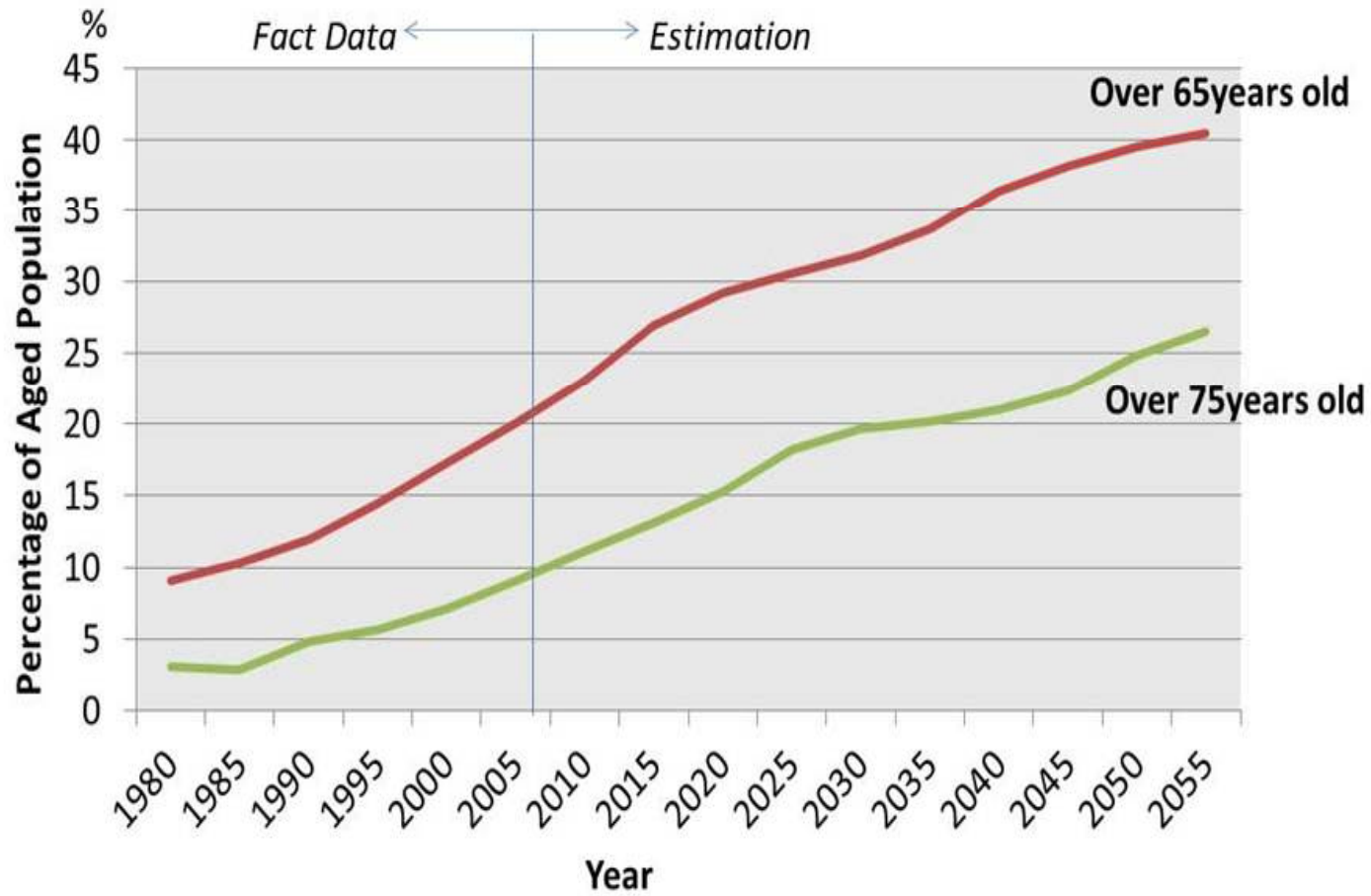
ONTOLOGY OF GARBAGE

SOCIAL ISSUES

AGING SOCIETY

Percentage of Aged Population in Japan 1980-2055

PSYCHOLOGICAL ISSUES

Why do we over-consume?

- GDP AND HAPPINESS

- FALSE-SELF SYSTEM

Happiness and Income

Rate of the answer "Very Happy" in World Value Survey %

GDP per capita (US dollar)
World Economic Outlook Database, IMF
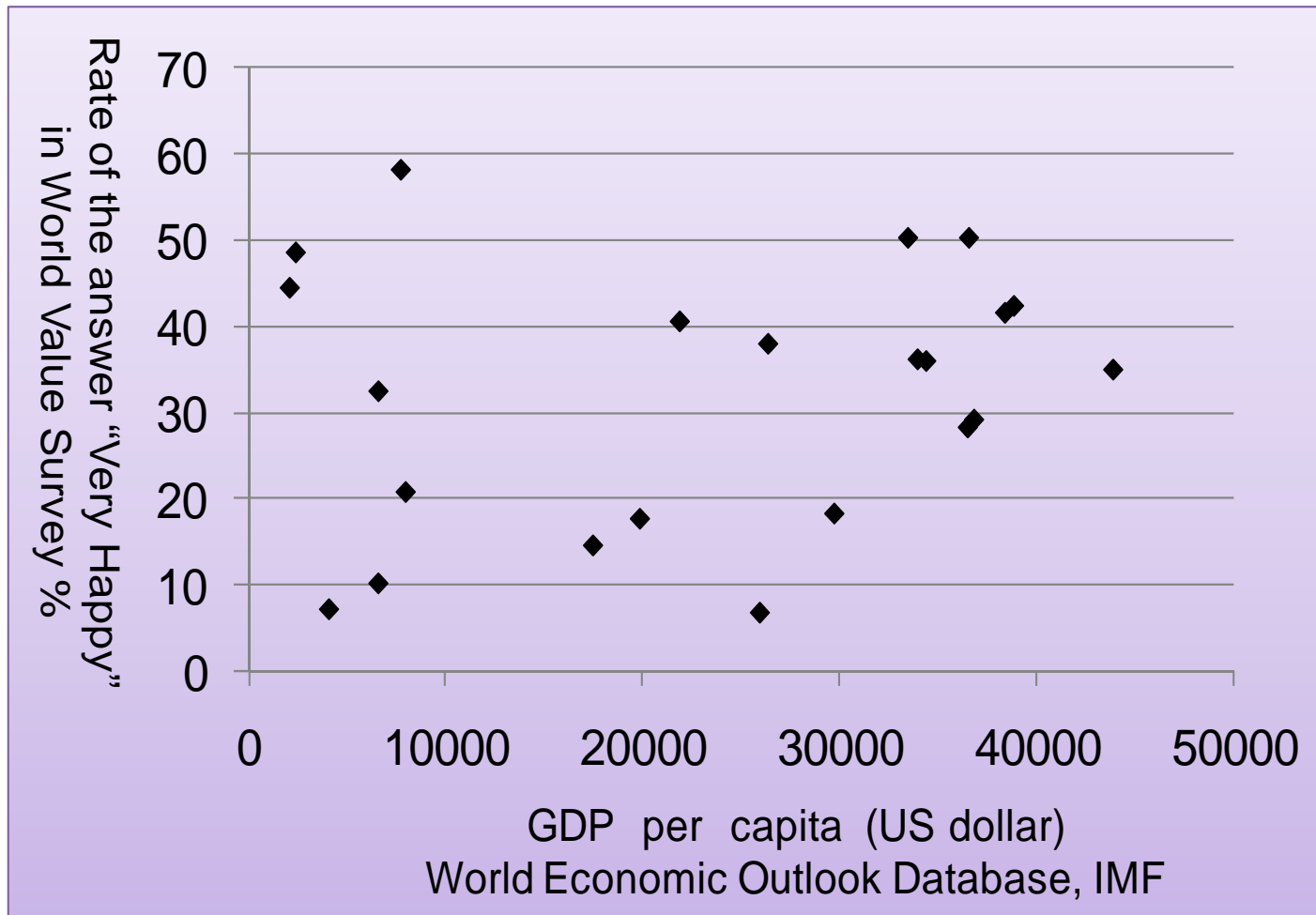
FALSE-SELF SYSTEM:
I Am What I Consume

UNSUSTAINABLE CULTURE OF "HAVING": OVERVIEW

- Subjective well-being does not necessary correlate with high personal wealth (Diener 2004).

- Social/Psychological mechanisms drive consumer behaviour that is irrational and unsustainable (Boven 2003).

- Much of irrationality of our environmentally unsustainable behavior could be attributed to a 'false self' system (Winter & Koger 2004).
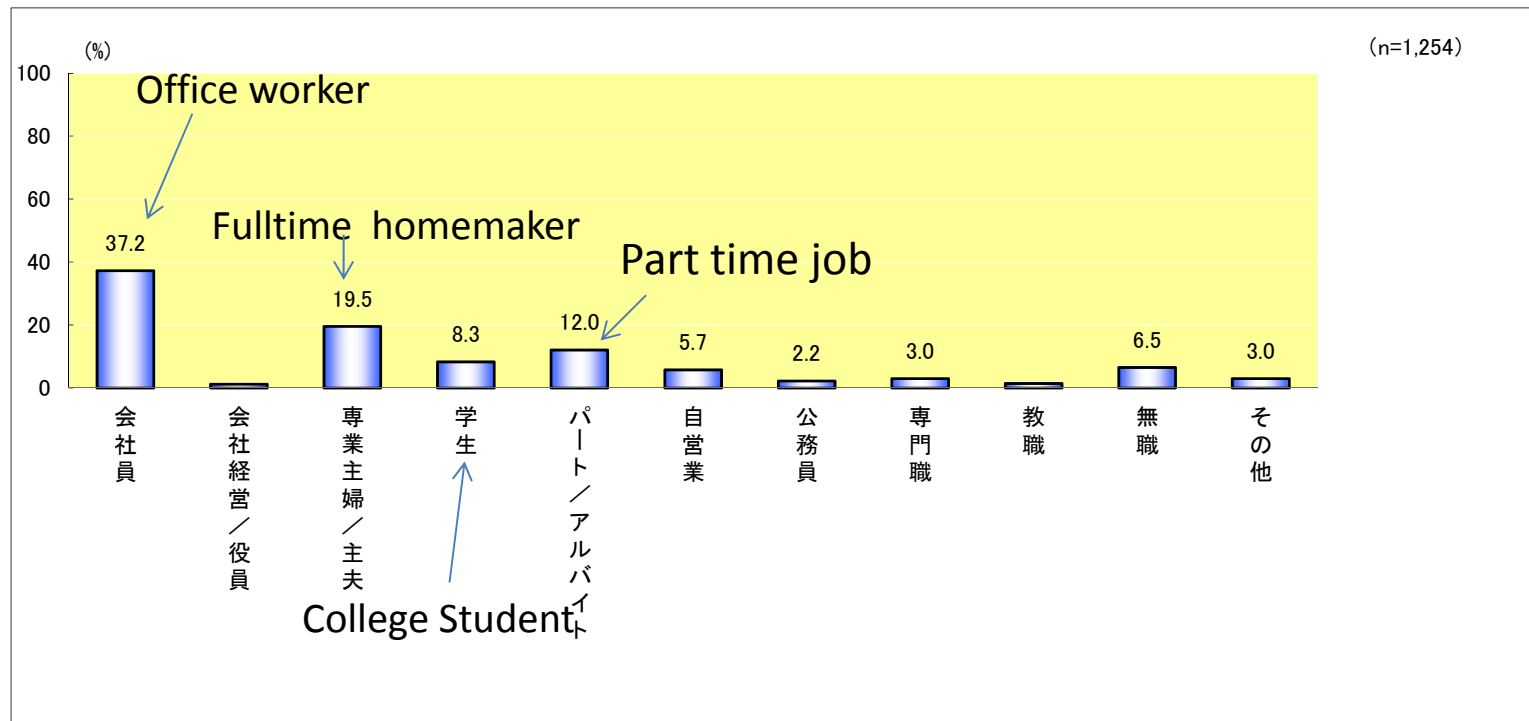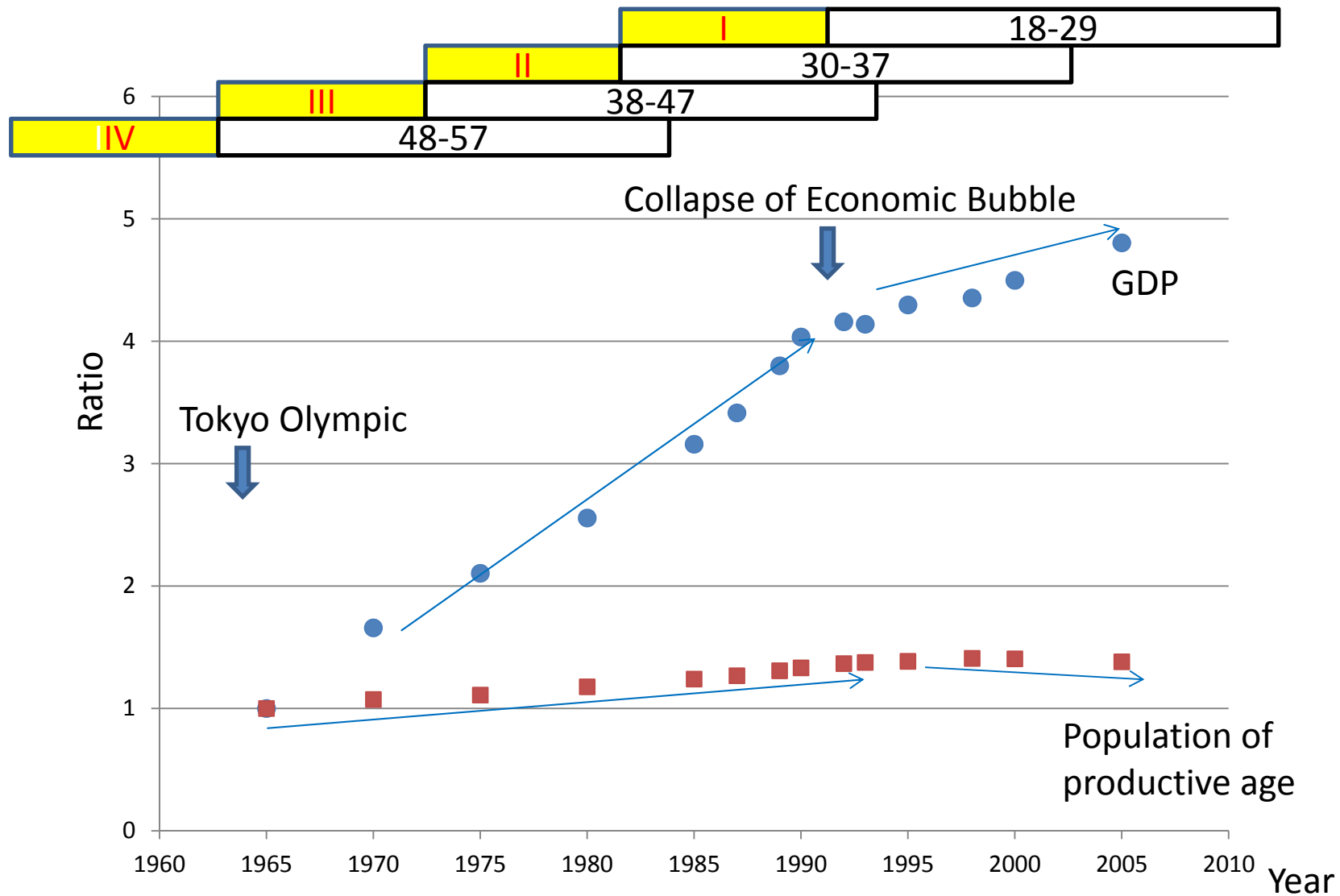
Overconsumption Mechanism
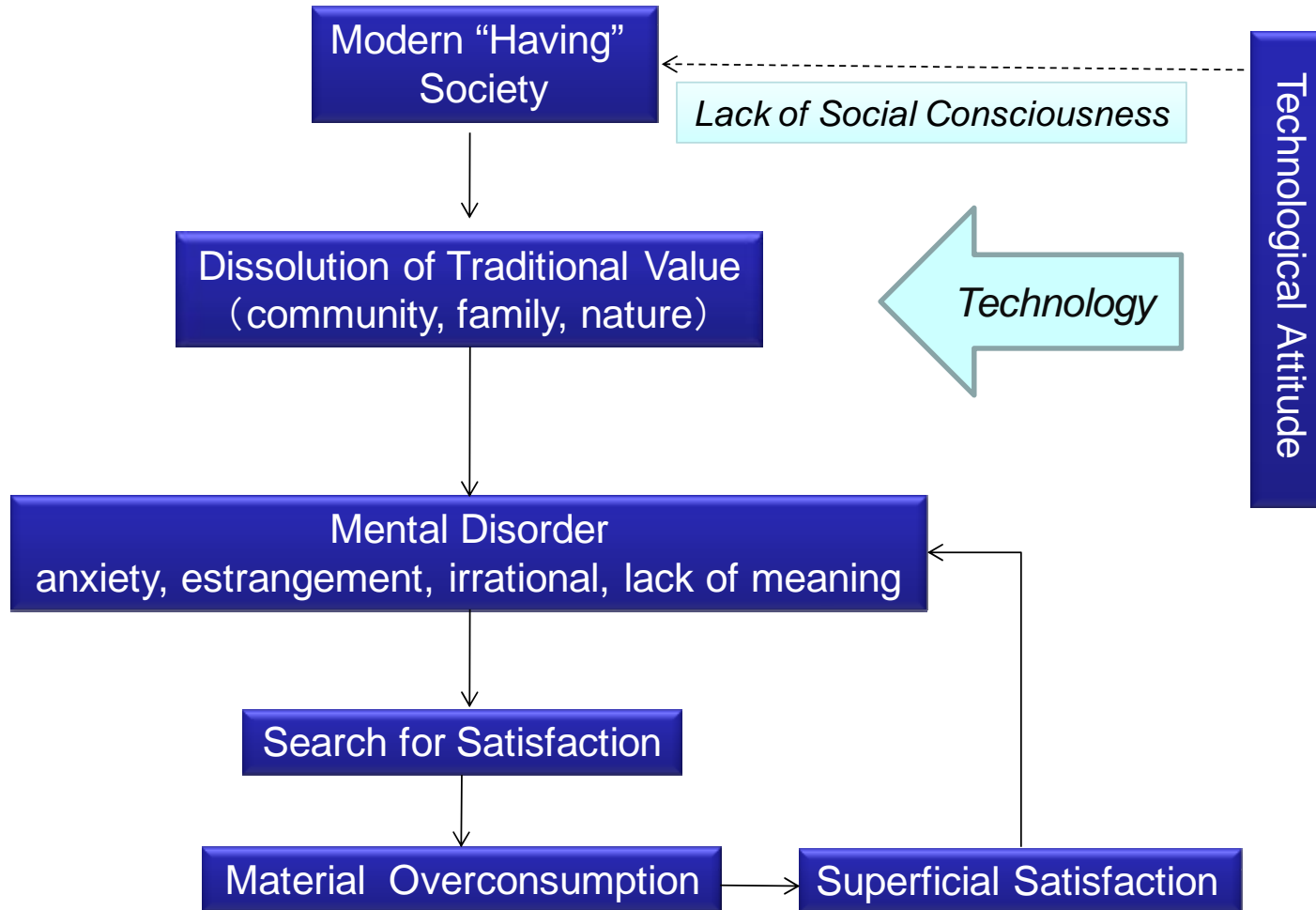
SURVEY:
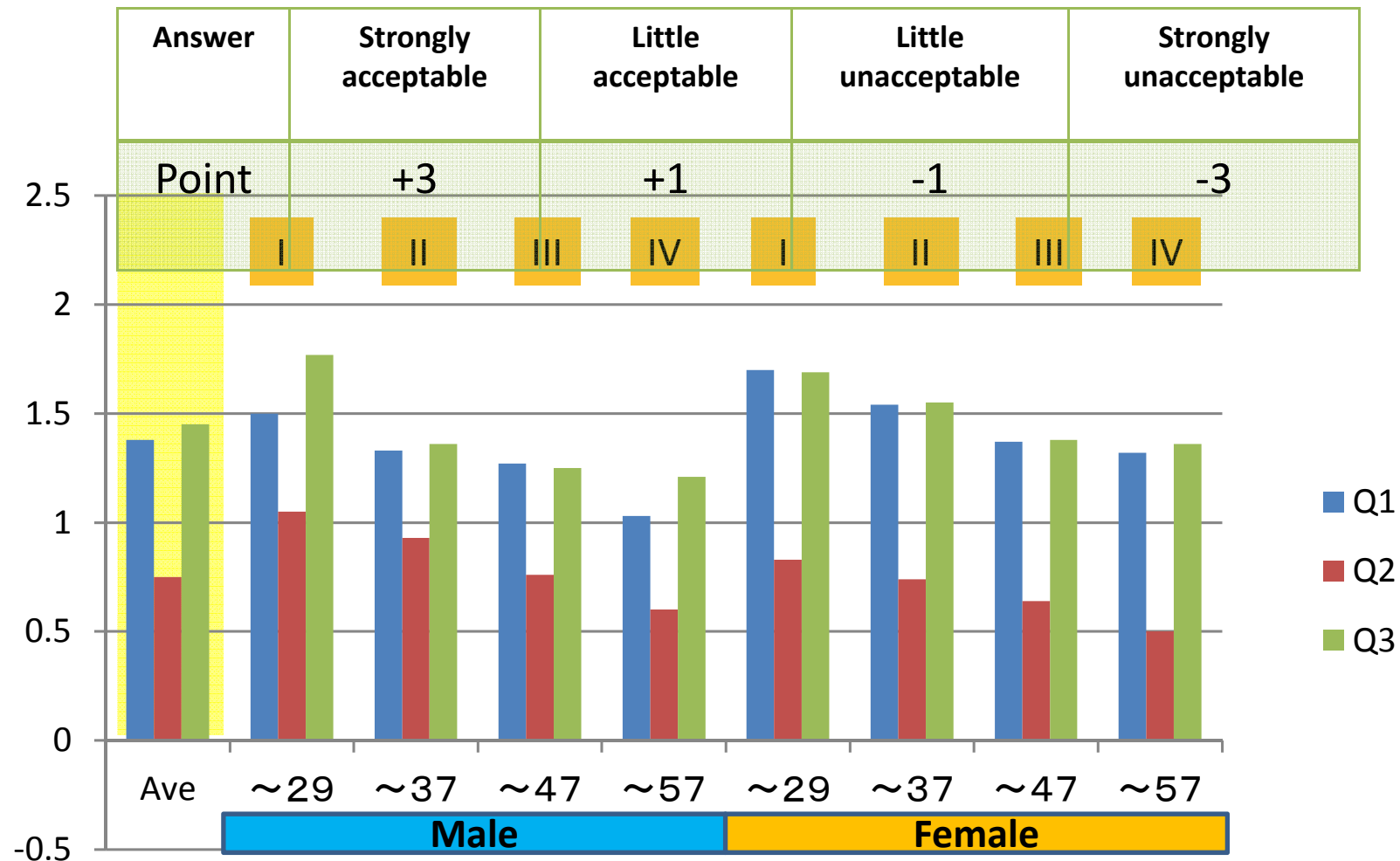
PURCHASING BEHAVIOR IN JAPAN

Methodology of Survey

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

Questionnaire & Demographic Age

Purchasing Behavior (I)

| Answer	Strongly acceptable		Little acceptable		Little unacceptable		Strongly unacceptable
Point	+3		+1		-1		-3
	I	II	III	IV	I	II	III	IV

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?

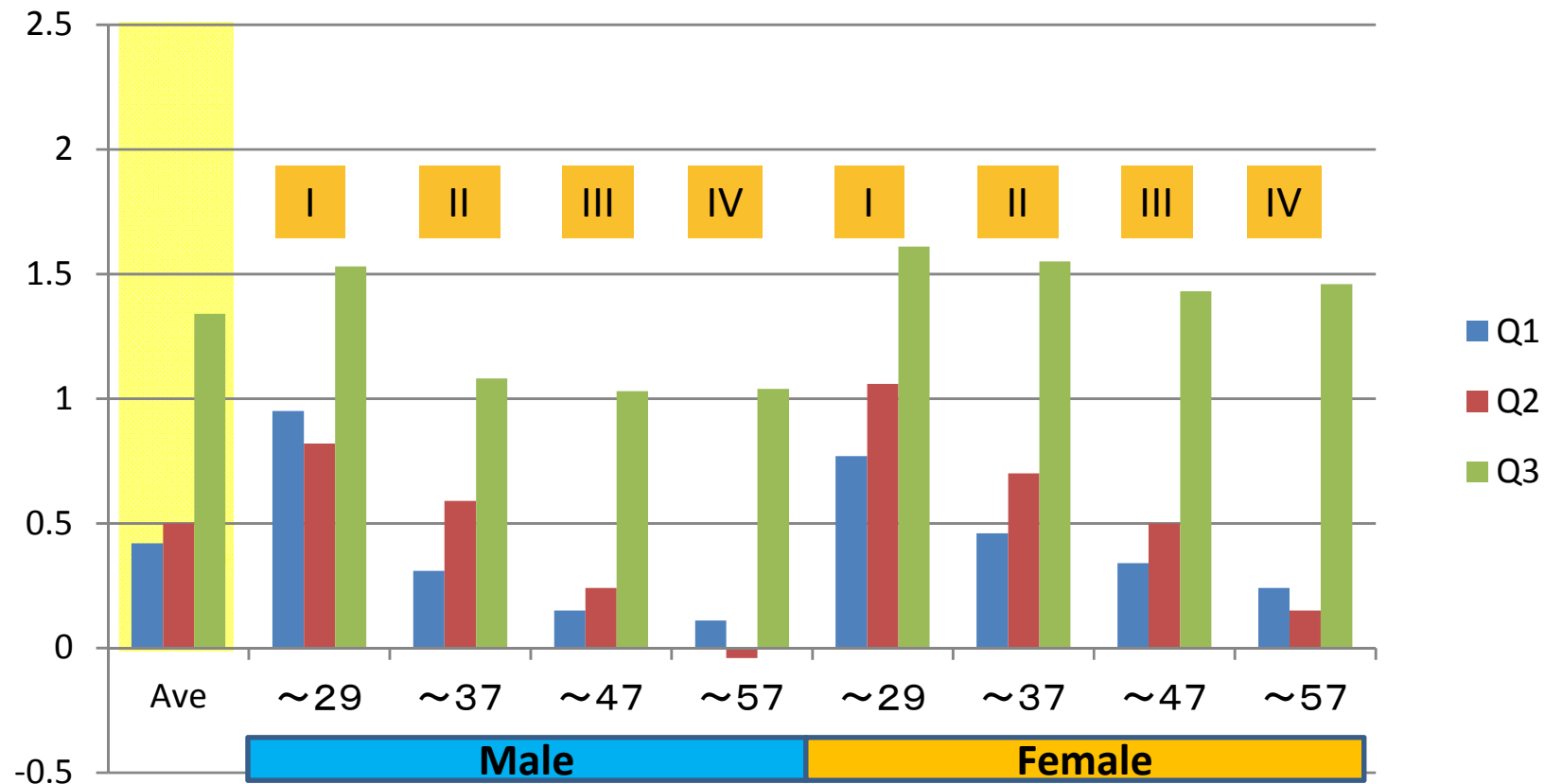# Purchasing Behavior (II)
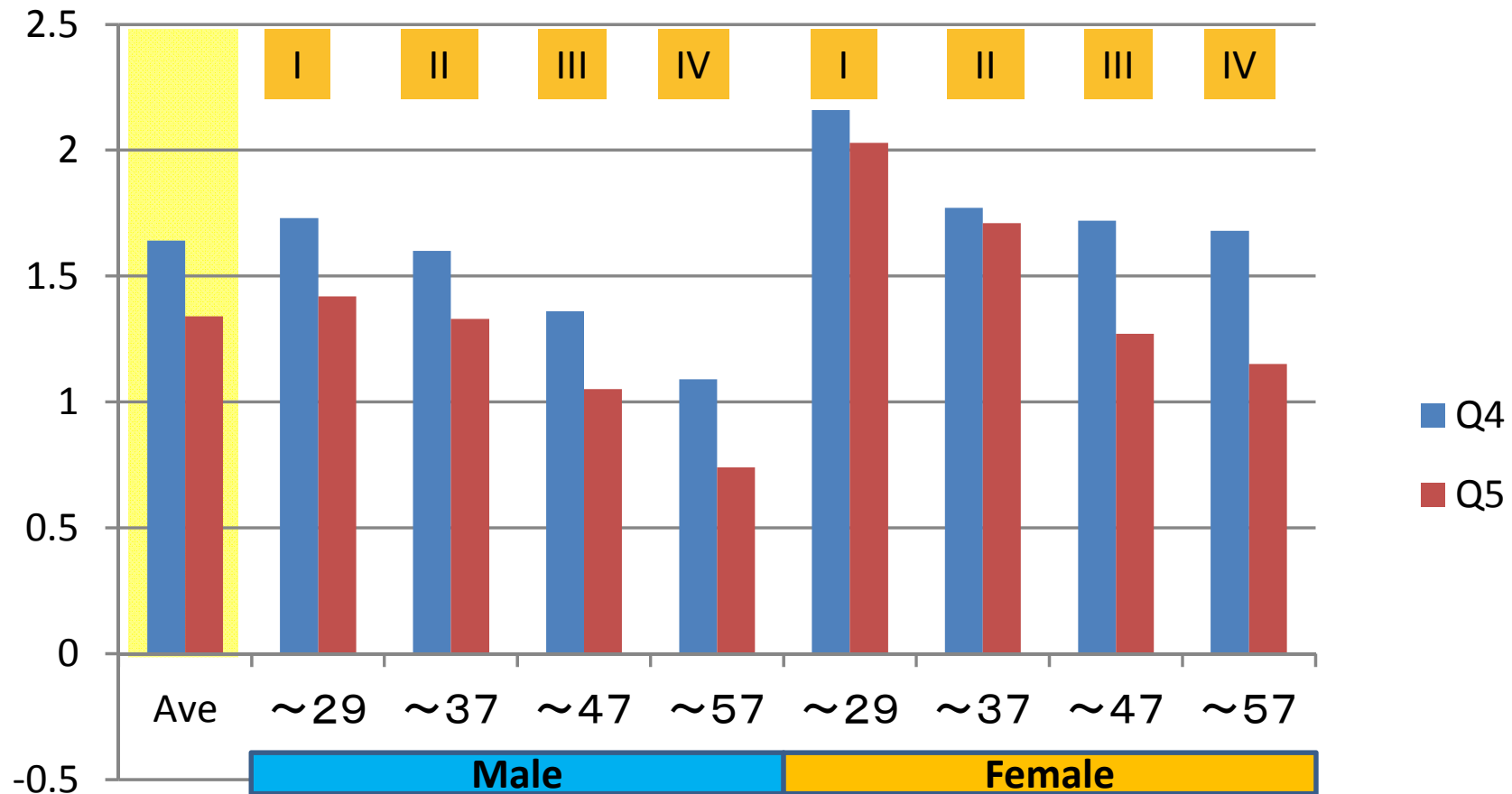
Q4 Do you want to avoid a loan and a debt when shopping?
Q5 Are you happy to increase your savings.

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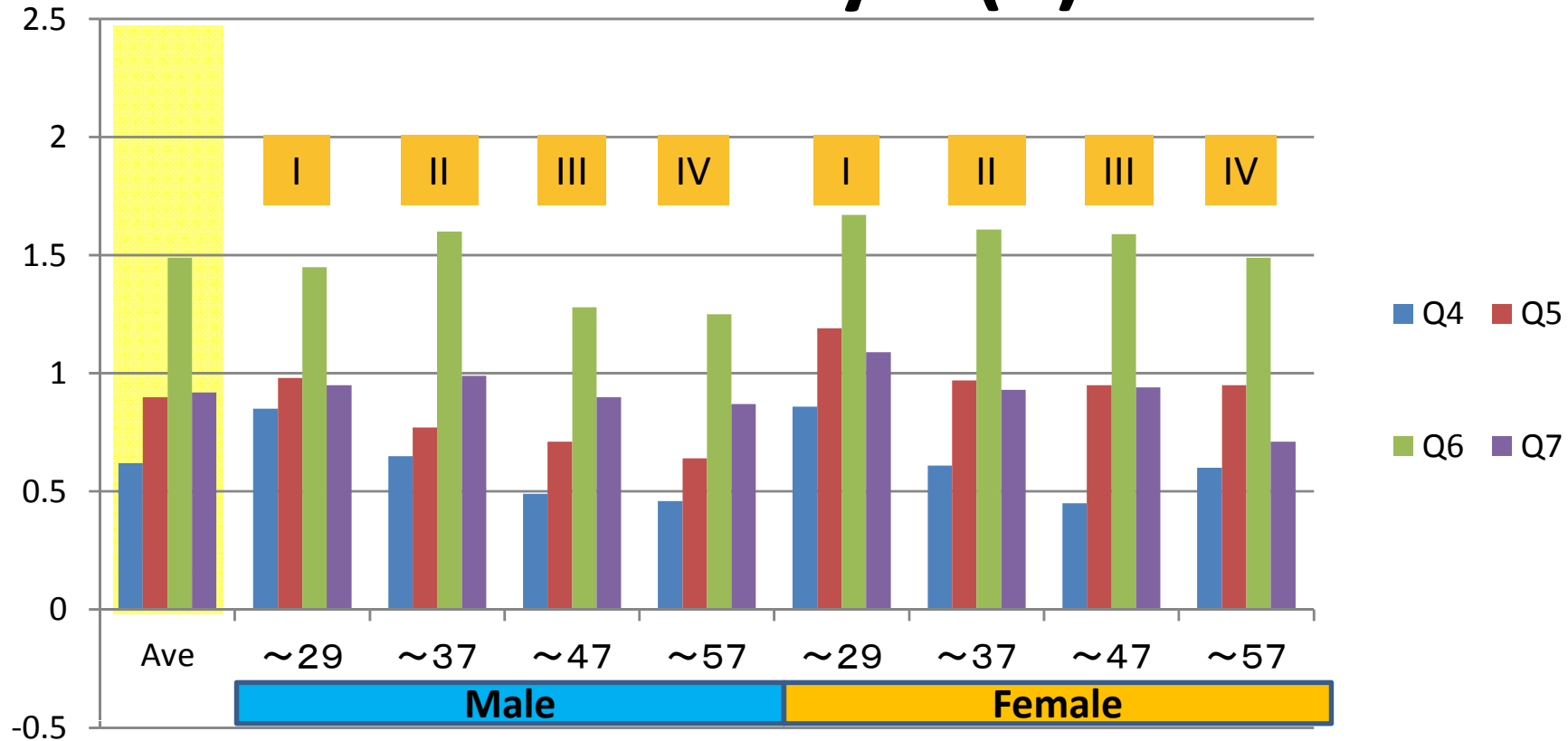
Q4   Do you act considering the future?
Q5   Do you want a risk free lifestyle?
Q6   Do you want to live at your own pace, without straining yourself?
Q7   Do you want to have laid-back life, if you have enough income to live on?

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 theses characteristics**
  - Grew up surrounded by an abundance of material goods.
  - Born into the "Internet and Mobile" era.

NICHE INNOVATION

SOLUTIONS MUST ADDRESS THE FOLLOWING ISSUES:

LANDSCAPE- Purchasing trends, aging society, environmental,
psychological and ontological mechanisms…

REGIME- Current problems related to recycling: QCD, energy saving,
invisible flow…

NICHE INNOVATION- ????????

NICHE INNOVATION=

SERVICE-ORIENTED PRODUCTS

-A creative style of leasing-

What are Service-Oriented Products?
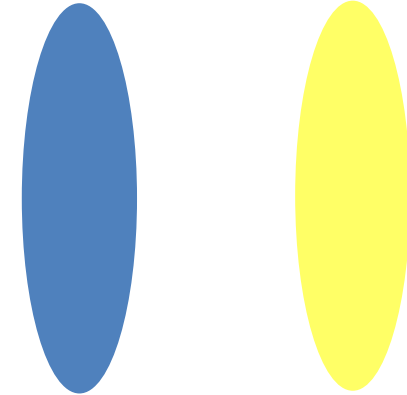## (an analogy with the restaurant industry)

Service (cuisine)

Hardware (dishes)

Hors D'oeuvre
Appetizer
Soup
Main dish
Dessert

Fixed course
A set   B set

Customers pay money not for the dishes but for the cuisine.
Customers choose a fixed course from the cuisine it includes.
Dishes are used many times by many people.

SOPs are "dishes" on which companies "serve" services.

An Approach to SOP Business

1. Choose basic product
2. Create services and fixed courses
3. Decide life-cycle options
   - remanufacturing, reuse of modules, recycling upgrading, maintenance, and so on
4. Design SOPs
   - Reconfiguration which makes offering of various services possible
   - Structure suitable for life-cycle options
5. Make <u>attractive/creative</u> service menu

New Business Model for Consumer Products

Achieving "Recycling QCD"

- Business on Lease Basis
  - Customers: New benefits which they couldn't get by owning the product.
    - Ex. Product can be exchanged easily
  - Manufacturer: Increased profitability
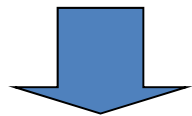
New Business Model Involving
"Service-Oriented Products" (SOPs)

Comparing SOP Concept with Conventional Products

		Conventional products	SOPs
Customer	choose	product specifications	"service" menu
	purchase	hardware	service(hardware rental)
	replace	buy a new one	change with extra charge
Business	profit	product sales	service provision
	manufacture	assembling parts	combining module
	Post-use	disposal/recycling	reuse/recycling
Relation between business and customers		weak (in post-sales periods)	close (until use period ends)

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 the 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

SOP's impact on REGIME and LANDSCAPE

SAMPLE OF SOCIO-TECHNICAL REGIME ISSUES:

Quality Cost Delivery:
  An SOP will always be under company management

Energy Saving:
  Products can easily be exchanged for new energy saving models

Invisible Flow:
  DTOS will ensure that illegally discarded products can be traced.

Sample of Socio-technical Landscape Issues

<u>Purchasing behaviour</u>:
An SOP follows the purchasing trends of young people
- attractive service menus can provide new 'sales'
opportunities thus stimulating the economy

<u>Ageing Society</u>:
Companies can create 'service menus' that provide extra
support for and aging population

<u>Philosophical</u>:
SOP with DTOS encourages consumers to question what is means
to own something, i.e., 'ownership=responsibility

CONCLUSION

1-Recycling has become one of the essential solutions but recycling strategies and methods must become far more sophisticated. The conventional recycling system has serious defects from the viewpoint of "Recycling QCD".

2-Businesses stimulate people's desire, sell a lot of products to people, and then lose their attention of the products after sale. These businesses are also supported by peoples overconsumption disorder.

3- Research suggested a departure from the notion of "owning" consumer products in Japanese young people, suggesting systems such SOP's may be feasible in the future.

Preparation for Next Class

1. Choose a product
   a. TV & AV Equipment, Others (electric home appliances), Private car, PC & Information communication equipment
2. How many of these products were disposed of every year in Japan?
3. How much energy was consumed at the product usage stage a year in Japan?
4. What is your idea based on today's lecture to solve these problems? (e.g. SOP's, Service menu......)
5. Analyze positive and negative points of your idea using quantitative and/or qualitative method.

An Approach to SOP Business

1. Create the services and fixed courses
2. Choose the basic product
3. Decide its life-cycle options
   - remanufacturing, reuse of modules, recycling upgrading, maintenance, and so on
4. Design the SOPs
   - Reconfiguration which makes offering of various services possible
   - Structure suitable for life-cycle options
5. Make the business plan

Student Presentation Guidelines

Choose a product!!!

Research:

-Product lifecycle (especially 'end-of-life').
-Environmental impact of the product, ex, how is it recycled, energy consumption...
-Consider issues related to 'invisible flow', QCD.

-Consider any social, psychological, philosophical issues that may be related to product usage, ex, demographics (who uses the product, why do they use it...)

Transform your chosen product into a 'Service Oriented Product' (SOP).

-Develop an innovative and attractive 'service menu'.
-Show how your SOP addresses the environmental/socio-technical issues above. Explain the impact your SOP could have on the environmental/socio-technical landscape.

-Use ideas/methods presented in the lecture (the power point slides will be uploaded on the university website)
- Read the handout: "Concept of Dual Traceable Ownership System (DTOS) as a Sustainable Design for Product Recycling"
- Conduct your own research.

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

Schedule

- Individual group presentation (-80 minutes)
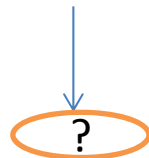

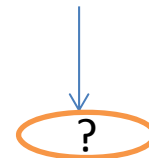15 minutes: presentation
10 minutes: Q&A, discussion

- Debate(-20 minutes)

Compare: which is feasible   Compare: which is feasible

- Explain debate process (10minutes X 2)

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, esthetique			
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			

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. Malmo, Sweden.

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