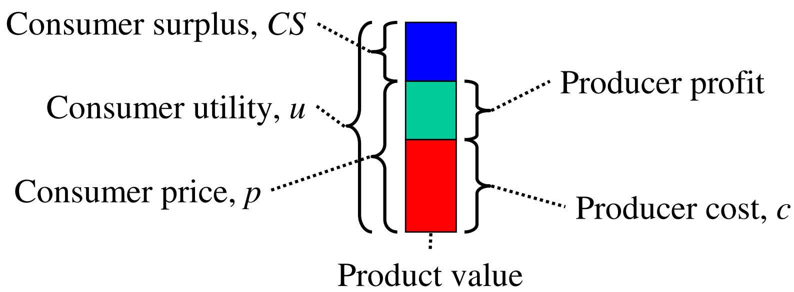
Consumer Customers

S-38.041 Networking Business

Consumer’s Problem

Conflicting interests



- Consumer tries to maximize consumer surplus, *CS*
- Consumer’s utility from a product is dynamic
- Producer tries to maximize producer surplus, profit, *p-c*
- Social planner tries to maximize social welfare, *u-c*

The consumer’s problem is one of the core topics in microeconomics because it efficiently exposes the demand-supply dynamics of consumer behavior.

Lets assume a single consumer and a single product. Consumer’s *utility*, i.e. *willingness-to-pay*, for the product is a measure for the product’s full value to a consumer. Utility is personal: the same product creates different utilities for different consumers. Utility is sensitive to mental and physical states such as hunger, sleep, happiness, etc. Utility of a single product also depends on the availability of other products: complements and substitutes.

Consumer tries to maximize the *consumer surplus* (= utility - price) by aiming at a lower price. If the price remains higher than utility, the consumer will not buy.

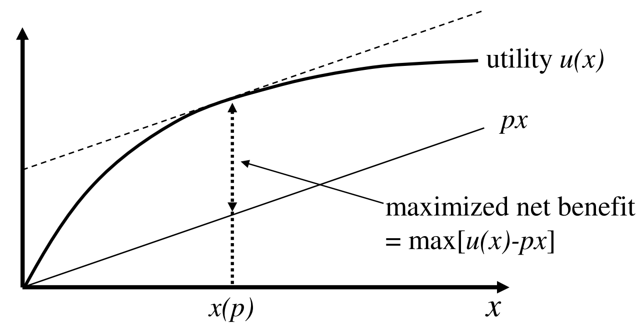
Producer tries to maximize the *producer surplus*, i.e. *producer profit* (= consumer price – producer cost) by increasing prices and decreasing costs.

Social planner, i.e. society, tries to maximize the *social surplus*, i.e. social welfare (= consumer surplus + producer surplus), by increasing consumer utilities (via promoting innovations) and decreasing costs (via promoting competition). Politicians maintain the balance the between consumer and producer surplus.

Telecommunications services is often an oligopoly market and subject to close regulatory guidance, which affects the sharing of surplus between consumers and producers.

Consumer’s Problem

Utility function



- *u(x)* is typically increasing and concave
- Consumer chooses x(p) because of maximal net benefit
- Cummunications expenditure is small wrt total income
  - ⇒ Utility of communications is quasilinear wrt income
  - ⇒ Level of income has little impact on *u(x)*

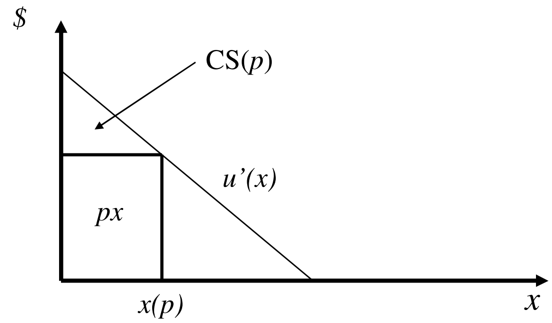
Lets assume a single consumer and a single product. Utility function *u(x)* describes utility as a function of product quantity *x*. Utility typically increases with quantity but in a decreasing manner. We say that *u(x)* is an increasing and concave function.

Since the consumer tries to maximize his net benefit, i.e. consumer surplus, he chooses a quantity with maximum net benefit (=max[*u(x)-px*). The first derivatives of utility and cost are equal at the optimal quantity x, or in other words, the marginal utility equals price.

Note that the cost of communication services typically represent only a small fraction of the consumer’s total income. This means that the consumer’s communications behavior is not very sensitive to his income level. It also means that the utility function can be considered quasilinear, which implies that utility functions can be kept less complex by ignoring the income level.

Consumer's Problem

Demand curve for single customer, single good



- CS(p) = $u(x(p))-px$
- For simplicity, *u'(x)* is drawn as a straight line

Lets assume a single consumer and a single product. Utility function *u(x)* describes utility as a function of product quantity *x*. Utility typically increases with quantity but in a decreasing manner. We say that *u(x)* is an increasing and concave function.

Since the consumer tries to maximize his net benefit, i.e. consumer surplus, he chooses a quantity with maximum net benefit (=max[*u(x)-px*). The first derivatives of utility and cost are equal at the optimal quantity x, or in other words, the marginal utility equals price.

Note that the cost of communication services typically represent only a small fraction of the consumer's total income. This means that the consumer's communications behavior is not very sensitive to his income level. It also means that the utility function can be considered quasilinear, which implies that utility functions can be kept less complex by ignoring the income level.

Consumer's Problem

Multiple consumers and services

- Consider a market with n customers selecting from k services

$$CS_i = \max_x [u_i(x) - px]$$

Vector quantity of services, $x = (x_1, \ldots, x_k)$
Customer i belongs to $N = \{1, \ldots, n\}$
Assume $p(x) = \Sigma_i p_i x_i$, for a vector of prices $p = (p_1, \ldots, p_k)$

- Demand function for customer i is $x^i(p)$, given vector p
- Aggregate demand function is $x(p) = \Sigma_i x^i(p)$, total demand
- Consumption may cause side-effects (externalities)
- Service demand may depend on other services (cross elasticity)
  - Substitutes
  - Complements

Consider the service portfolio and subscriber base of a GSM operator. You can find the the service vector and its corresponding price vector from the operator's public tariff list. Each subscriber maximizes his consumer surplus, CS, by choosing the usage level for each service according to his personal utility function and price set by the operator. This can also be formulated as a subscriber's personal demand x(p), demand as a function of price. All personal demand functions together for the aggregate demand function, or total demand.

Demand function is simple if one subscriber's demand would not affect the other subscribers. In practice, however, a side-effect called network effect, or network externality, can create strong dependences between personal demand functions.

Demand function is also simple if the personal demand of one product would not affect the personal demand of other products. In practice, however, products are to some extent substitutes (SMS and MMS service) and/or complements (SIM card and GSM phone) to each other. This dependence is visible as cross-elasticity between products, price elasticity and demand elasticity.

Positive Network Effect: Example

- Assume market of N potential customers, $N = 100$
- Willingness to pay, utility, $u_i(n) = ni$, $i = 1 \ldots N$
- Market is dynamic, i.e. refunding works well
- Given price p
  - Potential equilibrium of demand is at n customers
  - The ”indifferent” customer is $i = N\text{-}n$
  - For $u_i(n) = p = ni = n(N\text{-}n)$
  - Demand curve shows three possible equilibria: 0, A, B

Source: Courcoubetis&Weber/2003

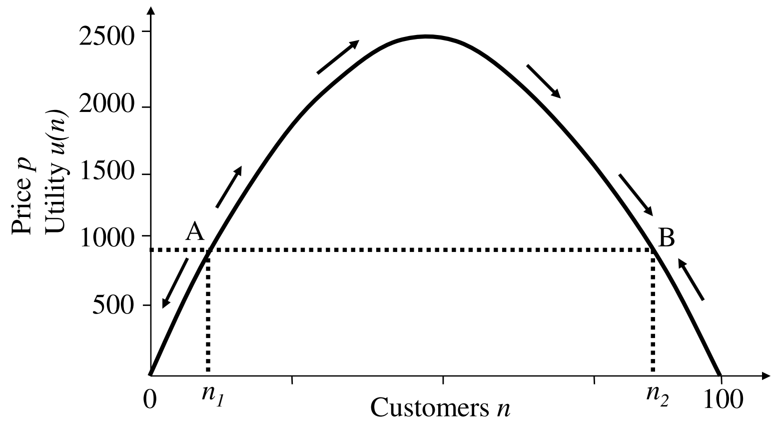
Positive network effect can be illustrated with a simplistic market example: one producer (e.g. GSM operator), one product (e.g. GSM subcription), 100 customers, and a careful selection of a utility function, $u_i(n) = ni$

Note that the utility function is personalized, that is, it is different for each customer because customers are indexed with i and the index appears as a multiplier in the utility function. This relates to technology adoption life cycle with customer segmentation: early adopters, laggards.

Note that there is an explicit network effect because the utility function has the number of current customers, or likely customers, n as a multiplier in the utility function.

Price set at p the potential equilibrium points are 0 (nobody buys) and spots where price equals utility (”indifferent” customer at A, B). At indifference points there are customers, non-customers, and one indifferent customer, $i = N\text{-}n$.. The utility of this indifferent customer equals price, that is, $p = ni = n(N\text{-}n)$. This equation defines the demand curve as a parabola crossing origo and opening downwards (see picture).

Network effect: example



- Perturbation at A leads to 0 or B which are stable equilibria
- Market failure happens unless positive feedback brings to B
- Setting the price *p* defines the critical mass of customers n_1 needed for success
- Derivative on social welfare is positive at n_2..100 (social subsidies justified!)

Source: Courcoubetis&Weber/2003

The demand curve of our example shows the possible equilibrium points (0, A, B). The arrows indicate the direction of the force of network effect.

Point A is an unstable equilibrium because the network effect works away from it. A small perturbation in customer base at A will either cause market failure (moving to 0 customers) or market success (moving to B and n_2 customers).

We can say that n_2 is the critical mass, or minimum number of customers, required for this service to succeed. Often no single operator can achieve the critical mass and the operators willingly cooperate to achieve it together (e.g. in standards and interoperability).

The network effect, or demand-side economy of scale, tends to make the strong operators stronger and the weak ones weaker. In addition, the mass production advantage, or supply-side economy of scale, tends to do the same. Therefore the operator markets are closely monitored by the regulator.

Consumer service portfolio

Home telephone

- Number to family/location (analog, ISDN, VoIP)

Home Internet

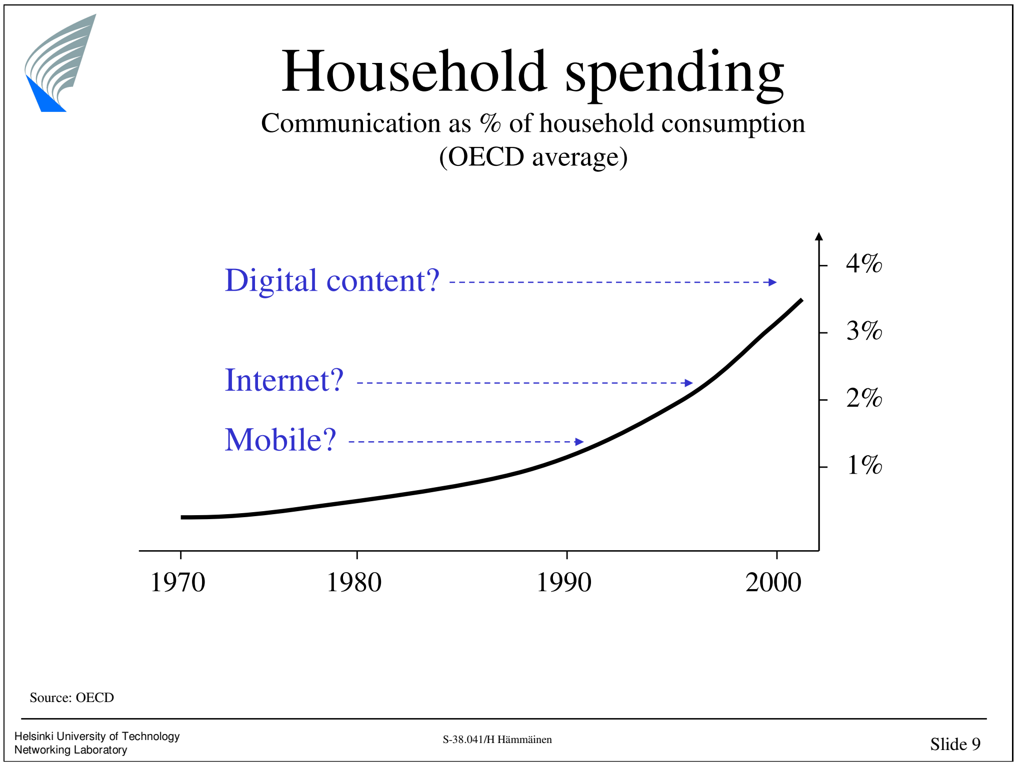
- PC broadband Internet access (copper, cable, fiber, WLAN)
- Value-added services (email, home page, security, …)

Home TV/radio broadcast

- Signal source (cable, terrestrial, satellite)
- Signal type (analog, digital/MPEG, digital/IP streaming)

Personal cellular handsets

- Personal life management
- Services bundled on SIM card (GSM, WCDMA)



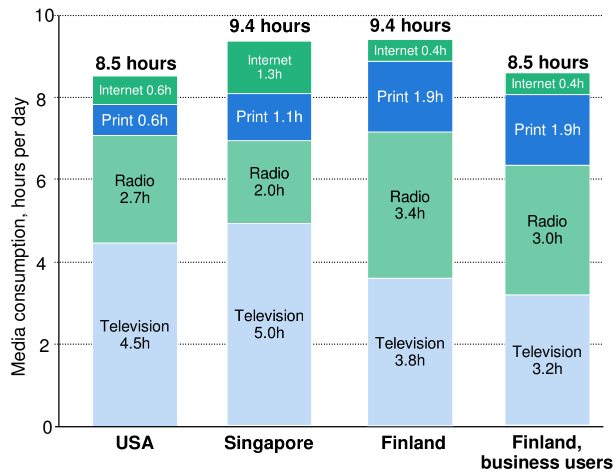
The OECD statistics show the growth of household spending on communications from less than 1% to 3-4% between 1980 and 2000 when considered as percentage of total household spending.

This relative growth can be explained by the general increase in welfare which moves spending from basic necessities to more advanced technology-based consumption.

A rough estimate indicates that the mobile communications services have contributed c. 1% and Internet another 1%. Since mobile and Internet have already reached high consumer penetrations in industrialized markets, they cannot fuel much more growth without additional components. Some analysts predict that digital content is main engine of growth.

Media consumption

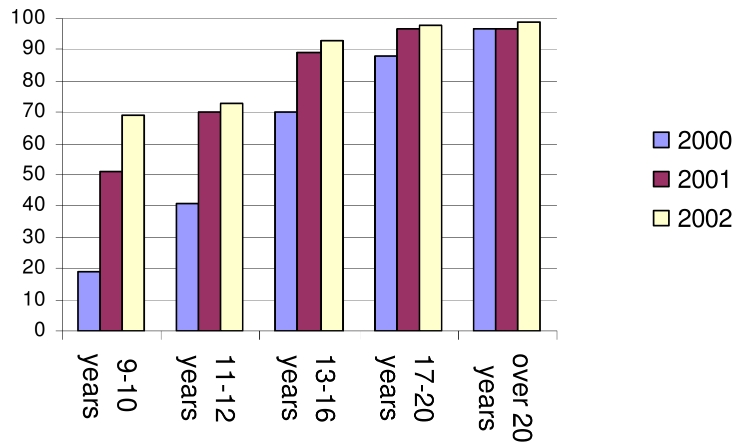
Mobile is not yet recognized



Source: Mediacom 2002, OMD Research 2001, Suomen Gallup 2002

Kids adopting the mobile culture

(% of age class)



Source: Lapset, nuoret ja matkaviestintä 2000-2002

Case Japan: Daily Usage Time

Mobile Internet

Minutes/day	Female	Male	Overall
<5	48.28	56.07	53.85
5-10	22.06	19.86	20.49
10-20	13.78	9.88	10.99
20-30	8.20	5.74	6.44
30-60	4.68	4.25	4.37
60-90	1.27	1.44	1.38
>90	1.72	2.76	2.46

- More than 50% of users use less than 5 min per day
- No clear correlation
  - time of day vs. target content
  - amount of usage vs. target content

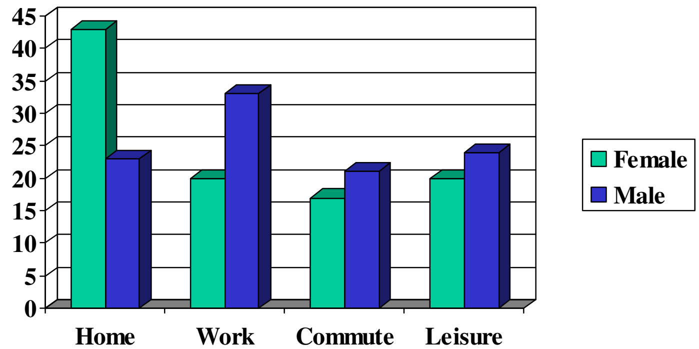
Source: MoCoBe.com survey, 2003

One way to get more information about consumer behavior in communications is via direct consumer surveys.

This example survey by MoCoBe in Japan indicates that the consumer’s usage portfolio of mobile Internet content remains the same at all times of day. It also suggests that consumers with large consumption and those with small consumption have similar structure in their content portfolio.

Case Japan: Daily Usage Location

Mobile Internet (%)



- Usage follows the duration of presence (except commute)
- No clear correlation between location and content

Source: MoCoBe.com survey, 2003

The survey also suggests that the amount of consumer's content consumption correlates closely with his duration of presence at each environment such as home, office, commuting, and leisure sites. On the other hand, the type of content does not correlate with the location of presence.

All these observations support the conclusion that the main indicator of a consumer's content usage is his personality. For instance, if a person listens to music at home via his handset, he is likely to do the same at school or in the office.

This conclusion motivates the industry players to invest in good understanding and segmentation of consumers.

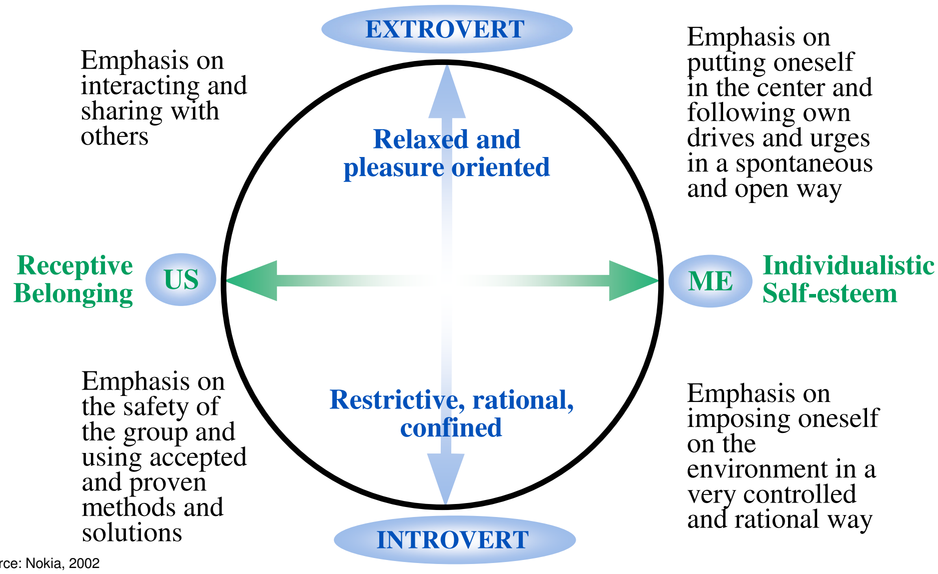
Case Japan: Usage Summary

Mobile Internet

- Personality drives the usage patterns, not location or time
  - contextual marketing should focus on personality
- 73% of users consider email/chat as #1 app
  - ringtones/pictures is #2 with 6% of respondents
  - email is a killer app!
- Only 26% of users pay extra for mobile Internet content
  - 60% of those who pay extra, pay less than 4 USD/month

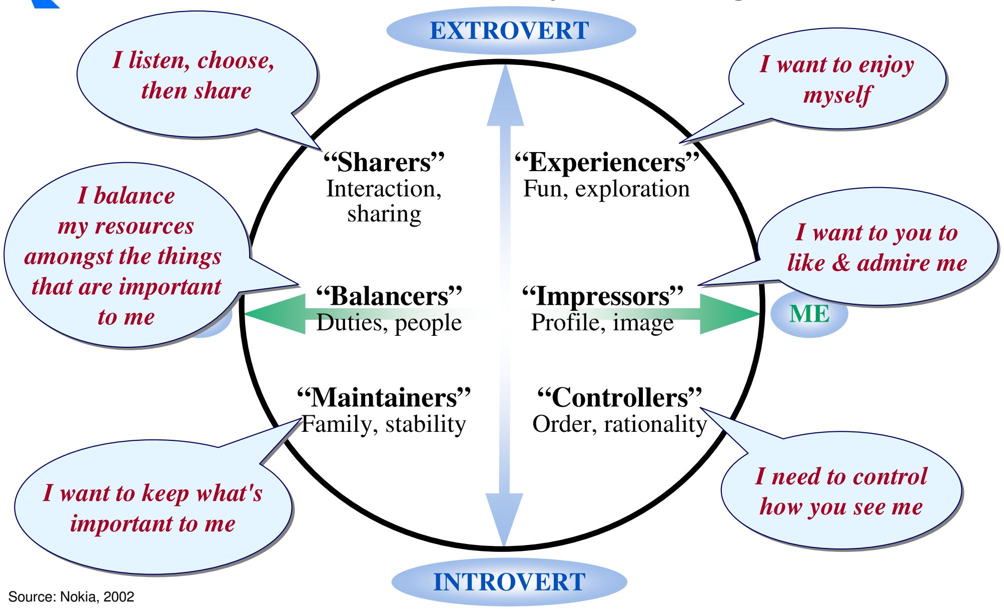
Source: MoCoBe.com survey, 2003

Framework of consumer orientation



Source: Nokia, 2002

The Six "MindStyle" Segments



Source: Nokia, 2002

What do the Mindstyles tell us?

- The Mindstyles describe 6 different Life Strategies that people use to approach life's priorities and challenges.
- Understanding these different strategies provides strategists and designers with insights on what is relevant and important to different groups of consumers.

Traditional vs new media

PAST

Rational
Limited Choice
TV, radio, movies
Newspapers & magazines

Emotional
More 'face'/Word-of-mouth
Slower pace/simple
"Black & White"
More sharing of media
"People would gather together to look at photos"
Less *"informed"*
More planning
(less spontaneous)
Less taken for granted
'Fireside' values

PRESENT

Rational
Wide choice
Long-range/Global
Instant access
Internet, email
Cell phones

Emotional
More mobile/spontaneous
Faster, need to keep up
More 'colour'
Greater choice
But
Complex – overload
Isolated
Less personal contact
Dependent
Rely on TV/mobile *"too much"*

FUTURE

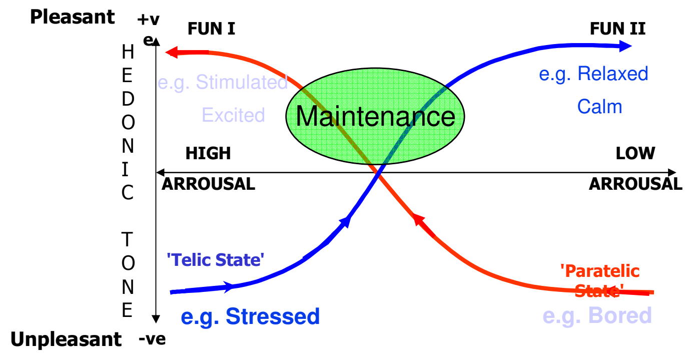
Rational
More, Faster, Better
Merging of Mobiles & PC
Multi-media combinations
'All in one' devices

Emotional
'The virtual world
is the real world'
Technology takes over
Human hybrids
Humans become lazy
Loss of Privacy
'Big Brother'

Source: Vanjoki, 2003

Two Types Of 'Fun'

- Consumers make a distinction between two types of 'Fun' in relation to entertainment. **Fun I** is active, stimulating and exciting, to escape from boredom. **Fun II** is more passive, relaxing and calming to escape from stress. People use Media and Entertainment alternately to create these moods. **Younger** identify more with **Fun I** and **Older** with **Fun II**.



Source: 'Reversal Theory', Michael Apter

How do I manage my world?