

# Information and Society-E2

## Information Economy 3

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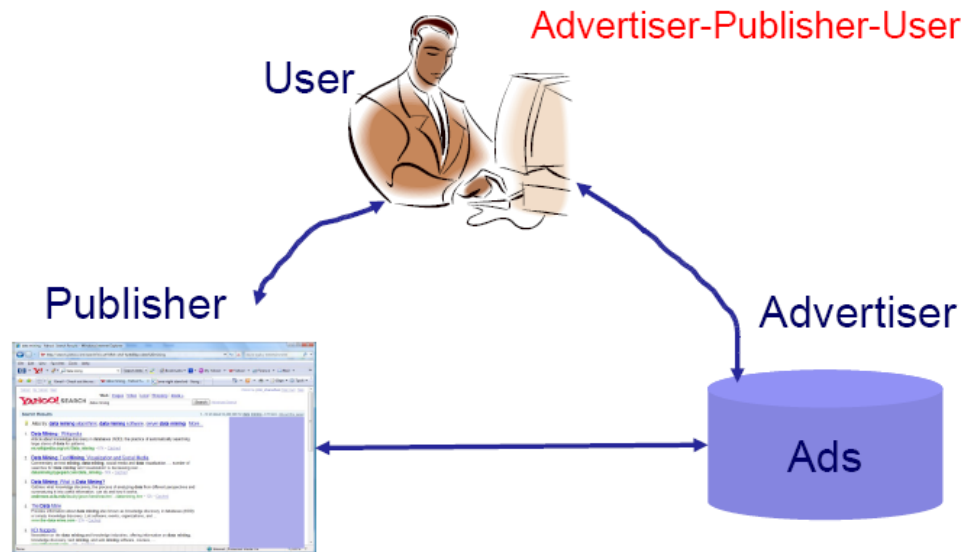
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# **COST MODEL OF ONLINE ADVERTISING**

# Online Advertising Business Models

- Business Models
  - CPM Model (pay-per-mille model)
  - CPC Model (pay-per-click model)
  - CPA Model (pay-per-action model)



# CPM

## (Cost Per Mille)

- Price model used in charging for an advertisement placed on website (similar to TV)
  - Represents the **cost for 1000 impressions**
  - Recently, CPM billing has been **limited to major websites**, with CPC typical for small to medium-sized websites
    - CPM is common model when targeting a specific URL or site
    - It allows advertiser to know exactly how much money the ad campaign will cost
  - **Publisher is not concerned** with the fact whether the visitor is in the **required segment of users** – risk is on the advertiser side as for whether the visit will be converted or not
    - **Weak correlation with sales or leads**

# CPC

## (Cost Per Click)

- Cost for each time the ad is clicked
  - The cost of 1 CPC is incurred when [text ads or banner ads](#) positioned on a website or e-mail is [clicked](#) and the website visitor [visits](#) the ad website
  - This type of fee-levying ad is referred to as a [click-guaranteed ad](#)
  - CPC varies with the placement method and scale of ad campaign, but usually ranges anywhere from several yen to several tens of yen
- CPC is good indicator of banner quality
  - E.g. Banner can be shown 200,000 times and clicked 1,000 times with CPC of \$0.08 giving \$80 (click-through rate is  $1000/200,000 = 0.5\%$ )

# CPA

## (Cost Per Action)

- Cost per successful conversion
  - A website visitor **clicks** on the ad and is taken to the advertisers website, with compensation paid out when the visitor **takes some type of action**, such as becoming a **registered** user or **purchasing** an item
    - CPA represents a **compensation per each action** (or conversion)
  - The desired action is decided by advertiser
  - CPC of a click-guaranteed ad tends to vary anywhere from several yen to several 10s of yen, while CPA ranges from several hundred to several thousands yen
- Similar to a click-guaranteed ad, **all risk** normally borne by the advertiser **is now shifted to publisher**
  - E.g., when the banner ad is poorly designed, the product or service is not appealing, or when a conversion does not result because of a problem in the design of the website then publisher is at loss
  - Publisher may refuse CPA if CPM or CPC models can fill his inventory

# **CONSUMER SEARCH THEORY**

# Search Theory

- **Search theory** analyzes **individual's optimal strategy to select** from a range of potential opportunities of random quality
  - *Assumption: delaying choice is costly*
- **Search models:** the idea is to **compare** the **cost of delay** against the **expected value of search**
  - Choice of product (or job) depends on the **searcher's beliefs about the alternatives available in the market**
- Applied in many areas, e.g.,
  - in consumer theory to analyze purchasing decisions
  - in labor economics to analyze job hunting strategies
  - etc.
- Optimal stopping problems (Mathematics)





# Search Costs

- **Monetary costs** of acquiring the information
- **Opportunity cost**: when one pursues a goal, s/he limits the extent to which other goals can be satisfied considering scarce resources (e.g. time, money)
  - Equal to the **best unrealized opportunity** (e.g. lost salaries if one went to school instead of working)
- **Cost of waiting**: can be high if consumer **urgently** needs the product
- **Mental effort** such as sorting the incoming information, and integrating it with current consumer knowledge
  - Depends on the consumer's ability to undertake the search (intelligence, prior knowledge, education and training, etc.)

# Fixed Sample Size Search Model vs. Sequential Search Model

- Let us assume that price is the only searched attribute
  - **Fixed sample size search model (non-sequential)**: consumer commits to searching  $M$  stores before buying
    - from lowest-cost stores
    - “Batch” search strategy
  - **Sequential search model**: consumer decides after each search whether to buy at current store, or continue searching to find cheaper option

# Fixed Sample Size Price Search (Non sequential)

- **Consumer**

- Wants to collect information to acquire good-quality and inexpensive goods
- Unknown: **actual pricing of individual retailers**
- Known or expected:
  - Overall price distribution at local retailers (search with a known or expected distribution)

- **Approach**

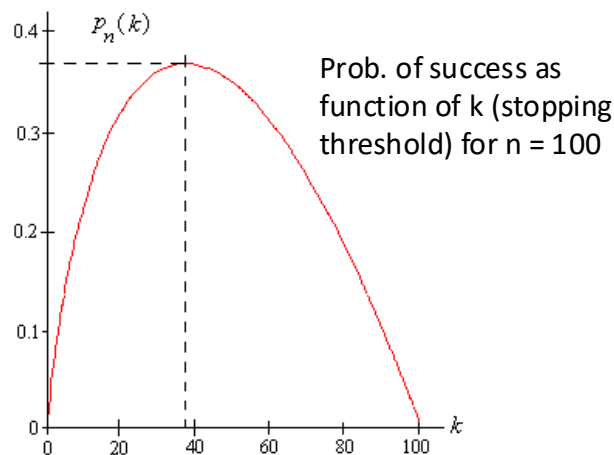
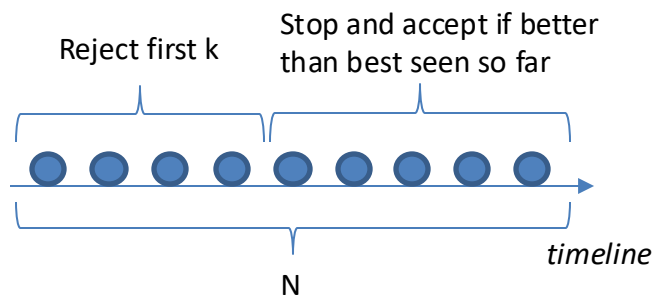
- Determine  $M$  stores to visit for the search of the best price
- Optimal search frequency  $M$  should minimize  $Ep(M) + cM$ 
  - $Ep(M)$ : expected lowest price gained from search  $M$  times
  - $c$ : search cost per trip

# Sequential Price Search

- **Approach**
  - Consumer decides after each search whether to buy at current store, or continue search
  - Set  $R$  as the allowable ceiling price (reservation price of search)
    - Search ends and product is purchased when a price lower than the reservation price is found

# Example of Optimal Stopping Problem in Sequential Search: The secretary problem

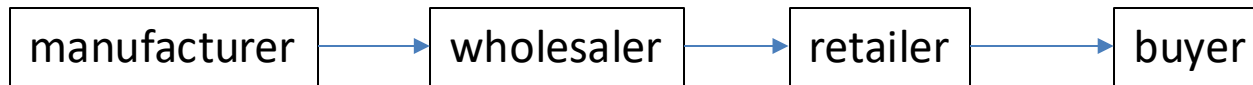
- “Secretary problem” (similar to matchmaking)
  - Manager wants to hire a secretary out of  $N$  candidates
  - Candidates **randomly** come for an interview
  - After each interview decision has to be taken that is **irrevocable**
  - Quality of unseen applicants is **unknown**
- Optimal stopping rule:
  - Reject  $k = N/e$  first applicants and stop at the first applicant who is better than all the applicants interviewed so far
  - **e** is the Napier's constant that is equal to **2.71828...**



# Search and Acquisition on Internet

# Search and Acquisition on Internet

- Effect of Internet on product search
- Typical supply chain before the Internet:



# Search on Internet

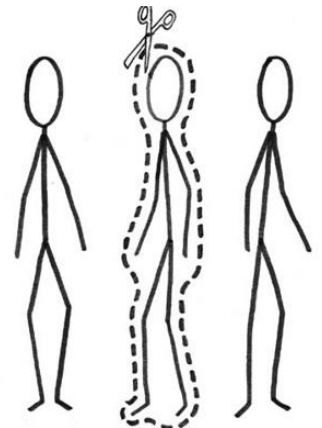
- After Internet has come?





# Internet and Disintermediation

- Internet was **expected to eliminate search costs** which in turn should cause disintermediation
  - **Search costs become low enough for end-consumers to incur them directly instead of employing retailers to do this**
  - Due to **high market transparency** buyers can be aware of prices directly from the manufacturer (more options)
  - This would in turn lead to lower prices and less variation between prices quoted by different sellers
- **Disintermediation - reducing the number of intermediaries** between manufacturer and buyer
  - Dell - sells many of its systems important strategy for large retailers (e.g. Walmart) to decrease prices
  - directly to the consumer



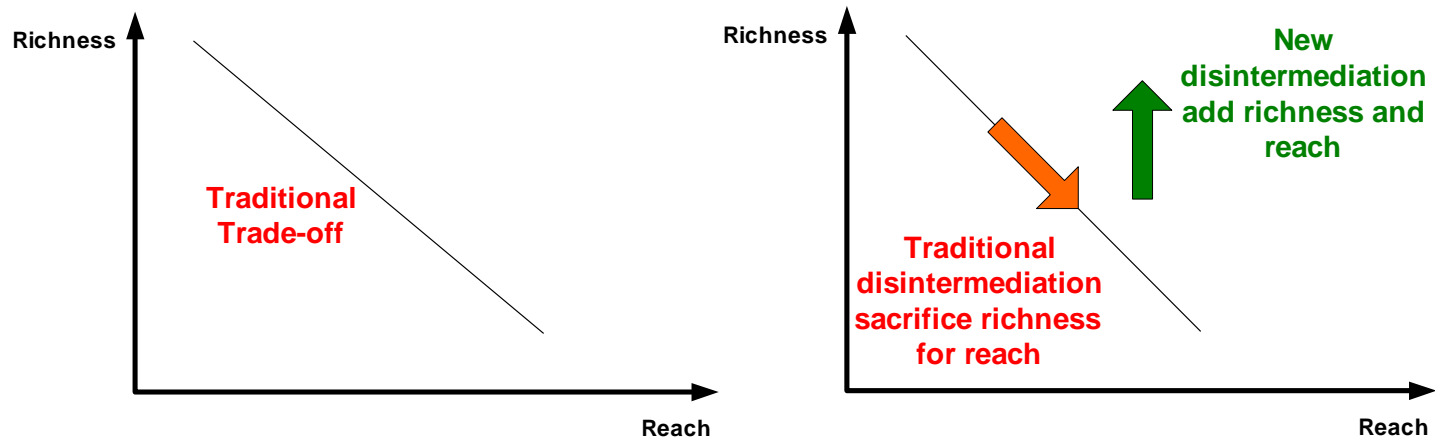
CUT OUT THE MIDDLE MAN.

# Internet and Disintermediation

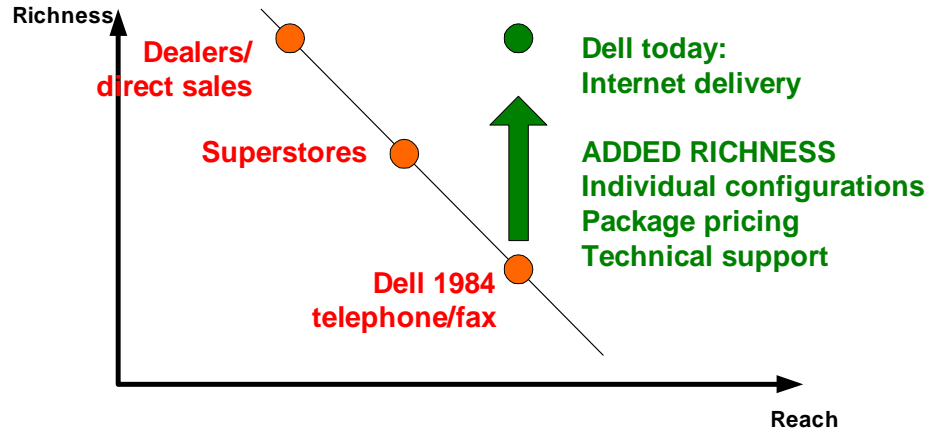
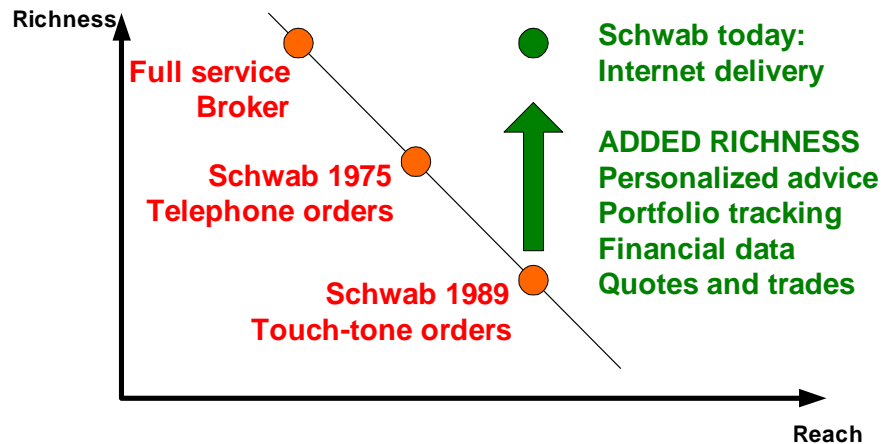
- Internet-related disintermediation occurred less frequently than many expected during the .com boom
  - Retailers and wholesalers provide **essential functions** such as the **extension of credit**, **aggregation of products** from different suppliers, and **processing of returns**
  - Organizing the shipping of goods by the manufacturer is difficult
- **New intermediaries** appeared in the digital landscape (e.g. Amazon, eBay)
- In response to the threat of disintermediation, some retailers have attempted to integrate a **virtual presence and a physical presence** in a strategy known as *bricks and clicks*

# Richness vs. Reach

- Information delivered physically is subject to a universal **trade-off between richness and reach**
  - **Richness**—quality of information, accuracy, bandwidth currency, interactivity, etc.
  - **Reach**—number of people who participate in sharing information



# Richness vs. Reach: Examples



# Bounded Rationality

# Bounded Rationality

- Assumption of rational customers
- Decision makers lack resources or ability to arrive at optimal decisions
  - Time, information access, searching and analyzing skills etc. can be insufficient
  - Satisfactory solutions preferred than optimal ones (satisficing)
- Consumers are partly rational, while even irrational or emotional in remaining parts of their actions
  - They often employ heuristics rather than strict rules of optimization process

# Heuristics and Cognitive Biases when Making Decisions or Selecting Products

- **Herd behavior**: how individuals in a group can act collectively without centralized direction
- **Status quo bias**: an emotional bias; a preference for the current state of affairs
- **Money illusion**: the numerical/face value (nominal value) of money is mistaken for its purchasing power (real value) at a previous point in the general price level (in the past)
- **Present-biased preferences**: “now” has higher value than future
- **Threshold price**: the psychological fixing of prices to entice a buyer up to a certain threshold at which the buyer will be lost anyway
  - So while you wouldn't necessarily lose a buyer jumping from \$2.05 and \$2.06, you could lose one going from \$1.99 to \$2.00.

# Heuristics and Cognitive Biases when Making Decisions or Selecting Products

- **Anchoring (focalism)**: a cognitive bias for an individual to rely too heavily on an initial piece of information offered (known as the "anchor") when making decisions.
- **Loss aversion (risk aversion)**: people's tendency to prefer avoiding losses to acquiring equivalent gains: it is better to not lose \$5 than to find \$5.
- **Disposition effect**: the tendency of investors to sell shares whose price has increased, while keeping assets that have dropped in value.
- **Endowment effect**: the hypothesis that people ascribe more value to things merely because they own them
- **Calendar effect**: any market anomaly or economic effect which appears to be related to the calendar.



# **INFORMATION ASYMMETRY**

## **(情報の非対称性)**

# Uncertainty in Economic Decisions

- Uncertainty in **economic decisions**
- Many examples
  - E.g. buying a house
  - E.g. deciding whether to work for a large company with few chances of advancement or for a start up with less security but more opportunity for advancement



# Active vs. Passive Responses to Uncertainty

- Passive response
  - Ignoring
  - Results: missed goals, missed opportunities, high costs, civil or even criminal liability due to negligence
- Active response
  - Trying to understand and manage uncertainties
  - Diversification based on inversely correlated variables
    - e.g., choice of selling heaters and air conditioners as future weather is uncertain
  - Contingent contracts (derivatives, futures, options, etc.) to limit uncertainty and risk
  - Buying insurance to spread the risks

# Ubiquitous Uncertainty

- Subjective probability estimation by consumers
  - Consumers either have different information or different abilities to process the same information

# Asymmetric Information

- **Public Information** vs. **Private Information**

- Information relating to a specific matter is referred to as **public information** if it is shared by the entire economy (all market agents), and **private information** if it is in the possession of a specific agent

- **Asymmetric Information**

- **Asymmetric information** is used to describe the condition of information disparity where one agent is in possession of more information on a specific matter than other agents
- Examples: sellers vs. buyers, employees vs. employers, business managers vs. business owners, etc.
  - Sellers vs. buyers: e.g., electricians, plumbers, restaurant owners, dealers of rare stamps/coins

# THE AGE OF SURVEILLANCE CAPITALISM

監視資本主義

THE FIGHT FOR A  
HUMAN FUTURE  
AT THE NEW  
FRONTIER OF POWER

SHOSHANA  
ZUBOFF

THE TOP 10 *SUNDAY TIMES* BESTSELLER  
A *NEW YORK TIMES* NOTABLE BOOK OF THE YEAR  
ONE OF BARACK OBAMA'S TOP BOOKS OF THE YEAR

Surveillance capitalism  
(Google, Facebook, etc.)  
operates through  
unprecedented **asymmetries**  
**in knowledge** and the power  
that accrues to knowledge.

Surveillance capitalism **know**  
**everything about us**, whereas  
their **operations are designed**  
**to be unknowable to us**.

# Asymmetrical Nature of Information: Adverse Selection

- **Lemon Market**

- Market with **mixture of different quality goods** which are **difficult to differentiate**
- Usually, **seller possesses more information than the buyer** (asymmetrical information between buyer and seller)
- E.g., used car market and auto insurance market (English has the word “lemon” to refer to defective products)

- **Lemons' Principle**

- *Defective products proliferate as the result of asymmetrical information*  
**Adverse Selection**
  - Phenomenon of poor-quality goods driving good-quality goods out of the market
  - “Bad” products or services have more chance to be selected
- Used car example
  - Market mixed with car dealers selling good-quality products and bad-quality products. A car dealer selling good-quality cars receives undervalued recognition and leaves the market, while a dealer selling poor-quality cars receives overvalued recognition and remains in market
- Car insurance example:
  - People prone to accidents enroll in insurance
- Discovered by **G. Akerlof** - in his paper he uses the market for used cars as an example of the problem of quality uncertainty and information asymmetry (Akerlof, 1970)

**ADVERSE SELECTION, ETC.**



# Adverse Selection

- Phenomenon where poor-quality goods drive the good-quality goods out of the market
  - Behavior that takes advantage of asymmetric information
- A market with asymmetric information with respect to quality shows characteristics similar to those described by Gresham's Law:
  - “The bad drives out the good”
  - Gresham's law applies to monetary situation in which bad money drives out the good money out of circulation
- In some cases the market may even collapse (e.g., insurance market)



# Adverse Selection: Credit Card Example

- Difficult to distinguish between high- and low-quality borrowers
- In result, credit would be expensive
- Remedy: credit card companies share computerized credit histories
  - In Japan, Japan Credit Information Reference Center Corp.(JICC) manages credit information.

# Adverse Selection vs. Moral Hazard

- **Adverse selection** - immoral behavior that takes advantage of asymmetric information **before a transaction**
  - E.g., a person who is not in optimal health may be more inclined to purchase life insurance than someone who is healthy
- **Moral Hazard** - immoral behavior that takes advantage of asymmetric information **after a transaction**
  - E.g., if someone has fire insurance, they may be more likely to commit arson to reap the benefits of the insurance or do not put enough effort into preventing the occurrence of fire



# Moral Hazard

- Problem resulting from the asymmetrical nature of information (as one party cannot monitor behavior of another party)
- Behavior that attempts to profit from **strategically leveraging differential information** for own benefit
- Examples
  - Purchase of fire insurance may encourage the occurrence of fires
  - Returning a damaged product resulting from the buyer's negligence as a poor-quality product
  - Flat salary payment with no commissions for salesperson
  - Risk taking and financial bailouts of too-big-to-fail institutions

# Addressing the Imperfect Nature of Quality Information in Case of Services

- Public regulations of the **services sector**
  - Problems: **service returns are impossible** and after the contract is signed, **quality will be variable** during the process of actual service provision
  - Various **licensing and permit systems** established for the services sector, such as medicine, education, transportation and finance. **Unlike transactions for physical goods**, when it comes to services, there is an **imperfect characteristics of quality for buyer**.
- Ways to improve private transactions
  - (1) **Seller Return Policies** and **Product Quality Assurance Policies**. However, the moral hazard still exists where the seller is held responsible for a damaged product resulting from the buyer's negligence
  - (2) "**Reputation**" resulting from continuing transactional relationship (market assessment mechanism)
  - (4) **Standardization** (e.g., McDonalds)
  - (3) **Signaling** (addressing uncertainty by sending signals that indicate quality, even if quality itself is not known)

# Signaling

- In economics, more precisely in contract theory, signaling is the idea that one party credibly conveys some information about itself to another party.
- Car sellers signaling good condition of cars (car tests, allowing for trial rides, showing car mileage count, etc.)
- Job-market signaling – **candidate employees** send a **signal about their abilities** by acquiring certain **education credentials** (training of workers may be impossible or costly due to job teaching requirement)
  - Acquiring this signal is costly but still easier for workers with higher abilities (a strong signal should be easier for high-productivity people than for low-productivity)
  - Education serves then another role besides only knowledge acquisition. Working long hours is another signal
  - Unclear points: How much time, energy, or money should the sender (agent) spend on sending the signal?

# Information Economy (Summary)

- Impact of Internet on economy
- Externality, network externality
- Online advertising
- Consumer search theory
- Information asymmetry

