

# Web Information Analysis for Open-domain Decision Support: System Design and User Evaluation

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# Background

- A large amount of information on the Web
  - Everyone can send information
- Decision making based on the Web information becomes usual.
  - Job hunting
  - Purchasing
- However, the quality of the Web information is not assured because the cost of sending information becomes lower.
  - Generally search engine (such as Google) is main way for decision making on the Web.
  - Information literacy is required for selecting useful and credible Web information.


# Goal and proposal

- Our goal
  - To support wide range of decision making on the Web.
- Proposal
  - To clarify the process of decision making
  - To develop a supporting system in accord with the process of decision making
    - To develop information analysis system “WISDOM”
  - To verify whether the system contribute people’s decision making
    - Users evaluation

# Decision making

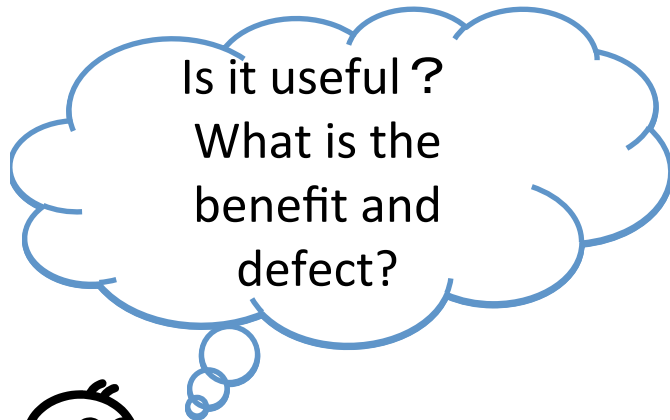
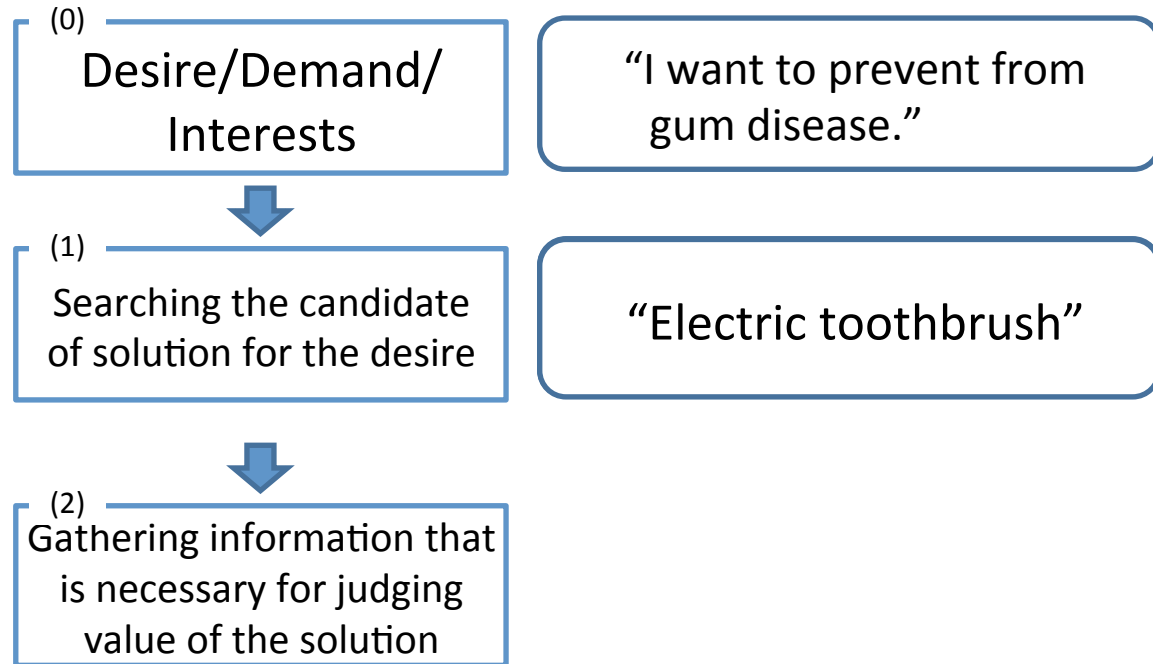
- Decision making is regarded as the following process:
  1. Searching the environment for conditions calling for a decision.
  2. Analyzing alternative courses
  3. Selecting a particular course of action

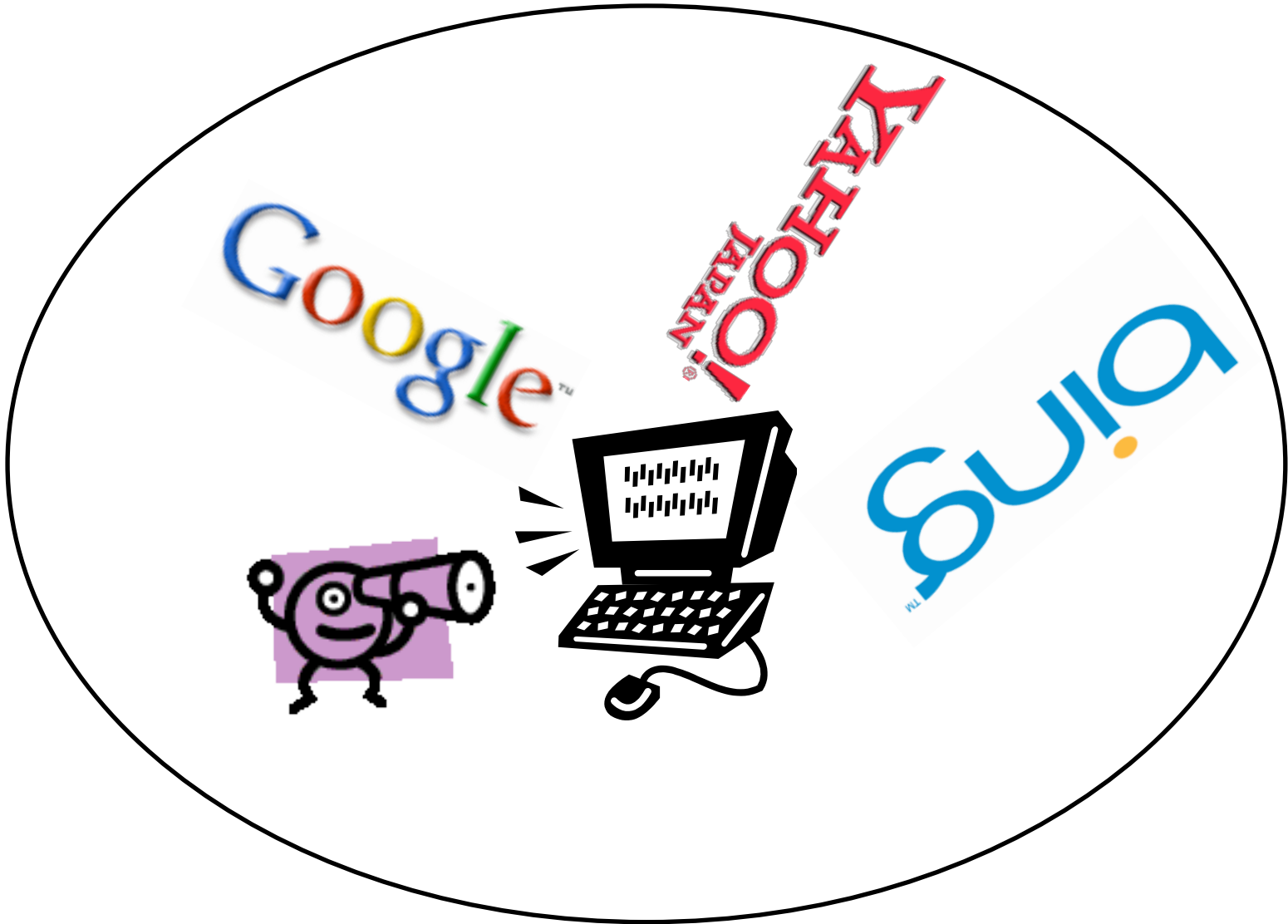
(Simon 1977)
- The same process for the decision on the Web



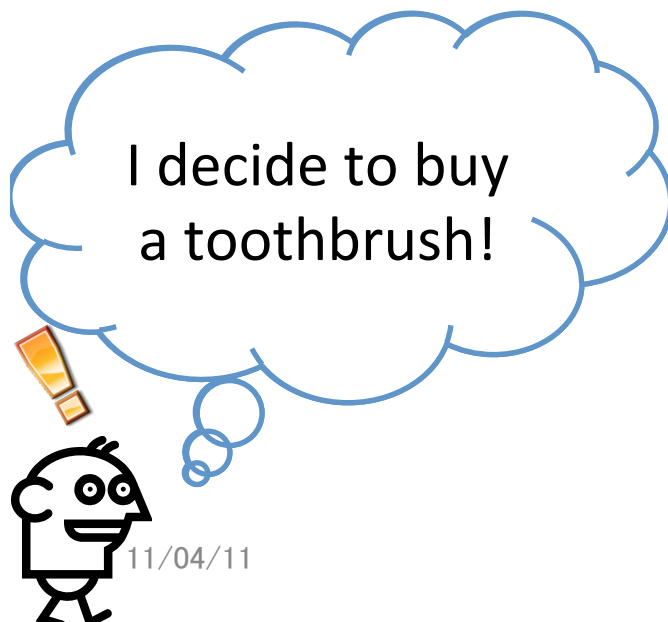
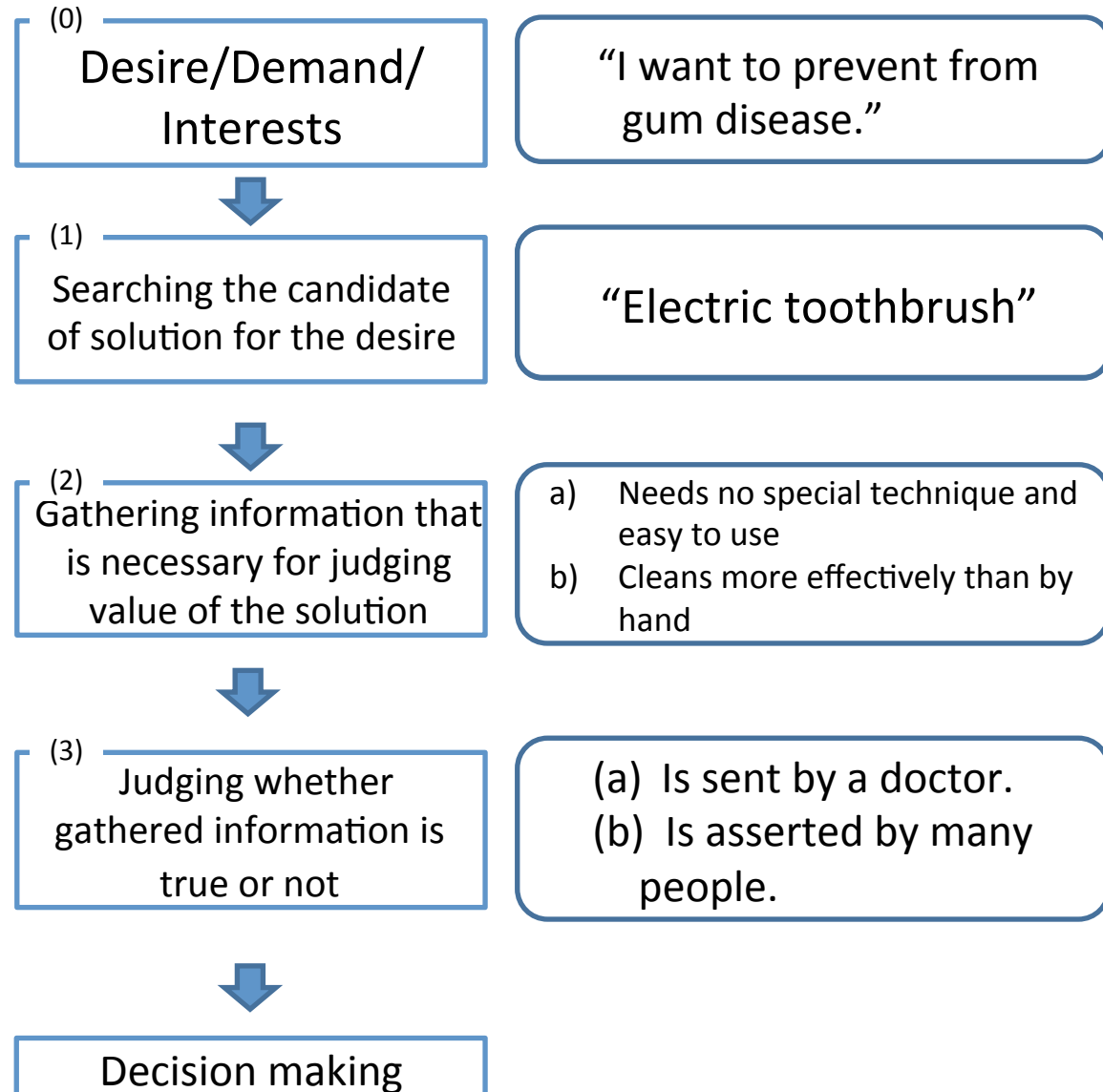
I am worried about  
my tooth,  
especially, gum  
disease.

# Process of decision making

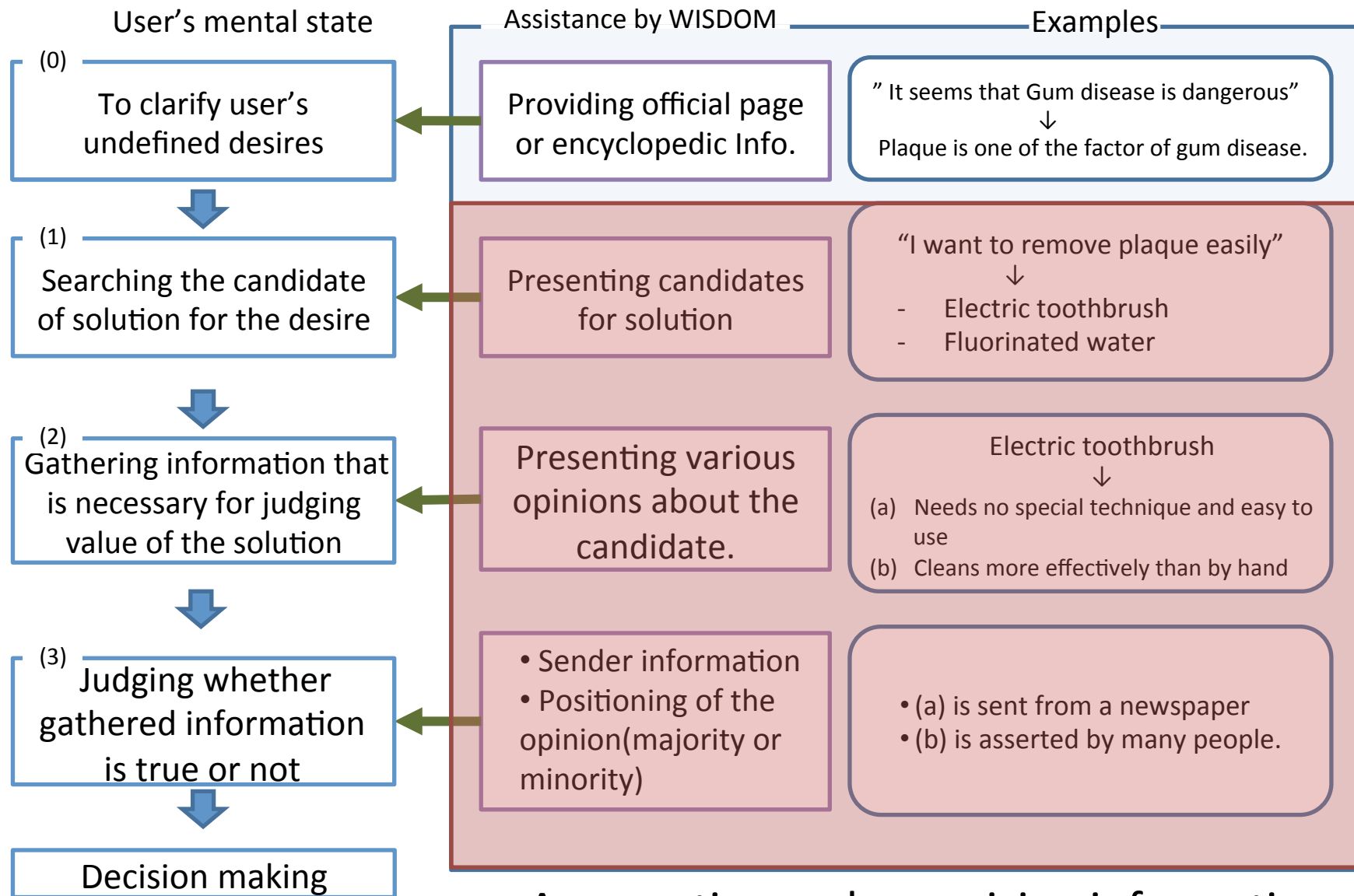




# Process of decision making



# Supporting decision making





# Outline of WISDOM

http://wisdom-nict.jp/

Query: "Electric toothbrush"

「電動歯ブラシ」で検索された結果「29073」件中「1000」件に対する分析結果のレポートを表示します。

電動歯ブラシ(でんどうはぶらし)とは電気の動力により自動でヘッドが動く歯ブラシの事。1961年、障害者の器具としてアメリカで開発... (Wikipediaより引用)

「電動歯ブラシ」の分析結果の注目ポイント

- 「電動歯ブラシ」はWeb上で肯定的に捉えられています。
- 「政治団体」は肯定的ですが、「QAサイト」は否定的です。
- 肯定意見が多い発信者:「SAKURA Internet Inc 企業」「Yahoo Japan Corporation 企業」
- 意見が多様なページ:「最速口コミ班 企業」「歯科相談室 企業」「教えて!goo QAサイト」

意見の分布

全体

肯定: 約 400  
否定: 約 -100

主要文 対立文 対比文

電動歯ブラシを使う:117  
わたし:7 人:3 家:3 外出先:2 水中:2 歯磨き:5 汚れ:2

歯垢を除去:76  
毛先の動き:2 手磨き:2 超高速振動:2 毛先:12 効果:10 奥歯:2

歯ブラシで磨く:17  
舌:2

歯垢を落とす:40  
隅々:3 毛:2 歯茎:4 汚れ:2

Definition of the topic

- Professional's page
- A page which contains various opinions

Visualizing bias of the stance by different senders

- Showing major/ minor information

11/04/11  
Presenting the list of various opinions

主な発信者・主な意見

発信者クラス	主な発信者	肯定的な意見	否定的な意見
企業	★歯ブラシ館:10件 話題のナレッジベース:8件 SAKURA Interne: Inc:12件	...本・歯間ブラシ2本・みがき粉1本・コップ又は電動歯ブラシ1個を同時に収納できます... 震動も脳を揺さぶる他社の電動歯ブラシとは明らかに違い、痛みも感じません! ...動歯ブラシとは違い、1分間に40,000回以上の超高速で毛先が微振動するハブラシ...	...手で磨いていた頃は毎年のように虫歯に苦しんでいて、後悔後に立たずですが何年か前か...
業界団体	Japan Dentist Associ...:1件		
政府・行政	日本貿易振興機構:1件	...電動歯ブラシの消費が急増していますが(毎年10万円以上の需要)、販売が好調なのは...	...認可した機関による検査を受けねばならず、合格しなければ、市場で販売はできません...
公益法人等	AWS アマゾンランキンゲール星空通販AW...:2件 COMME CA DU MODE:2件 uuu. vivian. net:2件	電動歯ブラシの品揃えが豊富。 ...既式の電動歯ブラシでは取り去ることの難しかった歯垢まで除去することが可能となった...	...、何度か磨いた 後でなければ味わえなかったあのツルツル感が一度で得られてビックリ...
自治体	仁静堂平山歯科医院内:6件 バリューネット:4件 日本語おもしろ発見隊:7件	とてもシンプルな機能でお値段も電動歯ブラシにしては手頃だったので私は満足です。	...社の電動歯ブラシの音の大きさは閉口してしまい、こちらを購入してよかったと思いま...
大学・学会	大学病院医療情報ネットワーク:1件 中川駅前歯科クリニック:2件	...この論文で認められていますからね。隣の何号矯正歯科でも買っていました!」... ...手用歯ブラシよりも歯垢(プラーク)の除去効果はやや高いようですが(下図)、電動歯ブ...	...単そうに見えて電動歯ブラシの使用方法は、手用歯ブラシよりも難しいといわれています...
医療機関	宮島早志歯科診療所:2件 阿部歯科クリニック:2件	...音波歯ブラシなど素晴らしいものが出ていますが、ブラシの当て方など使い次第です...	...ちゃんとブラシがあたっていないと電動歯ブラシなどを使っても意味がありません。

# User evaluation

- Purpose
  - To verify whether the information analysis with WISDOM is achieved through information extraction and aggregation
  - Whether the information presented by WISDOM is easily understandable for general users
- Outline
  - 100 participants use WISDOM and answer the questionnaire

# Contents of the questionnaire

## 1. Selected (given) topics

- Analyzing about 2 topics which we gave and comparing with the result of Google.

## 2. Free topics

- Analyzing about 2 topics which participants came up with and comparing with the result of Google.

## 3. Overall evaluation

- Evaluating WISDOM itself, such as usefulness of WISDOM or disadvantages of WISDOM.

# Selected topics

## The procedure

1. Selecting 2 topics from the given list and analyzing the topics with WISDOM and Google
  - Divided into two groups:
    - Starting from WISDOM/Google
  - Given topics are controversial things/issues in Japan

- The effects of homeopathy
- Merit-based wage system
- Resident registry network
- Hybrid car
- Coffee is good for health
- Anti-cancer drug
- Generic medicine
- Negative ion
- Construction of Dam in Japan
- Baby hatches

# Selected topics

## The procedure

2. Analyzing the topics and answering the following questions (at the same time).
  - i. Write your **motivation** to analyze the topic
  - ii. Did you find **a wide range of opinions**?
  - iii. Did you find **any bias** in opinions from the different stances of the senders?
  - iv. Did you receive any **surprising or new information**?
  - v. Did you confirm **the information you expected**?
  - vi. Were you able to analyze the information **efficiently**?

# Selected topics

The procedure

3. Analyzing another search/analysis engine.
4. Analyzing second topic with the same way of the first topic.

# Free topics

- The procedure
  - Analyzing two topics which participants came up with.
  - The procedure is common with selected topics
- The items of questionnaire
  - Common with selected topics

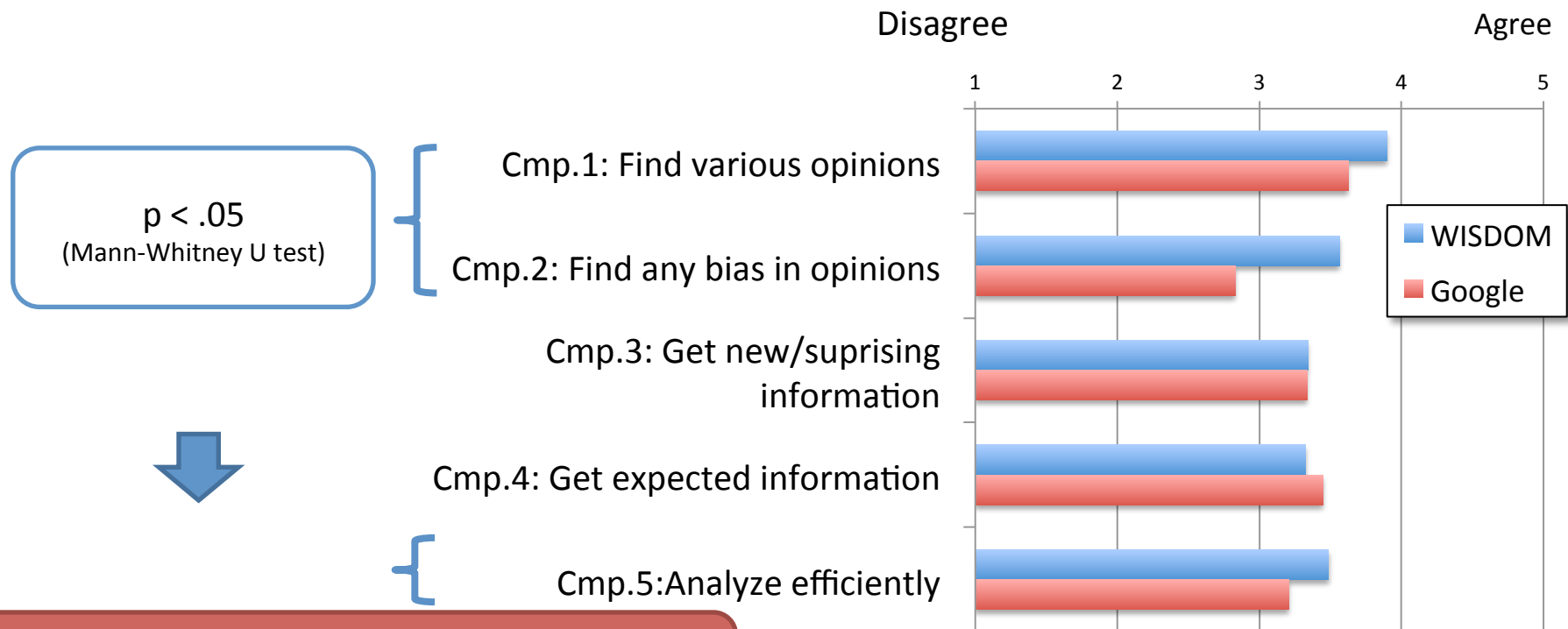
# Examples of free topics

- Grant for eco-car
  - I do not have car and even license, so I do not know this topic in detail.
- How to reduce CO2
  - Because I want to prevent from global warming.
- Senkaku island chain issue
  - Because I watched TV on this
- Utility value of iPad
  - Because I am interested in iPad.
- Drinking milk before bedtime is good for health.
  - Because I am interested in this topic.
- High-rise apartment building
  - I want to know merit and demerit.
- “Japan human space flight”
  - I am interested in this topic.
- Diatom earth
  - I heard diatom earth is used for water-absorbing coaster.



# Comparison with Google

- Counted the scores of selected topic and free topic (Horizontal axis : mean of the scores)



WISDOM is useful for getting information  
which is required for decision making

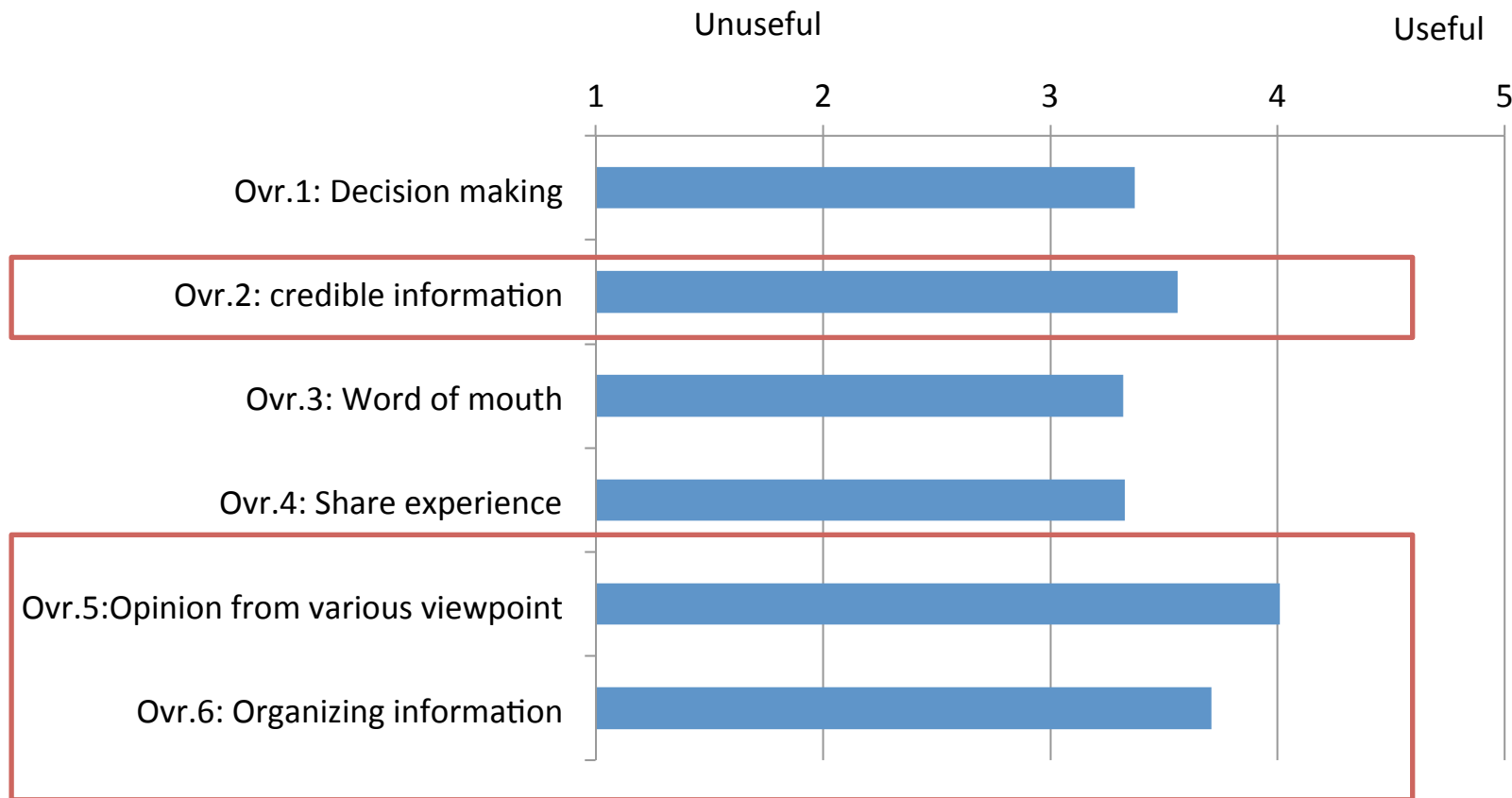
# Overall evaluation

## Advantage of WISDOM

- Following questions about advantages of WISDOM
  - 5 scale [disagree:0 - agree: 5]
  - 1. WISDOM is useful for decision making.
    - (decision making)
  - 2. WISDOM is useful for finding credible information with WISDOM?
    - (finding credible information)
  - 3. WISDOM is useful for searching reviews.
    - (word-of-mouth)
  - 4. WISDOM is useful for finding people who share your experience?
    - (share experience )
  - 5. WISDOM is useful for finding opinions from various viewpoints?
    - (opinion from various viewpoints)
  - 6. WISDOM is useful for grasp organized wide variety of information
    - (organized information)

# Overall evaluation

The average point of each item



2010/8/18

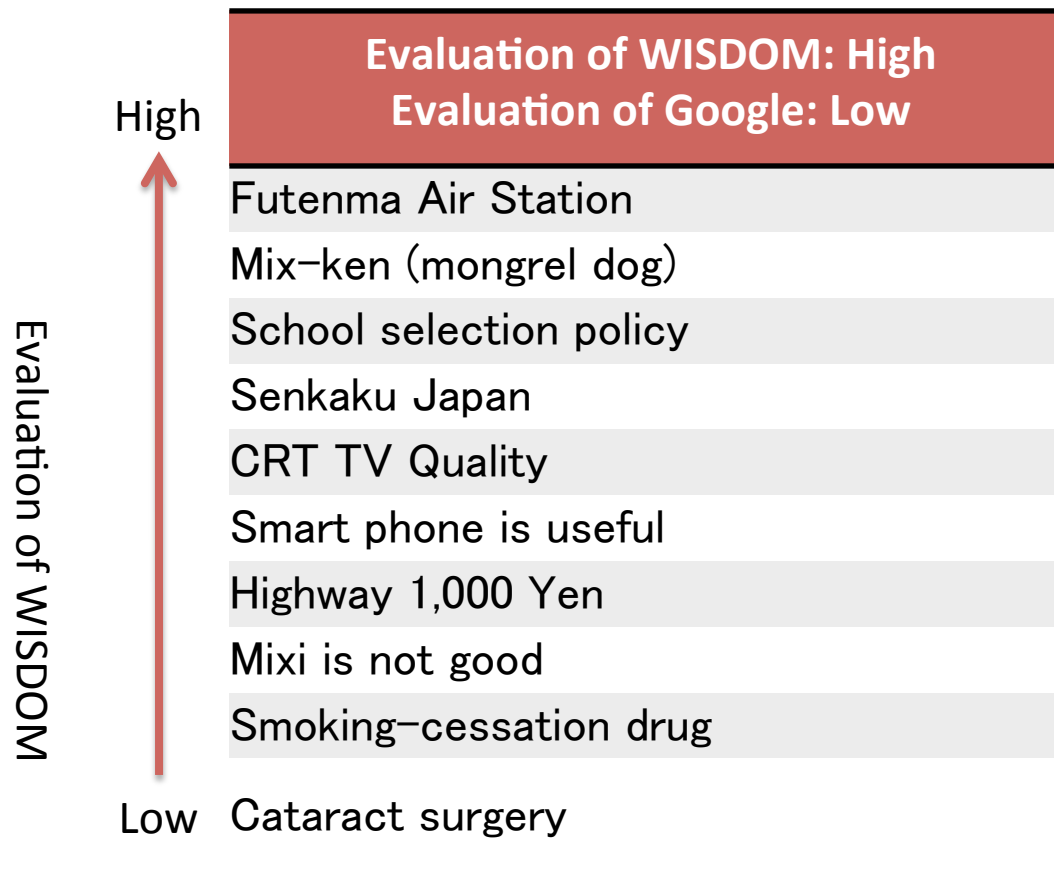
Advantages related to the process of decision making are highly evaluated.

# Analysis of free topics

- It is possible that participants' motivation and the characteristics of the topics affects evaluation
  - Investigating the relationship between free topic and evaluation of WISDOM
- To compare high evaluated topics and low evaluated topics

# Analysis of WISDOM

Highly evaluated topics



- Products and controversial social issues are highly evaluated.



# Analysis of WISDOM

## Low evaluated topics

WISDOM: Low (Search result 3000 over & opinion 300 over) Google: High		Motivation
Low	Solar panel	I want to know merit and demerit comparing with current electric generation method
	Smartphone	Smartphone is popular now.
	Cutting tax for eco car	I frequently see this topic on TV.
	Tokyo Disney Resort	I want to go to Disney Resort!
	Animal therapy	I heard the effect of animal therapy and want to confirm the effect.
	Is CO2 cause of global warming	I feel uneasy about global warming.
	Education for gifted children	I have a child, so I am interested in this topic.
	Thin client	I am interested vaguely in this topic
	Senkaku	I wonder which country, Japan or China has ownership of this island.
High	Abolition of capital punishment	I feel this topic is controversial and get various opinions.

Evaluation of WISDOM

- Selecting topics where WISDOM returned much information but low evaluated.
- In case of “Disney Resort”, official page rather than various opinions is required.
- When the motivation is vague, such as, “popular now”, “feel uneasy”, the evaluation is low.

# Results

- Compared with Google, WISDOM is
  - Equal when getting surprising or expected information
  - Superior when finding various opinions and bias of the different stance of senders.
  - WISDOM can mainly support the phase of collecting various opinions and verifying the quality on the decision making process.
- We attempt to support the users' vague motivation and a specific method by presenting definition of the topic and key words.
  - For the future, integrated evaluation including all phases of decision making process is required.



# Related Work

- Web information analysis system
    - Organization of information based on keywords
      - Yippy (<http://search.yippy.com/>)
    - Extracting dispute on the Web
      - Dispute Finder(Ennals et al., 2010)
    - Credibility Judgement
      - Wassmer et al. (2005), Weerkamp et al(2008)
        - Judging credibility based on the surface information of the text.
- WISDOM is characteristic on presenting and organizing information which is required for decision making.

# Conclusion

- We proposed the model of open-domain decision making on the Web information.
- WISDOM analyzes Web information from various viewpoints and assist user's credibility judgment for decision making by the following ways.
  - i. Uncovering biases
  - ii. Showing various opinions from multiple viewpoints
  - iii. Revealing information sources

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