Kansei /Affective Engineering and Decision Making

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Prologue

Science/technology has brought material happiness to the human society based on the rationality of logic.

The rationality of logic has developed mainly through Renaissance, Religious Revolution, Industrial Revolution and Bourgeois Revolution, etc. in Europe.

Truth

“Every phenomenon can be expressed by one absolute logic.” This is the truth.

Exploring the truth is the mission of the science and solving it could help people not only escape from the fears of the nature but also control the nature by applying the solution and gain great happiness.
Unabated curiosity

Based on the mission of the science, unabated human curiosity has developed to an extent whose consequences threaten the very existence of the human, including nuclear explosions, biological weapons and environmental destructions, etc.

Existence of one Exclusive Truth?

People may wonder if an absolute logic exists in the natural phenomena including the human society.

Does such one exclusive truth really exist?
Can people’s like and dislike be explained by the logic?

What if the truth really exists but in multiple forms? Or what if one logic could result in multiple consequences?

For example, does a logic exist to explain people’s like or dislike?

A logic to explain excitements?
Which do you choose?

What is the logical reason?
Have you decided it according to logical grounds?

Our Kansei has decided the selection.
Human-centered century

- The twentieth century was what we call a machine-centered century. The twenty-first century is a human-centered century in every respect, with scientific technologies that are friendly to humans and the natural and social environments of humans being valued.
- Therefore, research, development, and deployment of advanced scientific technologies may no longer be determined solely by technological communities, and issues whose solutions have been carried over to the twenty-first century may not be solved by the technologies of only one specific field.

Limitation of Scientific Effort

- For example, tie-ups and cooperation with human and social scientists are greatly needed, since the issues can no longer be solved by the scientific efforts of research and development alone.
- It is no exaggeration to say that such issues today affect all aspects of social technologies.
- Therefore, these issues can no longer be solved by conventional solutions.
Research focused on Kansei

- Matured technologies that have brought happiness to humans are among interdisciplinary scientific areas, and the mounting issues to be solved in the twenty-first century cannot be fully understood by conventional technological frameworks; the nature of scientific technology issues that we need to understand is obviously changing.

- Research focused on Kansei is expected to be the solution to these issues with the greatest potential.

Definition of Kansei by each researcher

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At the beginning of the Old Testament, light was created.

God said, “Let there be light,” and there was light.
Red dragonflies at sunset, red in the afterglow
Could it be the last time I saw their flight I was a child
On my Nanny's back?
100 million yen
899,940.88 EUR

The human creates the value.
Kansei Value – Kansei creates economic values –

<table>
<thead>
<tr>
<th>Material abundance</th>
<th>Mental satisfaction</th>
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<tr>
<td><strong>Creating</strong></td>
<td><strong>Story telling</strong></td>
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Appealing to people’s Kansei

Manufacturer

- **Taste**
- **Spirit**

User

- **Taste**
- **Interest**

**Collaboration**

**Sympathy for Kansei**

**Kansei Value**

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**Fourth Value**

- Performance
- Reliability
- Price
- **Kansei**

Up to now, we have requested high performance, the high quality, and the low price. However, people have not purchased it then. It has the Kansei as the fourth value.

**Paradigm shift in value standards**

**Kansei Value Creation Initiative**

(Ministry of Economy, Trade and Industry of Japan)
Kansei Science

Positive emotions

Kansei

Kansei Information

Kansei Information Processing

Functions of the mind with positive emotions as the essential property including beauty, comfortableness, interest and pleasure, etc.

Information of stimuli to create Kansei reactions

Procedure to collect, develop, modify, store and convey Kansei information

Fields of study
Descarets’ Dualism and Kansei Science

- Descartes’ dualism is considered to be one of the grand principles of modern science. It considers that minds and physical objects are separate substance; the former is function of the mind that can be recognized through one’s mental function (=consciousness), and the latter is space that can be physically perceived and measured (=extension / numerical values and those that can be expressed by CGS units).
- Kansei Science, on the other hand, is designed to integrate the psychological and material worlds by defining the brain as the hub.

Logic + Sense of fitness of mind
The future depends on the power of Kansei

Life is succession of choices.

It is important to be logical, but the “sense of mental fitness” is more important for our happiness and success.

Proper convergence of technology and mind (Kansei)

Recovering proper balance

The time selected the modern rationalism.

Two valued logic
Aristotle (BC384~BC322)

Descartes (1596~1650)

Leibniz (1646~1716)
Newton (1642~1727)

All the subjective views were eliminated.

Differential calculus/Integration

Modern irrationalism

Creator of probability
Pascal (1623~1662)

Handled information

Analytic Objective Quantitative Material-oriented Reason-oriented Universality-oriented Deduction-oriented

Comprehensive Subjective Qualitative Spiritual Emotional Individual-oriented Inductive

Modern irrationalism
Basic approach of Kansei Science

In the modern society, it is **scientific procedure** (= Descartes’ procedure) that appeal to our minds and build trust in us.

In Kansei Science where the Descartes’ approach seems to be less accessible, it is important to follow the Descartes’ procedure assuring no logical discrepancy and ensuring reproducibility which allows same results from experiments.

Kansei as a system
Building Kansei System
Requirements for Kansei-based dialogue

Artificial Kansei

Perceive and recognize others’ feelings and ideas

Measurement (perception)

Kansei of real human

Natural Kansei

Ultimate Kansei model

Expressing your feelings and ideas

Representation (Creation/Revelation/Action)

Artificial Kansei

To understand the Natural Kansei and to study methods of accurately expressing the Kansei in formula

Analysis based on data of specific timeframe

Natural Kansei

A system to support each individual differently according to situations of specific timeframe

The true value lies in the ability to handle each individual differently.

To understand the Natural Kansei and to study methods of accurately expressing the Kansei in formula

Analysis based on data of specific timeframe

Natural Kansei

Provide various services to various people

Individual

Measurement (Perception)

Group

Kansei System

Natural Kansei and Artificial Kansei

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Potential Kansei in nonverbal field

-Tacit knowledge
-Non-verbalized knowledge
-Field important for clear communication

The non-verbal area has the key role in the decision making.

Need for Kansei converter

Converter \( f \) (Kansei)

- It is crucial to deal with knowledge which cannot be verbalized.
- As Kansei varies from person to person, knowledge exchange does not take place as much as people have expected.
- For this reason, a Kansei conversion device is required between people and systems.
What is your emphasis in your shopping?

Field of sense for shoppers to look at and feel the goods and determine they are worth purchasing.

“Wide” and “looks wide” are different.
“Easy to use” and “looks easy to use” are also different.
“Running well” and “looks to run well” are also different.
“Feeling nothing” and “making you feel nothing” are different.

Thus, it is important to think carefully about how shoppers feel and determine, which cannot be measured by numbers.

Perceived Quality (Kansei Quality)

How Kansei values are created
Resonance of Kansei

Manufacturer

Resonance of Kansei

User

Manufacturer (sender) has “story” with strong messages. Level of “excitement” and “sympathy” increase.

Creating Kansei Values

Kansei value
(Level of excitement/sympathy)

$K_m$

It is an important problem to request the Kansei value to become the maximum.

$\omega_0$

Story
Story

“Story” – a keyword to sense of friendliness

Visibility of people’s life which can be assimilated psychologically.
Quantitative evaluation of story

Evaluating friendliness

Quantitative evaluation of level of excitement/sympathy

If you can embrace each other to the tiger, you will be impressed.

Do you quantitatively evaluate this impression?

This is an ultimate problem of Kansei engineering.

In a word, it is development of the method of doing as the evaluation as for the object with a difficult quantification.
Recently, in many cases, all manufacturers tend to produce products of similar shapes. They are beginning to try aggressively to differentiate themselves from their rivals. Products with totally opposite orientations increasingly co-exist now.
Positioning

It used to be a competition over who grabs the chairs first.

Emphasis is placed on the positioning in which people consider which chairs to pick.

Emphasis is placed on differentiation.

Nature of premium

- Premium wine
- Coffee

- Providing what consumers want before they request.
- Incorporating all of their daily tastes.
- Giving consumers a surprise (rather than a level of quality) over being provided with products of their choice.
Kansei engineering used to put emphasis on generalizing and sharing good products.

The emphasis shifted to differentiation from others.

Kansei engineering should be used not for homogenization but for intentionally creating unevenness.

Mediocre comfortableness is not enough

- Mediocre comfortableness alone is not enough in manufacturing products.

- How to make products is the common problem among mass-producing companies.

- Raising characteristics to the generalized levels is the most crucial issue.
What are problems?

● Scientific problems which need to be solved are apparently changing in the 21st Century amid mounting issues which cannot be solved by conventional methods.

● Many problems can no longer be solved alone(solely) by technology.

What are problems?

● Kansei-based researches are expected to play central roles in solving such problems.
Engineering used to put priority on knowledge over Kansei and objectiveness over subjectiveness. On the other hand, researchers are beginning to feel that “no technology is useful and comfortable to everyone” and it is up to the “Kansei” of each individual.

No technology is useful and comfortable to everyone.

Importance of Kansei engineering

If you look back on the past decade, you will find that the importance of the Kansei engineering is increasing.

For example, needs are increasing for information services which can flexibly support personality and Kansei of each individual as the Web technology and ubiquitous computing advance.
Importance of Kansei engineering

Kansei engineering-based approach is required for comfortable welfare equipment and nursing care services as we face the issue of Aging society with a low birth rate.

Engineering requires Kansei

However, I believe it is the engineering which requires the Kansei (or knowing about the Kansei). Many people think the Kansei engineering deals with the Kansei through engineering methods. "It is based on the idea that engineering methods are required to study the Kansei."
Engineering needs to make Kansei approach for paradigm shift

Engineering originally developed with emphasis on helping people.

It is becoming increasingly difficult to keep helping people and providing values to people while maintaining emphasis on manufacturing and functionality.

It will be difficult for engineering to be evaluated highly unless it changes its value standards.

Engineering will need to make the Kansei-based approach for paradigm shift.

The Viewpoint of Kansei Engineering on Decision-Making
• Is there a cutting-edge decision-making method that can be applied in every situation in life?

• Answering this question is not easy; however, considering that decision-making is significantly influenced by people’s emotions and Kansei, we may attempt to address it from the Kansei viewpoint.

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**How Decisions are Made**

• How do we make decisions?
• In order to reveal the true nature of decision-making, we must first understand its structural components.
How Decisions are Made

- The Figure is shown the decision-making process as it proceeds in the following sequence: data→information→knowledge→wisdom→action.

Change Flow from Data to Action (Decision-Making)

- Data become information when meaning is attached to them.
- When an individual generates ideas based on acquired knowledge, it then becomes wisdom.
- Finally, a decision originating from wisdom is generated, and triggers an action.

How Decisions are Made

- The vertical axis in the figure shows the degree of objectivity, while the horizontal axis shows the degree of subjectivity.
- Data are extremely objective and void of emotion.
- Data become information only when meaning is attached to them.
- Information becomes knowledge when shared recognition is found in the information.
How Decisions are Made

- Especially, the area of knowledge-wisdom-action is nonverbal and tacit; however, it is an important for clear communication.

Spectrum of Understanding

- Data are products of research, creation, collection, discovery, and so on, and are the raw materials for constructing communication.

- Ordinary consumers are often perplexed when they are simply presented with data and asked to process and understand them.
When Data become Information

• Only when data become information do they change into communicable forms for users/consumers.

• Messages can be regarded as clarified relationships between data and patterns and contexts, and these messages embody information.

When Data become Information

• Data change into information when they are organized into a meaningful form, presented in an appropriate method, and transmitted within their surrounding context.
From Knowledge to Wisdom

- Wisdom is a form of understanding that is very vague and personal.
- Unlike data and knowledge, wisdom cannot be created, and it cannot be shared with others, while knowledge can.
- Wisdom is a form of understanding that must be gained individually.

Individual Difference and Kansei

- The content and/or perceptions of a given form of understanding differ among individuals, and this individual difference is what constitutes Kansei.
- The flow of understanding progresses through the following sequence: data, information, knowledge, and wisdom.
Final Decision Making

- As described above, a decision is finally made when we progress to action through understanding context.
- It depends on individual Kansei.

Decision Making Model as a Discrete Event
Modeling as a Discrete Event System

- A decision may be conceived as a discrete event through an analysis of the act of deciding.

Petri Net Model of Decision Making

- The basic act of decision-making can be modeled by means of a Petri net, from the viewpoint of conditions and events.
Kansei information is given

- If the place for Kansei information gets a token, it means that the condition is satisfied. Then the transition enables.

After firing

- After firing the transition (stimulate 5 senses), the transition moved to the output, and stimulation is completed. Then two transitions are conflicts.
Transition “feel” fired

- After firing the transition (stimulate 5 senses), stimulation is completed. Then two transitions are conflicts. If the transition “feel” is fired, its token moved to the place “motivated”.

Transition “to decide” fired

- After firing the transition (to decide), its token moved to the place (decision making process is completed).
Transition “action” fired

- After firing the transition (action), its token moved to the place (sales). Finally a customer purchased.

Transition “doesn’t feel” fired

- If the transition “doesn’t feel” fired, its token moved to “not motivated”. In this case, we reexamine other Kansei information.
Transition “doesn’t decide” fired

- If the transition “doesn’t decide” fired, its token moved to the place ( decision-making process is reexamined).

Kansei Information
Kansei Information

- Kansei information is defined as information that stimulates our senses.
- Sight, hearing, touch, taste, and smell are among the many sensory functions of animals and humans, and they help us to perceive our external environment.

Examples of Kansei Information

There are various forms of information that appeal to our Kansei. The following is a partial list:

- **Visual Information**: pictures, animations, and paintings
- **Audio Information**: music and sounds
- **Textual Information**: texts, writings, and poems
- **Physical Information**: expressions and gestures
- **Figurative Information**: designs
- **Other Information**: senses of smell, touch, taste, and others
Decision cannot be Made Solely on the Basis of Logic

• When we receive these pieces of Kansei information through our five senses, we must determine whether or not to make a decision on some objective, such as purchasing something.

• And we often encounter a situation in which a decision cannot be made solely on the basis of logic.

An Example of Decision-Making with Kansei Information

• Decision-making with Kansei is triggered by the reception of Kansei information, which then motivates one to make a decision.

• Here is an example of such decision-making.
Cat Bank with Injured Right Ear and Its Point of Purchase Advertisement

Episode Happened at a Store

- This episode happened at a store that sells porcelain cat banks.
- One day, the store owner accidentally dropped a cat bank and made a small crack in the right ear.
- Since it was no longer salable as it was, the store owner created the following point-of-purchase (POP) advertisement which read like this figure, and posted it in front of the cat bank.
“I am a cat. I got into an accident on March 3rd, the day of the Festival of Dolls. Ouch! I injured my right ear, but, I feel better now. I’m looking for an owner who will accept me the way I am and will treat me kindly. I’m a bit clumsy but good at jokes. I would like you to be my friend.”

As a Result

As a result of such POP advertisement, many customers visited the store saying, “I want a cat bank with an injury on its right ear,” and the store sold such cat banks until they ran out of stock.
Effect of POP Advertisement

• This exemplifies a process of decision-making; in this case, to purchase the bank because of the transmission of Kansei information created by the POP advertisement, and the stimulation of the Kansei of the customers who saw the advertisement.

Systems-Thinking Ideas Generate Optimal Choices (Decision-Making)
There are multiple elements that make up the decision-making process. In reductionism, as shown in Figure (a), decision-making can be broken down into each element, and understanding these individual elements alone leads to the comprehension of both nature and behavior, which are the components of complex decision-making.

On the other hand, the idea of systems thinking, as shown in Figure (b), conceives of thought as a system, emphasizing the causal relationships between the elements, and utilizing these elements to understand the characteristics of behavior and to qualitatively analyze the decision-making.
Accelerating the Decision-Making Process

- Advancements in computer and network technologies have dramatically accelerated the pace of the business environment and daily life.
Accelerating the Decision-Making Process

We no longer wait in line for a long period of time at a bank teller’s window, and standing in a long line at a ticket booth at a train station is now a rare occurrence.

- TV comedy shows in the old days used to make use of a scene where people are waiting for a public pay phone; however, young people nowadays cannot relate to this concept.
- Physical mail and faxes have become communication methods of the past.
Accelerating the Decision-Making Process

- However, the quality and speed of our decision-making still remain in the past.
- Lines formed at bank ATMs or train station ticket booths are caused by customers who cannot decide the amount of the transaction or the destination to which they wish to go.

75% of business decisions are made within a week

- In the past, it was inconceivable to spend long hours surfing the Internet.
- Even though the processing speed of machines has improved, added value cannot be created unless humans accelerate their decision-making.
- The speed of international business has far exceeded our senses.
- As shown below, 75% of business decisions are made within a week:

  Decide on the spot: 25%
  Decide within days: 25%
  Decide within a week: 25%
Need for accelerated and accurate decision-making

- The process of decision-making commonly used among Japanese companies, in which issues are brought back for further internal discussion, followed by the obtaining of approvals before a decision can be made—taking a month or so for the whole process—can no longer meet current expectations, because employing such methods can only gain the remaining 25% of business results.

- There is a need for accelerated and accurate decision-making.

The power that Kansei provides may decide a future outcome

- In order to achieve accelerated and intuitive decision-making, it is necessary to consider it from the standpoint of Kansei engineering; that is to say, the power that Kansei provides may decide a future outcome.

- Life consists of a series of choices, and it is important to be logical when making decisions. However, it is even more important to gain the “right feel” to attain success that leads to happiness.
The power that Kansei provides may decide a future outcome

- Accomplishing this goal requires the appropriate union of technologies and mind/Kansei, as well as the recovery of proper balance; and Kansei engineering will provide powerful tools for reaching these goals.

Concluding Remarks

- As I mentioned in the first half, Kansei engineering started based on the idea of “including the Kansei of humans into manufacturing.”
- Appropriate convergence of technology and mentality (Kansei) and recovery of the proper balance are expected to be achieved by shifting discussions on Kansei engineering from individual discussions to integrated discussions.
- Kansei engineering is a cross-sectional (comprehensive) science and should integrate specific technologies in psychology, cognitive science, neuropsychology, sociology, business management, education, psychophysiology, value-centered designing, ethics engineering, and computer science.
Concluding Remarks

- In the latter half, I put forth several considerations of decision-making from the standpoint of Kansei engineering.
- First, the process of decision-making progresses in the following sequence: data, information, knowledge, wisdom, and action; and a decision is finally made when our objective intentions transition into subjective intentions.
- This indicates that decision-making takes place in a highly personal sphere, and is influenced greatly by the Kansei that individuals possess.
- Kansei information is information that stimulates one's Kansei; and we learned, for example, that Kansei information plays an important role in our decision-making on purchases.

Concluding Remarks

- There are multiple elements in decision-making.
- The ideas of systems thinking (which considers the causal relationships between these elements) are important in a Kansei-information-focused decision-making system, and such thinking enhances the understanding of system behavior with the lowest entropy.
Concluding Remarks

• Lastly, the necessity for accelerated decision-making was discussed.
• It was noted that having the “right feel” assumes a major role in accelerated and intuitive decision-making, instead of decision-making solely based on logic.
• A challenge for the future will be implementing in a concrete system the issues discussed here, as well as conducting experiments in actual practice.

Fine!

Thank you for your attention!