

# Methodology for the Establishment of “Standards” as Socio-technology

55th EOQ Congress June 20-23  
Budapest, Hungary  
“World Quality Congress”

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## Shogo Kato



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- Assistant Professor
- Iizuka-Tsuru Laboratory
- Department of Chemical System Engineering,  
School of Engineering, The University of Tokyo
- Research Area
  - Main theme: "[a model for long-term care program](#)"
  - Applications of the model for long-term care program
    - "a model for designing a rehabilitation training program"
    - "a model for discharge coordination"
    - "a model for preventing accidental falls"

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# “Quality” in Healthcare Services

- “Quality” in healthcare services is required
  - Healthcare expenses increase.
  - Medical accidents grow in number.
- System / Culture for ensuring quality has not been prepared enough in healthcare.
- One of the promising approaches is to apply quality concept, methodology and techniques developed and successfully implemented in industry into healthcare.

Healthcare Social System Engineering Laboratory

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## Outline

1. Backgrounds
2. Model for Determining Long-term Care
3. Analysis of the Methodology for the Establishment of the Knowledge Contents required for Determining Elderly Care
4. Process Model for Establishing “Standards”
5. Summary and Future Plans

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# Standardization and Socio-technology

Standard: Things or methods those have come to be considered acceptable or good on the basis of someone's experience\*.

[1] Iizuka, Y., 2009: General Modern Quality Management, Asakura Publishing co., Ltd.

- Developing and sharing appropriate standards can strengthen the organization's competitive advantages.
- In order to catch up with the fast-changing environment, an appropriate methodology for the establishment of "standards" is also required.

Socio-technology: Technology which is needed for the society to solve social problems.

- The methodology for the establishment of standards is also one of the socio-technology, when the social needs is so high for the subject of the standard.

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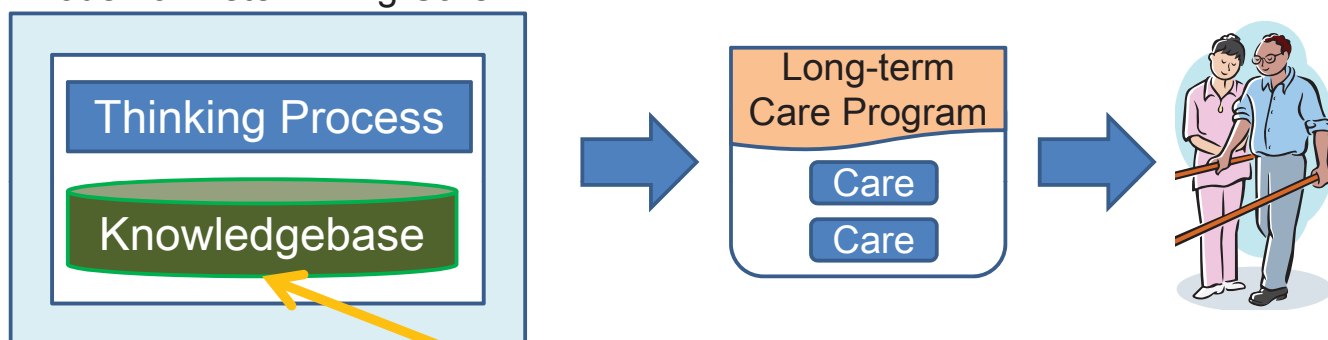
## Investigation Objects

- [2] Kato, S., Tsuru, S., Iizuka, Y., 2008, A Process Model for Determining Elderly Care on ADL (Japanese), Journal of Japanese Society for Quality Control, 38(1), 119-141.
- [3] Kato, S., Tsuru, S., Iizuka, Y., 2010, A Model for Designing Long-term Care Program, Proc. of the 54th EOQ Congress, Izmir, CD-ROM, 8p.
- [\[4\] Kato, S., Tsuru, S., Iizuka, Y., 2009, Developing the Knowledge Contents on ADL Required for the Processes for Determining Elderly Care \(Japanese\), Journal of Japanese Society for Quality Control, 39\(2\), 77-97.](#)

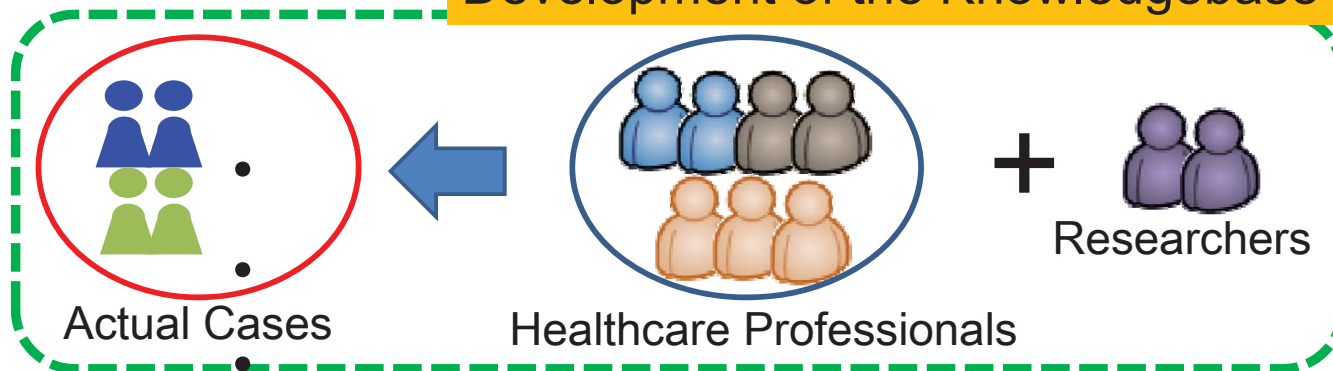
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# Investigation Objects

Model for Determining Care



Development of the Knowledgebase



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# Needs for Long-term Care

Progress of healthcare technology.  
Improvements in lifestyle.

Change in family structure.  
Nuclear family became majority.

## Super-aging society

The number of elderly people, who needs assistance for daily living has been increased.

## Less families' assistance

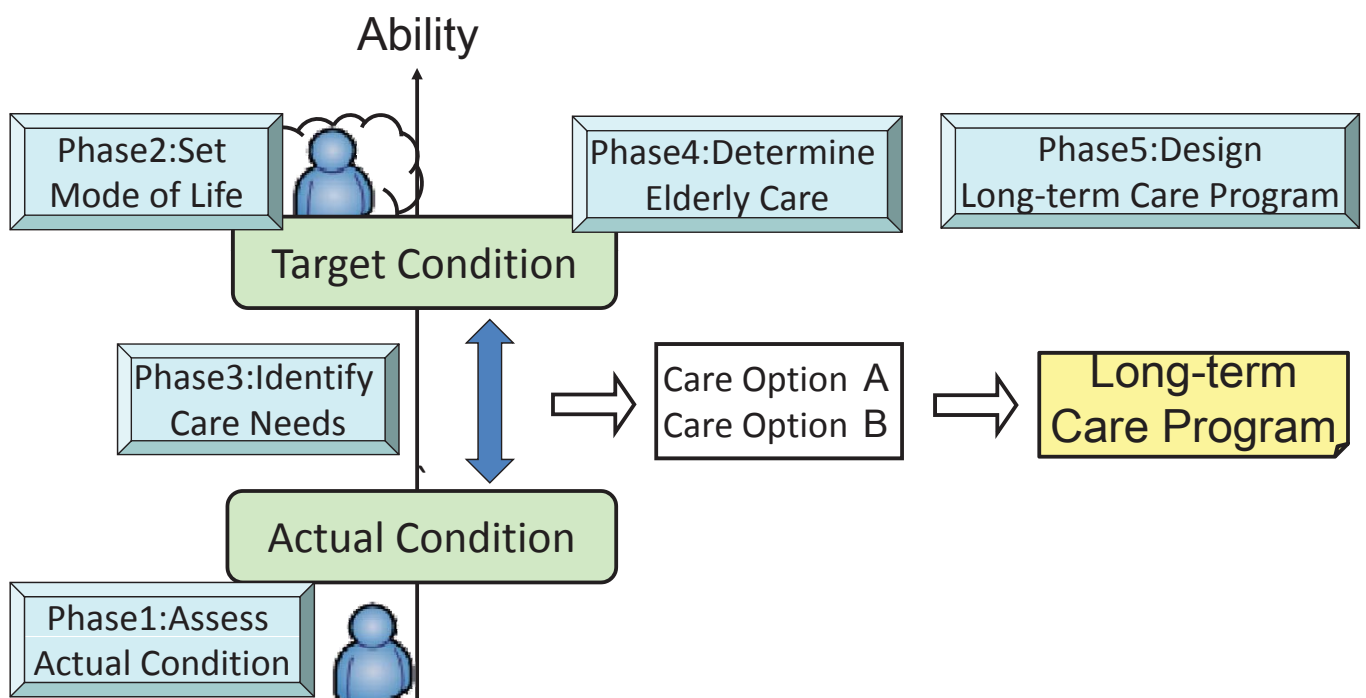
The number of elderly people, those are living alone or only with elderly family, has been increased.

**Social system for Long-term Care is needed.**

**Long-term Care Insurance System** started.

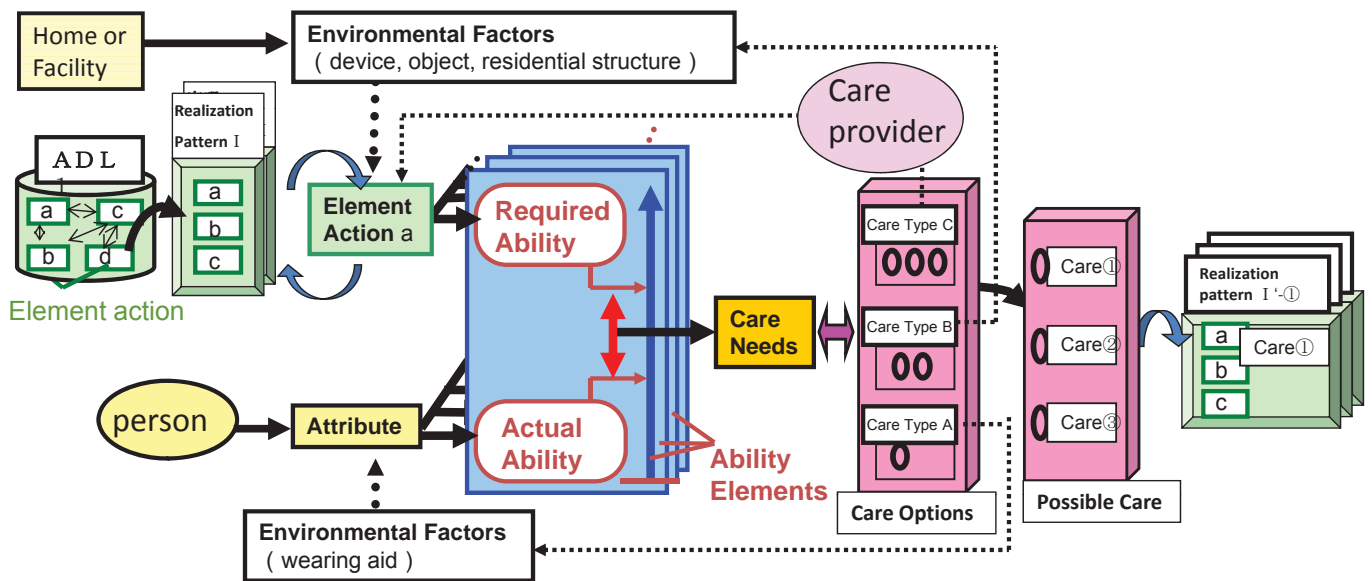
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# Core Concept



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# Framework



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## Input: Structure of "Ability" of a Person

		structure of ability		"ability elements"
abilities concerning mind	intellectual abilities	abilities to acknowledge		ability to acknowledge for Eating, Dressing, Bathing, Grooming, Excretion, Moving
	abilities concerning senses, appreciation	five senses		ability of seeing, hearing, etc.
		internal desires		ability to have a desire to urinate, defecate, etc.
abilities concerning motions	abilities concerning motion of each body region	abilities concerning eating and excretion	(mouth)	ability to masticate one's food
			(throat)	ability to swallow
			(excretory organ)	ability to urinate/defecate, etc.
		abilities concerning one's hand	(hands)	ability to grasp, pinch, etc.
			(arms)	ability to move one's hand to face, etc. ability to hold up weighing object, etc.
	abilities concerning motion of entire body	(in a recumbent position)		ability to roll over
				ability to sit up
				ability to lie down
		(in a sitting position)		ability to keep oneself in a sitting position
				ability to get up ability to sit down
		(in a standing position)	ability to keep oneself in a standing position ability to walk	

### ■ Criteria

(Consulting [FIM](#))

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### evaluation criteria

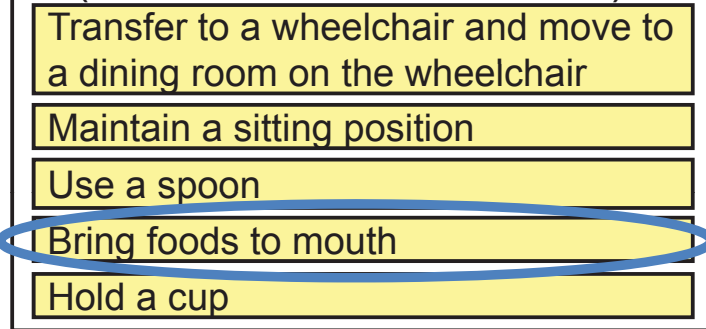
score 5: can do by oneself
score 4: can do by oneself under limited conditions
score 3: unsteadily, sometimes failure
score 2: can do by oneself only some part of the action
score 1: can not do by oneself entirely

# Output: Realization Patterns + needed care



Realization Pattern

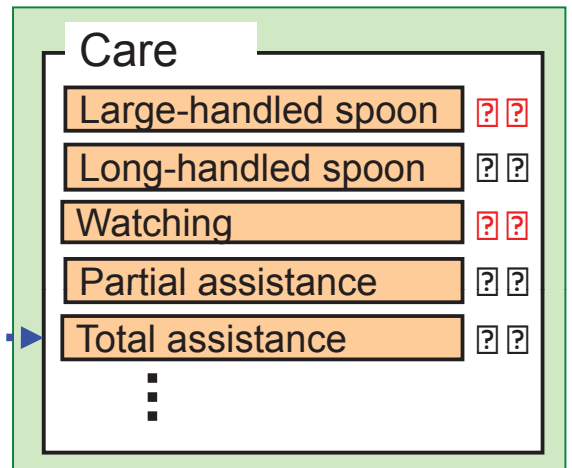
(Series of Element Actions)



Output of the Model

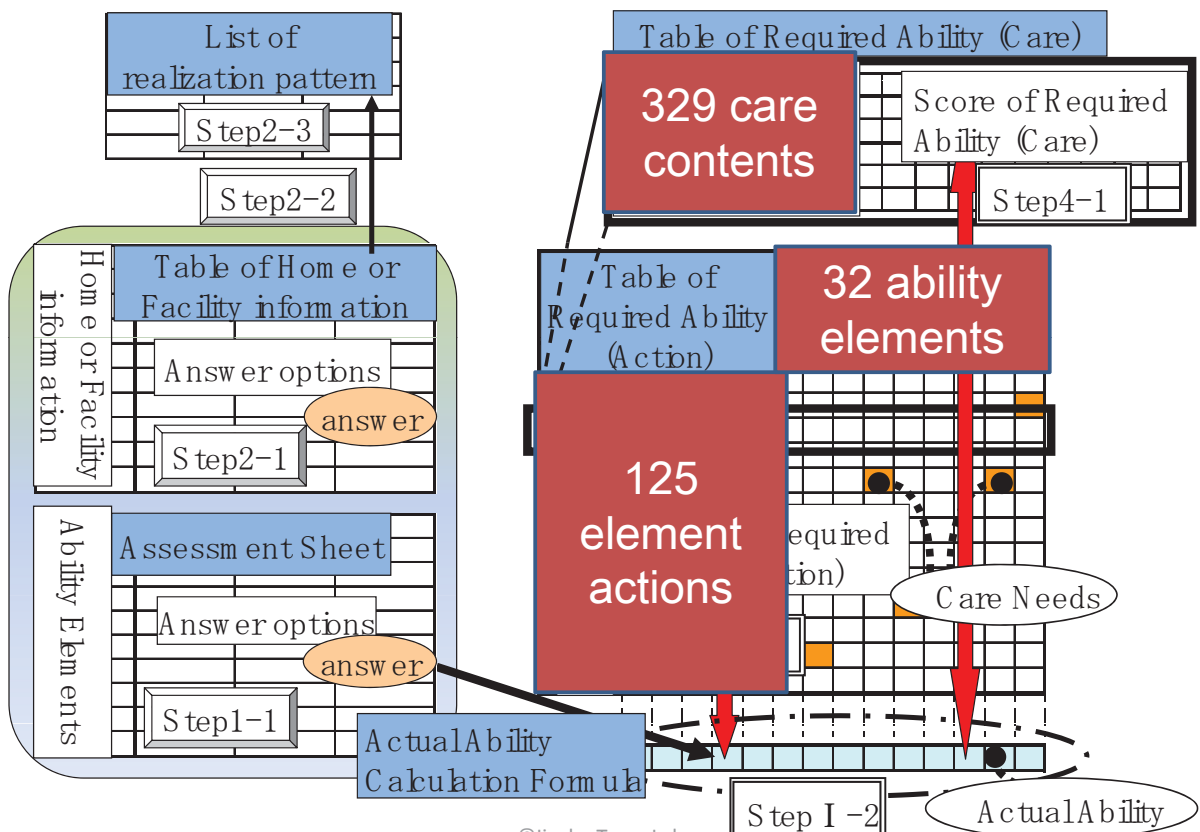
Multi-realization patterns

for each ADL



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## Integration based structure of the model



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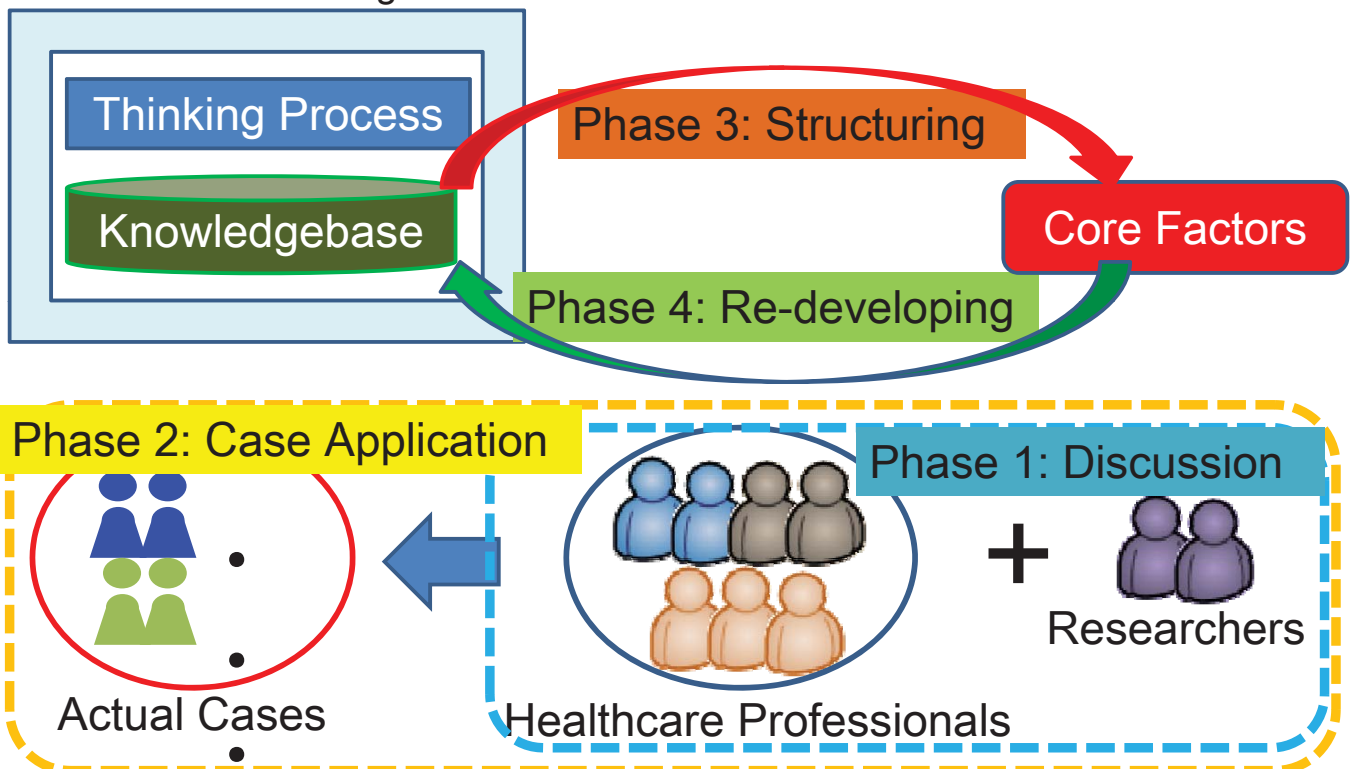
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## Methodology for Developing the Knowledge Contents

Model for Determining Care



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# Methodology for Developing the Knowledge Contents

Phase	Output of each Phase
1. Discussion by Focus Group	Preliminary Version
2. Case Application	Modified Version
3. Structuring Core Factors	Core Factors
4. Modifying based on Core Factors	Completed Version

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## Re-construction of “Phases”

### Original

- Phase 1 : Developing the Preliminary Version by Structuring Technical Knowledge
- Phase 2 : Modifying the Preliminary Version through Application to Actual Cases
- Phase 3 : Structuring the Knowledge Contents
- Phase 4 : Re-developing the Knowledge Contents based on the Core Structure

### New

- Phase 1: development of the 1st draft by [discussion in a focus group](#)
- Phase 2: development of the 2nd draft by [applying](#) the 1st draft [in actual cases](#)
- Phase 3: development of the 3rd draft by [systematizing the hypotheses](#)
- Phase 4: applying the 3rd draft to actual comprehensive cases for [verification](#)

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# Method for Analysis

- (1): We extracted a total of 63 descriptions. These are concerned with the methodology for developing the knowledge contents, as described in relevant studies[3].
- (2): For each description, we extracted the requirements for the operations and the required guides for the operation, through interpreting and generalizing.
- (3): We integrated each requirement based on what it is concerned with in the model.

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## Example (Original)

- We deconstructed ADL items into minute actions based upon the following two perspectives in order to fulfill "completion" and "clarity".
  - "purpose of actions": purposes underlying the actions - by including this perspective, we can prevent omissions in fulfilling ADL items and we can thus fulfill "completion"
  - "concrete actions": concrete actions needed to achieve the purpose of actions- by including this perspective, we can determine the makeup of element actions, and we can fulfill "clarity"

[In general, purpose-and-means relationships and cause-and-effect relationships are noted as perspectives for deconstructing something \[5\].](#)

[5] Iwasaki, H., 2010: Quality Management Seminar Basic Course Text Chapter 2: Problem Solving Method, Union of Japanese Scientists and Engineers.

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# Example (generalized and integrated)

- The three following perspectives on the relationships between relevant factors can be useful in deconstructing these factors appropriately:
  - (1) "factor-factor": relationships between factors. These configure the upper factor in the same layer
  - (2) "purpose-means": the relationships between purpose and means required to achieve a purpose
  - (3) "cause-effect": relationships between cause and effect

\*Iwasaki, H., 2010: Quality Management Seminar Basic Course Text Chapter 2: Problem Solving Method, Union of Japanese Scientists and Engineers.  
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## Analysis of the Methodology

ID	Original Description	extraction of requirements		integration of requirements	
		requirements (operation)	requirements (guide)	requirements (operation)	requirements (guide)
1	We developed knowledge contents (preliminary version) through discussion with seven experienced medical/welfare professionals (two nurses, three social workers, and two care managers), those have at least five years of experience, focusing on points in table 1.	organize the focus group	<ul style="list-style-type: none"> <li>•It is needed to select such specialists, those have enough technical knowledge on relevant issue, as focus group member.</li> <li>•It is desirable to select multiple members from multiple organization in order to prevent a bias.</li> </ul>	organize the focus group	<ul style="list-style-type: none"> <li>•It is needed to select such specialists, those have enough technical knowledge on relevant issue, as focus group member.</li> <li>•It is desirable to select multiple members from multiple organization in order to prevent a bias.</li> </ul>
2	We determined that six ADL items to be included: dressing, eating, grooming, urination, bathing, moving, consulting with comm on ADL valuation method [14][17][22].	determine the scope of "purpose", which should be taken into consideration		determine the scope of "purpose", which should be taken into consideration	
5	We distinguished each "pattern of realization" if it includes distinct "element actions", arise from the difference of "place", "body position", "instruments" for each ADL.	develop the "purpose" and "implementation plan"	<ul style="list-style-type: none"> <li>•It is appropriate to distinguish each "purpose" and 2 implementation plan if it includes distinct factors.</li> </ul>	develop the "purpose" and "implementation plan"	<ul style="list-style-type: none"> <li>•It is appropriate to distinguish each "purpose" and 2 implementation plan if it includes distinct factors.</li> </ul>
6	We developed the list of "element action" by identifying the union of sets of all element actions included in all pattern of realization.	develop the components of "purpose" and "implementation plan"	<ul style="list-style-type: none"> <li>•It is needed to eliminate overlap in components of "purpose" and "implementation plan" because it is possible that same factors are included in multiple "purpose" and "implementation plan".</li> </ul>		<ul style="list-style-type: none"> <li>•It is needed to eliminate overlap in components of "purpose" and "implementation plan" because it is possible that same factors are included in multiple "purpose" and "implementation plan".</li> </ul>
	We deconstructed ADL items into minute actions based upon the following two perspectives in order to...		<ul style="list-style-type: none"> <li>•It is needed to use three perspectives on factors.</li> </ul>		<ul style="list-style-type: none"> <li>•The three following perspectives on</li> </ul>

We have analyzed total 63 descriptions and extracted important essences of general methodology

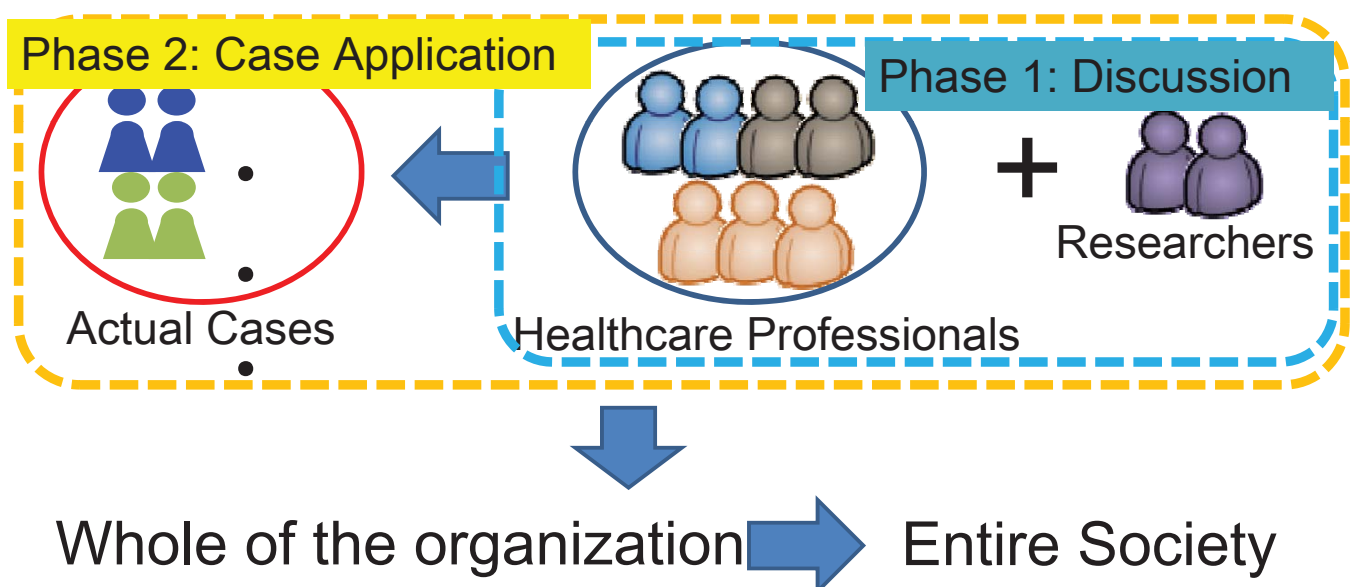
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## Commoditizing the developed Standards

- Establishment of the Standards
  - Developing standard
  - [Commoditizing the developed standard](#)



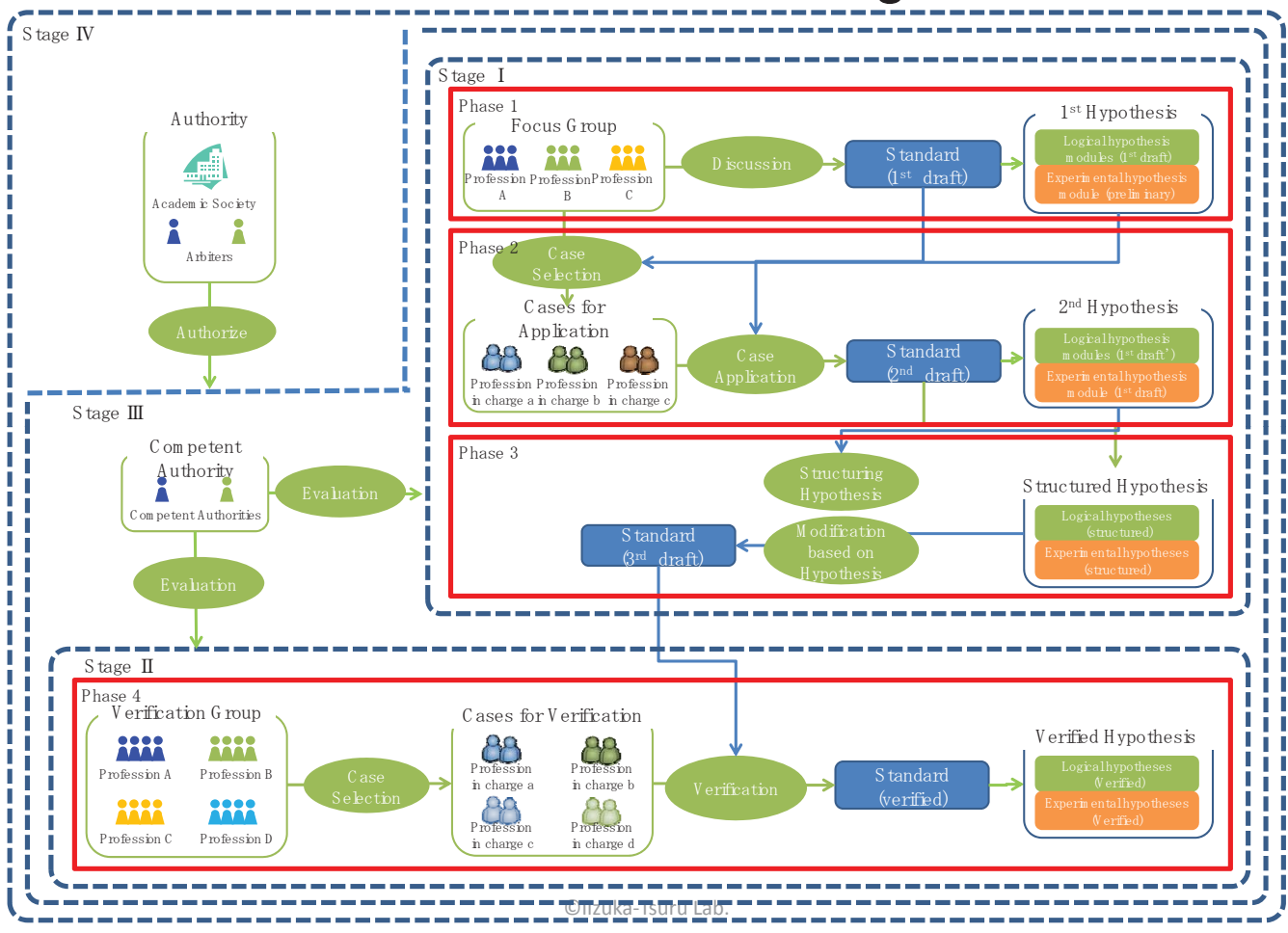
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# 2 Processes for Establishing Standards

- Process for Developing Genuine Standards
  - Phase 1: development of the 1st draft by [discussion in a focus group](#)
  - Phase 2: development of the 2nd draft by [applying the 1st draft in actual cases](#)
  - Phase 3: development of the 3rd draft by systematizing the hypotheses
  - Phase 4: applying the 3rd draft to actual comprehensive cases for verification
- Process for Commoditizing Standards
  - Stage 1: development by a focus group
  - Stage 2: creating publicity in order to attract participants
  - Stage 3: evaluation by a competent authority
  - Stage 4: authorization by an academic society or arbiter

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## Process Model for Establishing Standards



# Developing Genuine Standards

Phase	outline of Phase	output (standard)	output (hypothesis)
Phase 1 : development of the 1st draft by discussion in a focus group	<ul style="list-style-type: none"> <li>develop the Standard (1st draft) through discussion in the focus group</li> <li>develop theoretic hypothesis modules (1st draft)</li> <li>determine the scope of relevant Standard</li> </ul>	Standard (1st draft)	Fragmented Hypothesis (1st draft) <ul style="list-style-type: none"> <li>theoretic hypothesis modules</li> <li>experimental hypothesis modules (preliminary)</li> </ul>
Phase 2 : development of the 2nd draft by applying the 1st draft in actual cases	<ul style="list-style-type: none"> <li>develop the Standard (2nd draft) through application to actual cases</li> <li>develop data hypothesis modules (1st draft)</li> <li>develop theoretic hypothesis modules (2nd draft) by modifying 1st draft</li> </ul>	Standard (2nd draft)	Fragmented Hypothesis (1st draft) <ul style="list-style-type: none"> <li>theoretic hypothesis modules</li> <li>experimental hypothesis modules (1st draft)</li> </ul>
Phase 3 : development of the 3rd draft by systematizing the hypotheses	<ul style="list-style-type: none"> <li>structure theoretic hypothesis modules and data hypothesis modules</li> <li>develop the Standard (3rd draft) based on structured hypothesis</li> </ul>	Standard (3rd draft)	Structured Hypothesis (2nd draft) <ul style="list-style-type: none"> <li>theoretic hypothesis modules</li> <li>experimental hypothesis modules (2nd draft)</li> </ul>
Phase 4 : applying the 3rd draft to actual comprehensive cases for verification	<ul style="list-style-type: none"> <li>verify the validity of the Standard through application to expanded actual cases</li> <li>develop the standard (verified) based on the results of verification</li> </ul>	Standard (verified)	Structured Hypothesis (verified) <ul style="list-style-type: none"> <li>theoretic hypothesis (verified)</li> <li>experimental hypothesis modules (verified)</li> </ul>

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## Feature: Developing Genuine Standards

- [Inductive method](#) → [Deductive method](#)
  - Effective in technically immature areas
  - Effective to systematize the whole of technology
- [Small Group approach](#)
  - We can control its advantages and disadvantages by choosing the focus group and cases for application appropriately.

		one specialist	small group	large group
speed	time needed	<a href="#">shortest</a>	short *depending on the focus group	<a href="#">longest</a>
	argument	<a href="#">not need</a>	easy to converge *depending on the focus group	<a href="#">difficult to converge</a>
accuracy	completeness of details	<a href="#">low (generally)</a>	high *depending on the focus group *depending on the application cases	<a href="#">highest</a>
	correctness of choice	only one's own	<a href="#">low risk</a> <a href="#">*depending on the focus group</a> <a href="#">*depending on the application cases</a>	<a href="#">high risk</a>

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# Commoditizing Standards

Stage	Outline of Stage	Output (standards)	Output (business model)
Stage I : development by a focus group	<ul style="list-style-type: none"> <li>design business model (in the broad sense of the term)</li> <li>demonstrate the local availability in the focus group</li> </ul>	demonstrated in the focus group	model from which each member of the focus group can benefit, is designed
Stage II : creating publicity in order to attract	<ul style="list-style-type: none"> <li>evaluate the business model among relevant players</li> <li>demonstrate the local availability among relevant players</li> </ul>	demonstrated among relevant players	model from which each relevant player can benefit, has designed
Stage III : evaluation by a competent authority	<ul style="list-style-type: none"> <li>evaluate the business model</li> <li>evaluate the subject for standardization</li> <li>evaluate the focus group</li> <li>evaluate the versatile availability of the standard</li> </ul>	evaluated versatilely	evaluated by a competent authority
Stage IV : authorization by an academic society or arbiter	<ul style="list-style-type: none"> <li>evaluate the knowledgeable person</li> <li>evaluate the evaluation process in Stage III</li> <li>recognize the validity of the business model</li> <li>recognize the validity of the subject for standardization</li> <li>recognize the validity of the focus group</li> <li>recognize the versatile availability of the standard</li> <li>Authorize the standard</li> </ul>	recognized versatilely	authorized by an academic society or arbiter

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# Commoditizing Standards

- Scope of commoditizing is gradually expanded
  - Corresponding to the process for “developing genuine standards”
- [Getting the endorsement along the way](#)
  - Good distribution for “speed” and “adequacy”
  - We can control its advantage and disadvantage by choosing the focus group, the authority and the verification group appropriately.

		endorsement from the beginning	endorsement along the way	grass-roots
speed	time needed	<a href="#">shortest</a>	short	<a href="#">longest</a>
	difficulty in implementation	<a href="#">easiest</a> <a href="#">*depending on the authority</a>	some difficulty *depending on the focus group *depending on the authority	<a href="#">difficult</a> <a href="#">*“converging” is difficult</a>
adequacy	limiting the scope for verification	<a href="#">highest risk</a>	low risk *depending on the verification group	<a href="#">lowest risk</a>
	correctness of choice	<a href="#">highest risk</a>	some risk *depending on the verification group	<a href="#">low risk</a>

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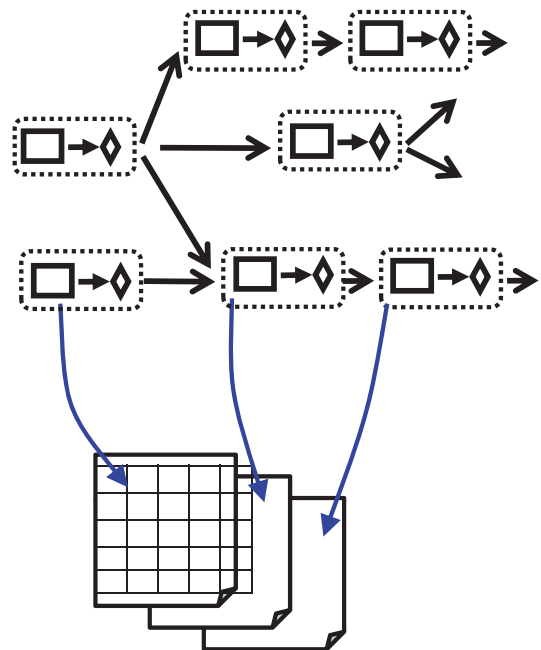
# Example of Application of our Process Model PCAPS(Patient Condition Adaptive Path System)

① An overall flow of clinical judgments and treatments that can be considered for a type of disease, consisting of clinical unit processes.

➡ Clinical Process Chart

② Specify a set of treatments, examinations, observations and other clinical treatments to be done in a unit clinical process.

➡ Unit Sheet



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## Developing the Standard Contents of PCAPS

We have developed standard contents of PCAPS for over 100 diseases!

- [Focus Groups](#) . . . for each diagnosis and treatment department
  - Leading doctors, nurses and other healthcare professional from multiple hospitals
  - Discussing at Conference at the University of Tokyo once / two months, and more conference if required
- [Verification Group](#)
  - 50 hospitals from all over Japan
  - Carrying out verification survey regularly once / year, and more surveys if required
- [Authority](#)
  - Academic Societies: Japanese Society of Pediatric Cardiology and

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# Discussion: Applicable Scope

- It focuses on technically immature areas.
- It is needed to be possible to find highly skilled professionals, and to organize at least a focus group.
- It may be needed to be areas those don't depend highly on particular values.

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# Summary

- We analyzed the methodology for developing knowledgebase required for determining long-term care.
- We proposed a process model for the establishment of standards.
  - Process for developing genuine standards
  - Process for commoditizing standards
- We showed the example of application.
  - Standard contents of PCAPS
- We discussed about Applicable Scope
  - Technically immature area
  - Possible to find highly skilled professionals
  - Possible to organize a focus group
  - Areas those don't depend highly on particular values

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# Future Plans

- We will try to apply our process model for various subjects.
- We need to evaluate the validity of our process model and the applicable scope.
- Our goal is to propose a series of the process model, corresponding to the various types of subjects.

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Thank you for your attention!



MANA  
1 and half

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