

A Context-Based Requirements Analysis Method for PSS Design

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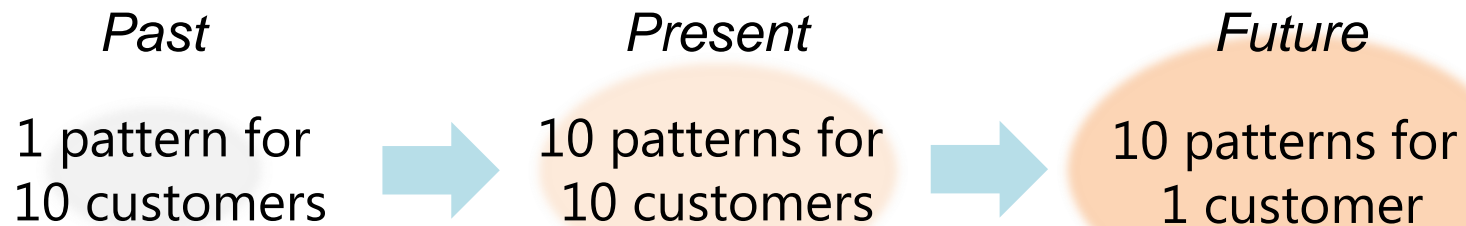
Introduction

❖ Value-in-Context [Vargo08, Chandler11]

- ▶ The value of a product is determined by customers, depending on their own **contexts in the product use**

➡ A customer would require different values in response to changes in his/her context

Shift of value proposition paradigm



Important thing:

Changing value proposition in response to context in product/service use of a customer

❖ Existing method for context and requirement analysis

- ▶ Persona / scenario method [Cooper98][Shimomura08]
 - » Partially include contextual elements such as customer attributes and situations in product/service use
 - » However, there is no framework which enables designers to extract contextual elements from various points of view



Objective

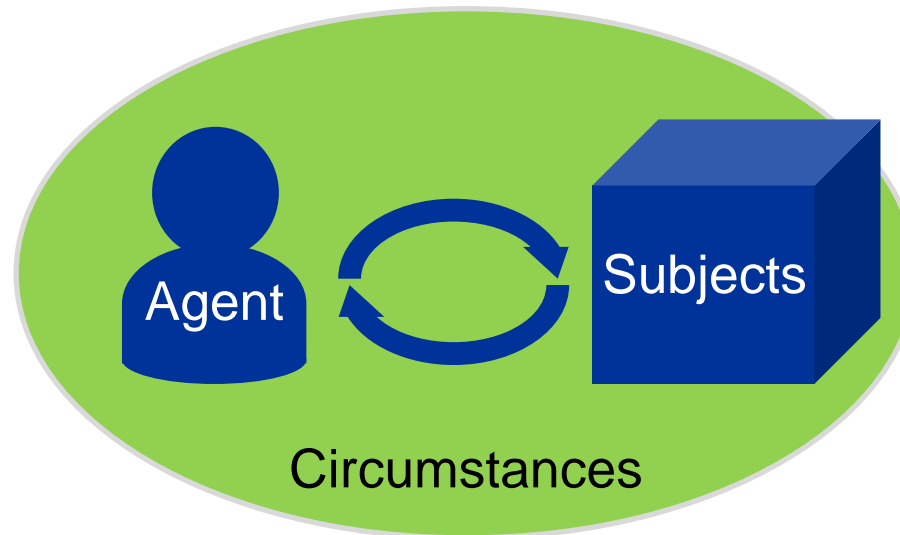
To formalize how the concept of context should be handled in PSS design

- ▶ Classification of contextual elements which influence customer requirements for PSS
- ▶ Context-based requirements analysis process

Definition of context in this study

❖ Context is about...

- ▶ Background
- ▶ Situation and circumstance
- ▶ Temporal relationship with something in before and after



Context in this study is defined as a set of spatial-temporal elements related to the person or product

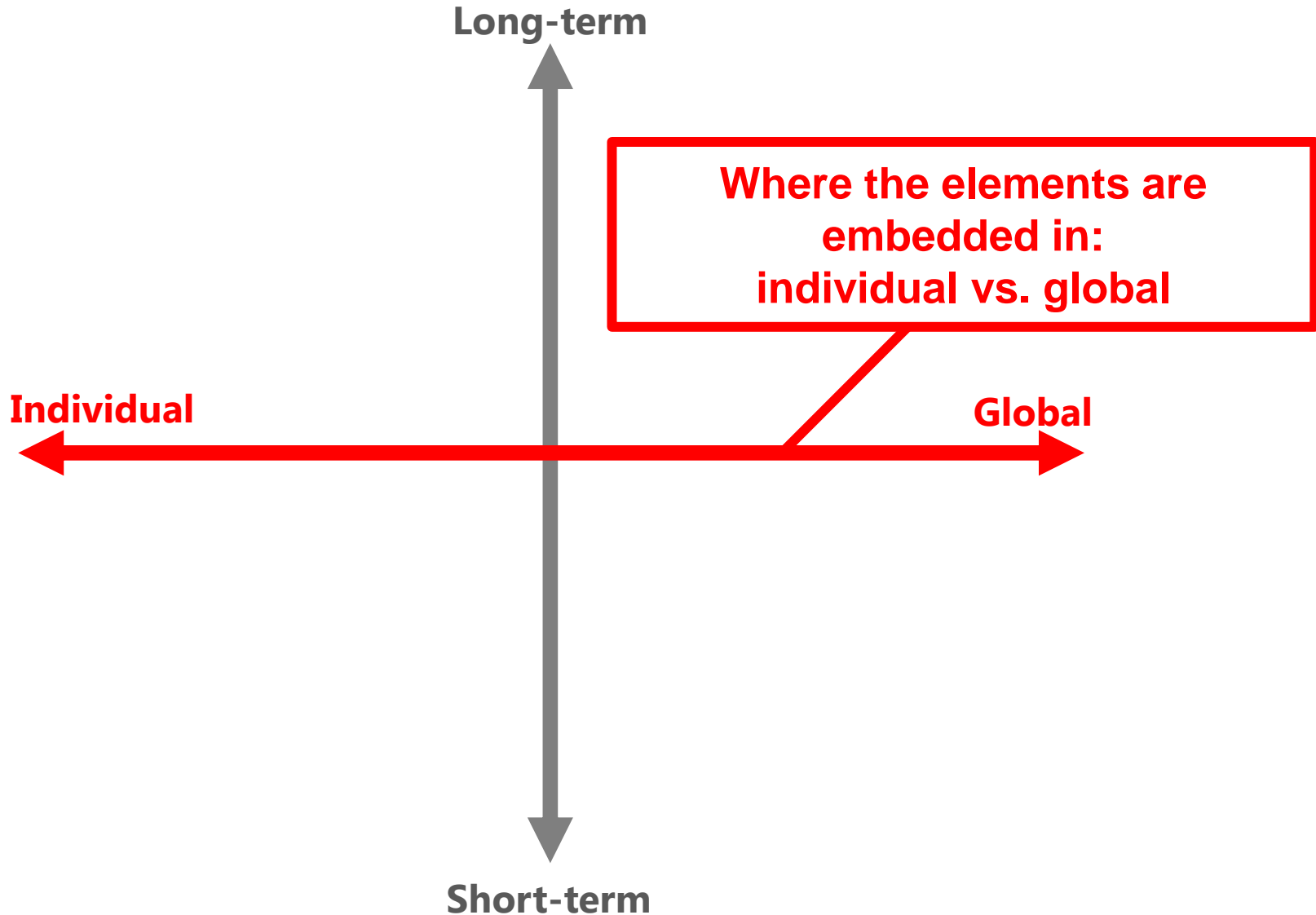
Proposal: Classification of contextual elements

Long-term

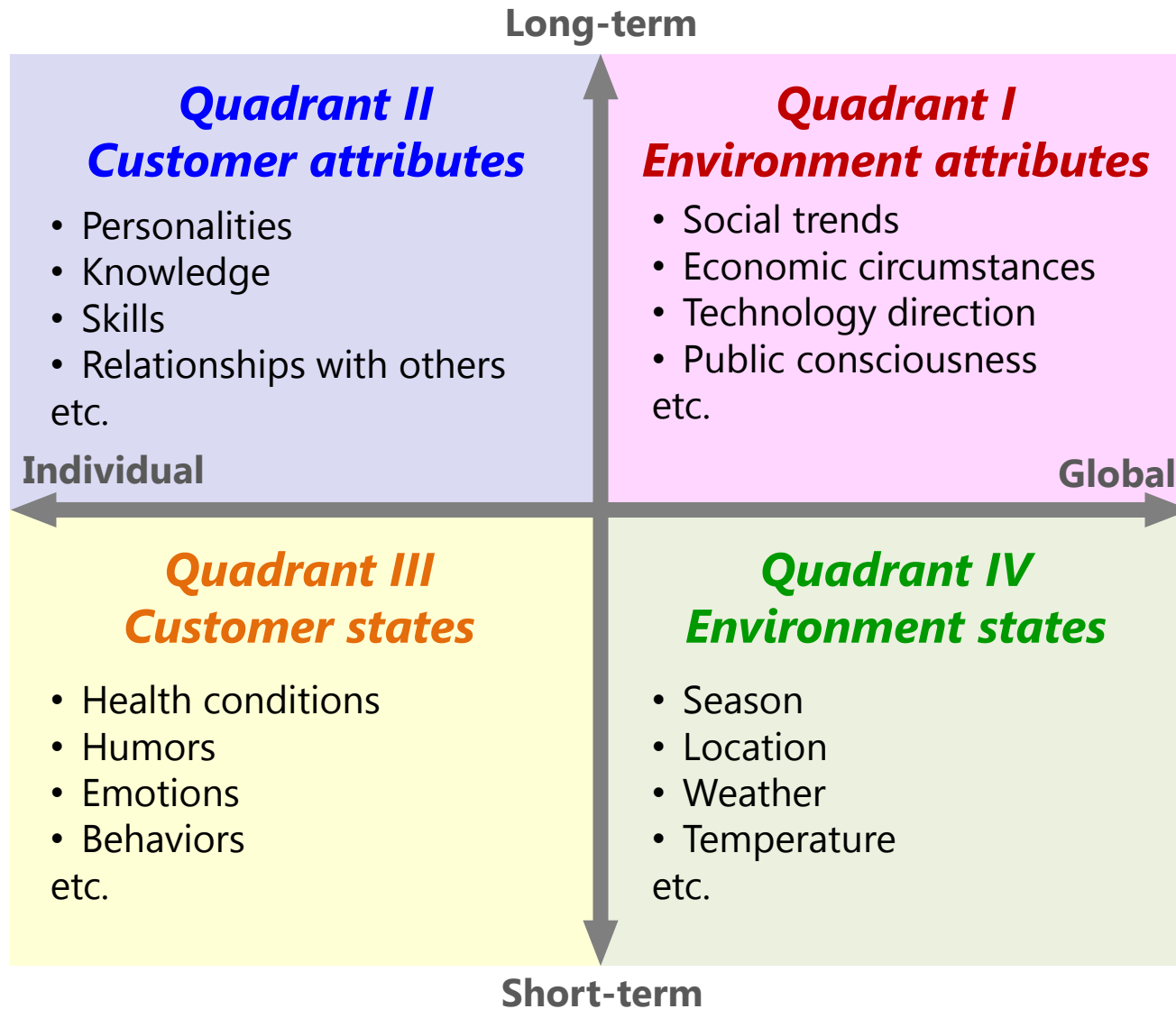
The change cycle of elements:
long-term vs. short-term

Short-term

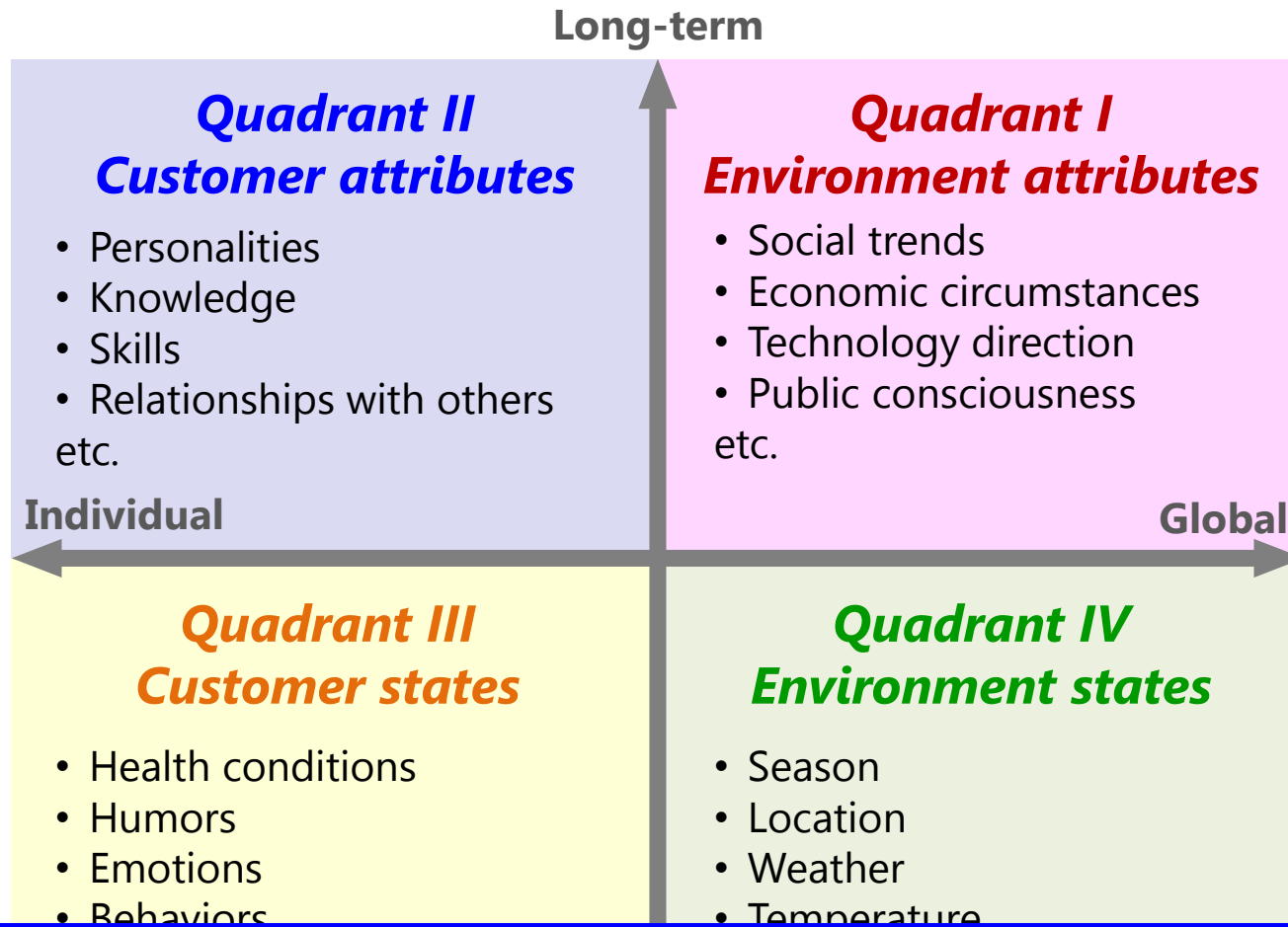
Proposal: Classification of contextual elements



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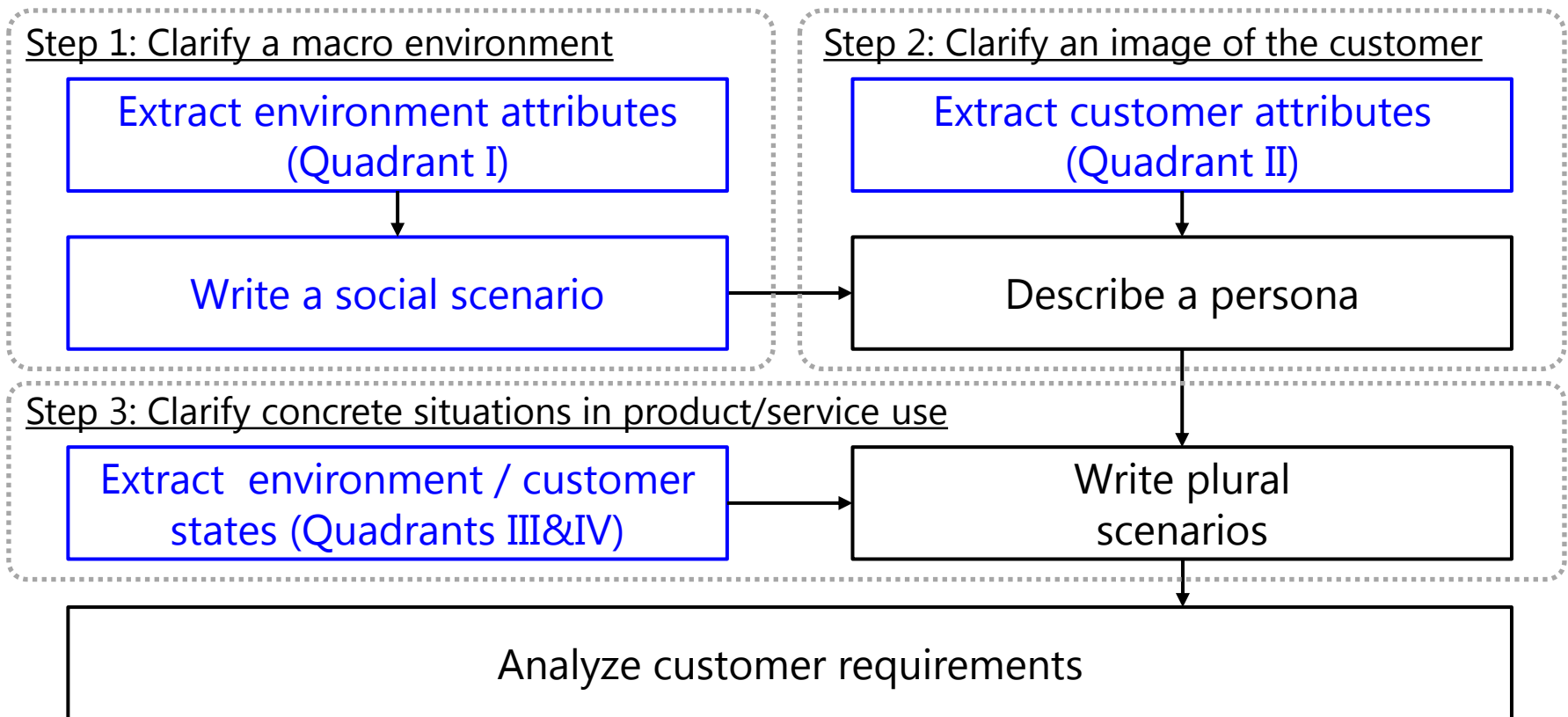


We regard a context in product/service use is made from a specific subset of these contextual elements

Proposal: Requirements analysis method

❖ Context-based requirements analysis process

- ▶ The persona / scenario method is extended to handle customer context explicitly



Step1: Clarify a macro environment

❖ Identifying contextual elements in Quadrant I

▶ Viewpoints:

» PEST analysis [Clulow05]

Quadrant	I. Environment attribute			
Viewpoints	Politics	Economics	Society	Technology
Contextual elements		Increased consumption of elderly people	Promotion of supporting elderly people Popularization of communication devices Popularization of electric wheel chair users	Development in Lifelog input station Development in information technology

Step1: Clarify a macro environment

❖ Describing a social scenario

- ▶ Represents a macro environment around the PSS in natural language by configuring extracted elements
- ▶ Includes the momentum of fundamental values in this world

Contextual elements	Social scenario
<p>Popularization of electric wheel chair users</p> <p>Development in information technology</p> <p>Popularization of communication devices</p>	<p>Popularization of electric wheelchair expands the range of elderly people, and they have begun to go out actively. This raises the demand for comfortable and enjoyable transportation. Moreover, this situation stimulates them to communicate with other people in their cities. As a result, many communities have been created around them. On the other hand, the accident rate has increased with the increasing opportunities of elderly people to go out. Their families have therefore come to feel insecure about their outings.</p>

Step2: Clarify an image of the customer

❖ Identifying contextual elements in Quadrant II

▶ Viewpoints:


- » Internal: unique knowledge, skills, experiences and preferences of the customer
- » External: relationships with surrounding products, services, people and organizations

Quadrant	II. Customer attribute	
Viewpoints	Internal	External
Contextual elements	<p>Using his electric wheel chair</p> <p>Using electric devises like other people</p> <p>Have Already retired his job</p>	<p>Having a wife and gentle to her</p> <p>Having many friends</p>

Step2: Clarify an image of the customer

❖ Describing a persona

- ▶ Represents a persona, which is a model of virtual customer, by configuring extracted elements
 - » Personality
 - » Lifestyle
 - » Goal

	Name: Ken Suzuki	Personality: <ul style="list-style-type: none">• Friendly and cheerful• Devoted husband	Lifestyle: <ul style="list-style-type: none">• Lives in Tokyo• Often goes for a walk with his electric wheelchair
	Age: 63		
	Gender: Male		
	Family: Wife (62)		
Memo: <ul style="list-style-type: none">• Can use electric devices like other people	Goal: <ul style="list-style-type: none">• Enjoying comfortable and enjoyable walk• Communicating with many people		

Step3: Clarify concrete situations in product/service use

❖ Identifying contextual elements in Quadrant III and IV

- ▶ Viewpoints:
 - » Quadrant III: Psychological and physical state
 - » Quadrant IV: Time, place, and occasion
- ▶ Each element is represented as a variable and its possible values

Quadrant	III. Customer states		IV. Environment states		
Viewpoints	Psychological state	Physical state	Time	Place	Occasion
Contextual elements	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Humor: Good / Bad </div>	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Health condition: Good / Getting a cold </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> With whom: No one / With wife / With a friend </div>	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Time: Morning / Afternoon </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Season: Spring / Summer </div>	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Road type: Flat / Slope / Stairs </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Forward visibility: Good / Poor </div>	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e6f2ff;"> Weather: Sunny / Cloudy / Rainy </div>

Step3: Clarify concrete situations in product/service use

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Quadrant	III. Customer states		IV. Environment states		
Viewpoints	Psychological state	Physical state	Time	Place	Occasion
Contextual elements	<div style="background-color: red; color: white; padding: 5px; text-align: center; font-weight: bold;">Variable</div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Humor: Good / Bad </div> <div style="background-color: red; color: white; padding: 5px; text-align: center; font-weight: bold; margin-top: 10px;">Possible values</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Health condition: Good / Getting a cold </div> <div style="border: 1px solid black; padding: 5px;"> With whom: No one / With wife / With a friend </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Time: Morning / Afternoon </div> <div style="border: 1px solid black; padding: 5px;"> Season: Spring / Summer </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Road type: Flat / Slope / Stairs </div> <div style="border: 1px solid black; padding: 5px;"> Forward visibility: Good / Poor </div>	<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Weather: Sunny / Cloudy / Rainy </div>

Step3: Clarify concrete situations in product/service use

❖ Writing plural product/service use scenarios

- ▶ Designers select a subset of valuables with a certain value to specify a concrete situation in product/service use
- ▶ To identify a variety of requirements, designers specify plural situations constructed by different subsets of contextual element

Example of a scenario

Selected contextual elements	Product/service use scenario				
<table border="0"><tr><td>Weather: Sunny / Cloudy / Rainy</td><td>With whom: No one / With wife / With a friend</td></tr><tr><td>Time: Morning / Afternoon</td><td>Forward visibility: Good / Poor</td></tr></table>	Weather: Sunny / Cloudy / Rainy	With whom: No one / With wife / With a friend	Time: Morning / Afternoon	Forward visibility: Good / Poor	<p>1 PM. Today, my wife is going out with her friend. I don't have all that much else to do; let's start off a ramble. I want to find a new interesting place.</p> <p>...</p> <p>Hmmm, this is a blind corner. How I hate it. "Screeeech!!!" Oh, what did I say? I am concerned about avoiding injury</p>
Weather: Sunny / Cloudy / Rainy	With whom: No one / With wife / With a friend				
Time: Morning / Afternoon	Forward visibility: Good / Poor				

Verification: PSS design workshop

❖ Organizing 1 day workshop

- ▶ In a Japanese manufacturing company
- ▶ 24 participants
 - » Divided into 5 design teams, considering the balance of their usual job and specialty



❖ The goal

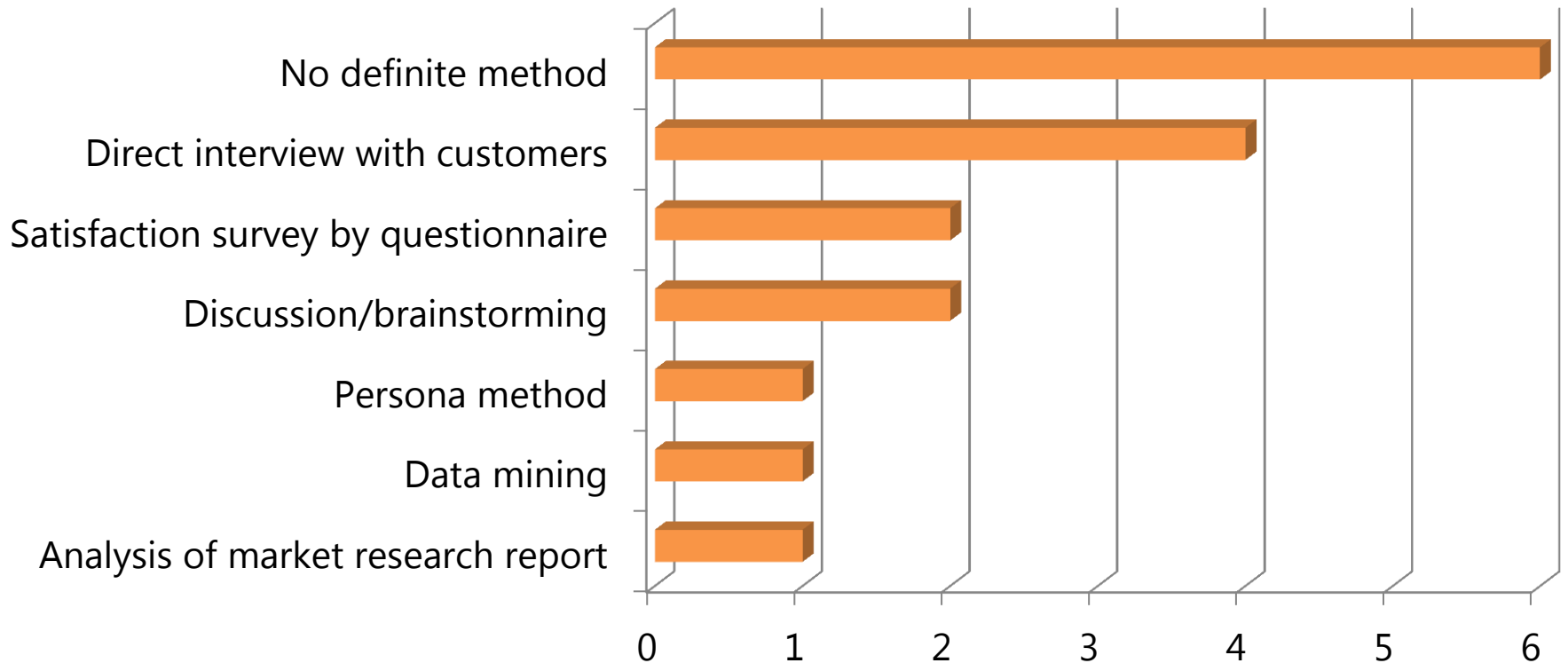
- ▶ To design a future innovative PSS considering value-in-context
- ▶ At the beginning of the workshop, each team set a core product and target customer

Team	Core product	Customer	
A	Monitoring camera	Convenience store in Africa	(B2B)
B	Smartphone	Female international student	(B2C)
C	Car navigation system	Taxi company	(B2B)
D	Plastic bottle	Beverage manufacturer	(B2B)
E	Refrigerator	Elderly woman	(B2C)

Verification: Questionnaire survey

- ❖ **After the workshop, a questionnaire survey was conducted**
 - ▶ It asked participants to compare the proposed method and their usual way of requirements analysis, with respect to result, process and tools

Number of answers about their usual way



Verification: Survey result

❖ Questionnaire result

Theme	Answers
Regarding analyzed requirements	<ul style="list-style-type: none">● Reasonable results could be obtained.● It was really interesting that completely different requirements could be identified by changing the selection of contextual elements.● In this workshop, we handled an imaginary case. I would like to apply the method used in the workshop to my actual work.
Regarding analysis process and tool	<ul style="list-style-type: none">● The way of thinking in the process was novel and effective in deeply considering situations of customer.● The requirements analysis process was well organized, something that has not been systematized in our company.● The worksheet for extracting contextual elements of the customer and environment states was useful to manifest our tacit knowledge.● It was still subjective to make a choice of what information should be used or not.● The viewpoints given by the tools were effective in deriving a lot of ideas easily, but these could restrict our creativity.

❖ Effectiveness

- ▶ Providing the viewpoints and process by which to extract various contextual elements for designers
 - » It realized the formalization of context-based requirements analysis for PSS design
- ▶ Formalizing the process to consider multiple patterns of context by regarding a short-term contextual element as a variable and its possible values
 - » It supports to consider various situations of product/service use

❖ Remaining issue

- ▶ Subjectivity in making a choice of what information should be used or not
 - » Criteria for selecting important information
- ▶ Completeness and validity of the classification themselves of context and its elements
 - » Survey to verify the classification of context

❖ Summary

- ▶ This paper aimed at the formalization of a way in which the concept of context should be handled in PSS design
 - » A framework which classifies viewpoints for extracting specific contextual elements which influence customer requirements for PSS
 - » The context-based requirements analysis process

❖ Outlook

- ▶ Criteria for selecting important information
- ▶ Further survey to verify the classification of context

Thank you!!

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