Persona-and-Scenario Based Requirements Engineering for Software Embedded in Digital Consumer Products

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We are NISE: Network Information and Software Engineering

Paris, Sep. 31, 2005

Scenario

- ☞ **Problem and Approach**
- ☞ **Hanako Methodology**
- ☞ **Field Studies**
- ☞ **Discussions and Challenges**
- ☞ **Conclusions**

Problem and Approach
Deep Gap Between Users and Developers

☞ **Digital Consumer Products are Ubiquitous in Our Life**

   👆 **Mobile Phone, Digital Camera, TV, Car Navigation System**

☞ **Perspective Gap: Do We Provide What Users Want ?**

**Users =
Non Technical People**

No more feature.
I like cute design!
Mobile phones are too
complex to use. It comes with
very thick and heavy manuals
which I can't carry with me.

**Developers =
Professional Engineers**

**We spent millions
dollars for developing
many new features,
but ...**

Problem and Approach
Evolution of Mobile Phones

☞ **From Mobile Phones (C) to Mobile Terminals (3C)**

☞ **Used at Every Scenes of Our Daily Life**

Yr	G	Communication	Contents/Media	Commerce/App.
95	2G	Voice		
96				
97			Music Tone	
98				
99	2.5G	E-mail	Web Browser, Color Display	
00			Camera	
01			SD Card	Java Apps
02	3G	High Speed Data	Video	Location Service
03		Video(TV) Phone	Flash Browser	GPS/Navigation
04		Wireless LAN	Full Music Player	Wallet, Security (Finger Print Sensor)

Problem and Approach
Our User Survey [Summer 2004]

☞ **A Survey of Our Field Study Shows**

☞ **Most of Users Prefer "Simpler and Usable"**

Legend: ☐ More Functionality ☐ Just Right ☐ Simpler ☐ Other

Categories: House Wife, Business under 35, Business over 35, Non-Eng. Student Female, Non-Eng. Student Male, Emg. Student Female, Eng. Student Male

X-axis: 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
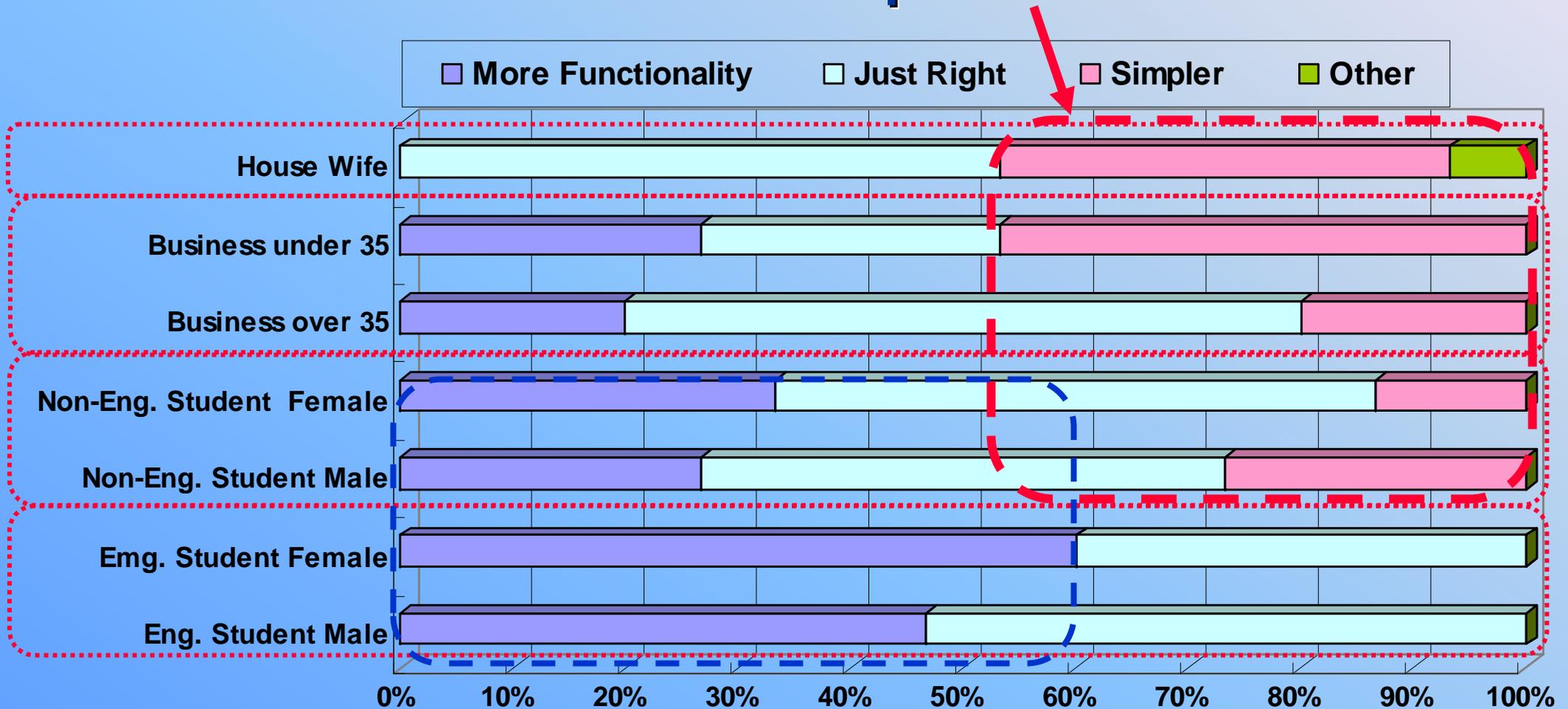
Response: 15 People/Cluster * 7 Cluster= 105

👉 *Developer, Catch Me if You Can!*

Akihabara and Yokohama Aug 28, 2005

Problem and Approach
Problems of RE for Digital Consumer Products

☞ **Problems of RE for Digital Consumer Products**

- ☝ **Unknown Many Users**
- ☝ **Wide Variety of Users and Usages (3C)**
- ☝ **Unexplored New World in RE**
- ☝ **Requirements Acquisition in Practice: Matter of Marketing without Engineering Basis or "Let Smart People Do it"**

☞ **Conventional Approaches**

- ☝ **User-Centered RE and User-Centered Design**
- ☝ **Persona**
- ☝ **Marketing Engineering**

☞ **Lack of Integrated Methodology**

Hanako Methodology
Our Strategy

☞ **Goal**

From System-Centered to User-Centered

From Product-Out to Market-In

Users

Bridging Gap between Users, Marketing and Engineering

Engineering

Marketing

Telcom. Operator

Conventional Way of Requirements Acquisition

☞ **Strategy**

- 👆 **User Focus**
- 👆 **Integrated Methodology with Engineering Tools**
- 👆 **Quantitative Measure**

☞ **Assumption: Incremental Development**

Hanako Methodology
Find a User by Persona, Hnako

☞ **Hanako: Popular Name of Japanese Women, Like Mary***

☞ **Find Hanako in Unknown Many Users**

Distribution of Value of Requirements (Number of Users)

Distribution of Requirements (Number of Features)

Target Users

Cast

Persona

Persona

Hanako = Primary Persona

Persona

Professional Developers

User Profile (Ex.: Computer Literacy)

Conventional Elicitation Strategy

Elicitation Strategy of Hanako Method

***Source: http://www.namestatitics.com**
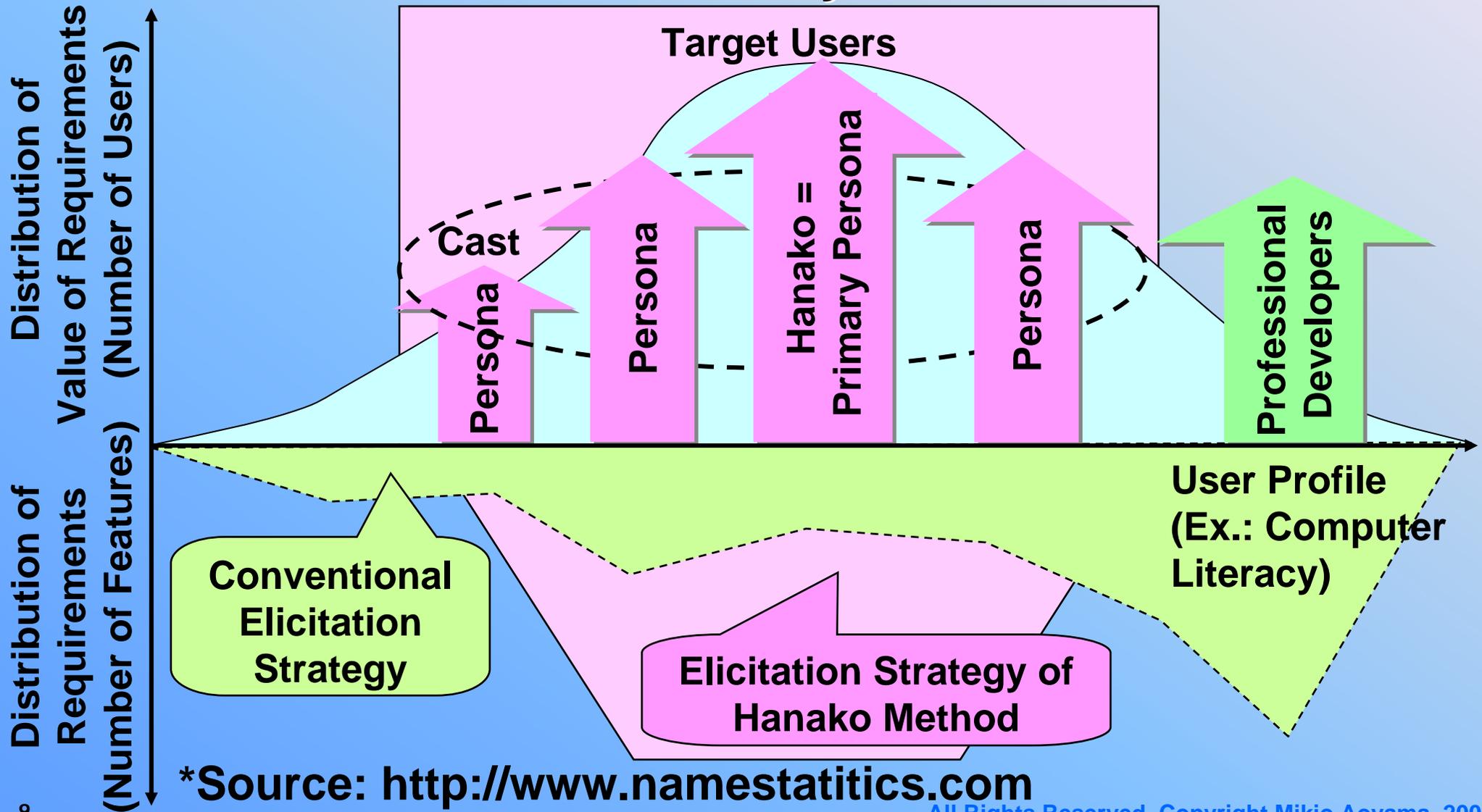
Problem and Approach
Persona

☞ **Persona: Social Role of People (Mask) = Model of Target Users**

- ☝ **Psychology by C. G. Jung**

☞ **Persona Method: Design Based on Persona**

- ☝ **Proposed by A. Cooper**
- ☝ **"Design for One"**

☞ **Cast: A Set of Personas**

- ☝ **3~13 Personas per System**
- ☝ **Primary Persona**

☞ **Problem: No Methodology**

Hanako Methodology Process

☞ **2 Stages: Persona Identification and Persona-Scenario Analysis**

Persona Identification

1. Disjoint Clustering of Target Users

Questionnaire on Features

2. Identification of Personas by (Inverse) Conjoint Analysis

3. Identification/Synthesis of Primary Persona

Persona Scenario Analysis

5. Persona-Scenario Analysis: Identification of Requirements Hot Spots

Questionnaire on Scenarios

Persona Pattern

**4. Description of Primary Persona and Cast**

Hanako Methodology
# (Inverse) Conjoint Analysis

☞ **Conjoint Analysis from Mathematical Psychology (1964)**

- ☝ **Ask Known-Users on Preferred Attributes of Products**
- ☝ **Find a Set of Preferred Attributes of Products: Features, Cost, Design, …**

A Set of Known Users

Preferred Attributes

Candidate Attributes

Preference
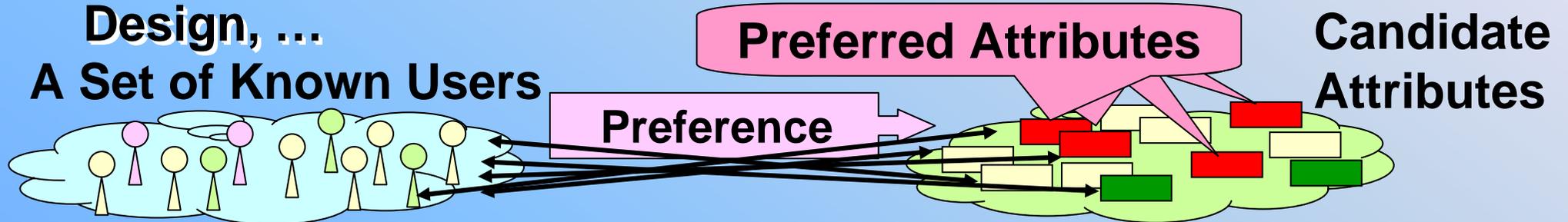
☞ **(Inverse) Conjoint Analysis**

- ☝ **Ask a Set of Candidate Clusters of Users on Preferred and Target Attributes of Products**
- ☝ **Find a Set of User Clusters Sensitive to a Set of Attributes**

Preferred User Clusters

Known Attributes

Preference

Preferred Users

A Set of Candidate User Clusters
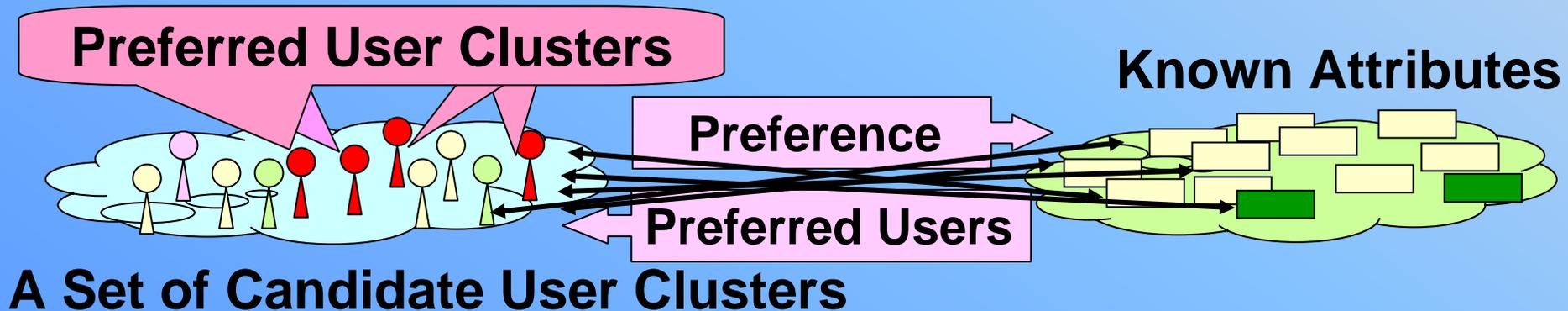
Field Studies
1st Field Study: Overview

☞ **Time: Summer 2003**

☞ **Goal: To Validate Hanako Methodology**

☞ **Participants: 14-17 Person * 4 Groups = 60**

☞ **Measure: Usage Frequency of Services**

Category	ES (Engineering Students)	PS (Policy Studies Students)	Total
Male	14(ES M)	14(PS M)	28
Female	17(ES F)	15(PS F)	32
Total	31	29	60

Service Groups		Services
Communi-cation	Voice	Redialing, Vibrator, Personal Calling Tone, Call Directory, Call Group
	E-mail	E-mail, Face Characters, Image Sign, Copy & Paste, Attachment
Contents/Multimedia		Image (Photo), Video (Movie), Web Access
Commerce/ Application		Calculator, Alarm Clock, Schedule, Secret Memory, Navigation

Field Studies
1st Field Study: 3 Usage Patterns

☞**Variant Service: Users' Preference Varies (High SD)**
☞**Common Services: Most Users Use (High Ave. Low SD)**
☞**Marginal Services: Few Users Use (Low Ave. Low SD)**
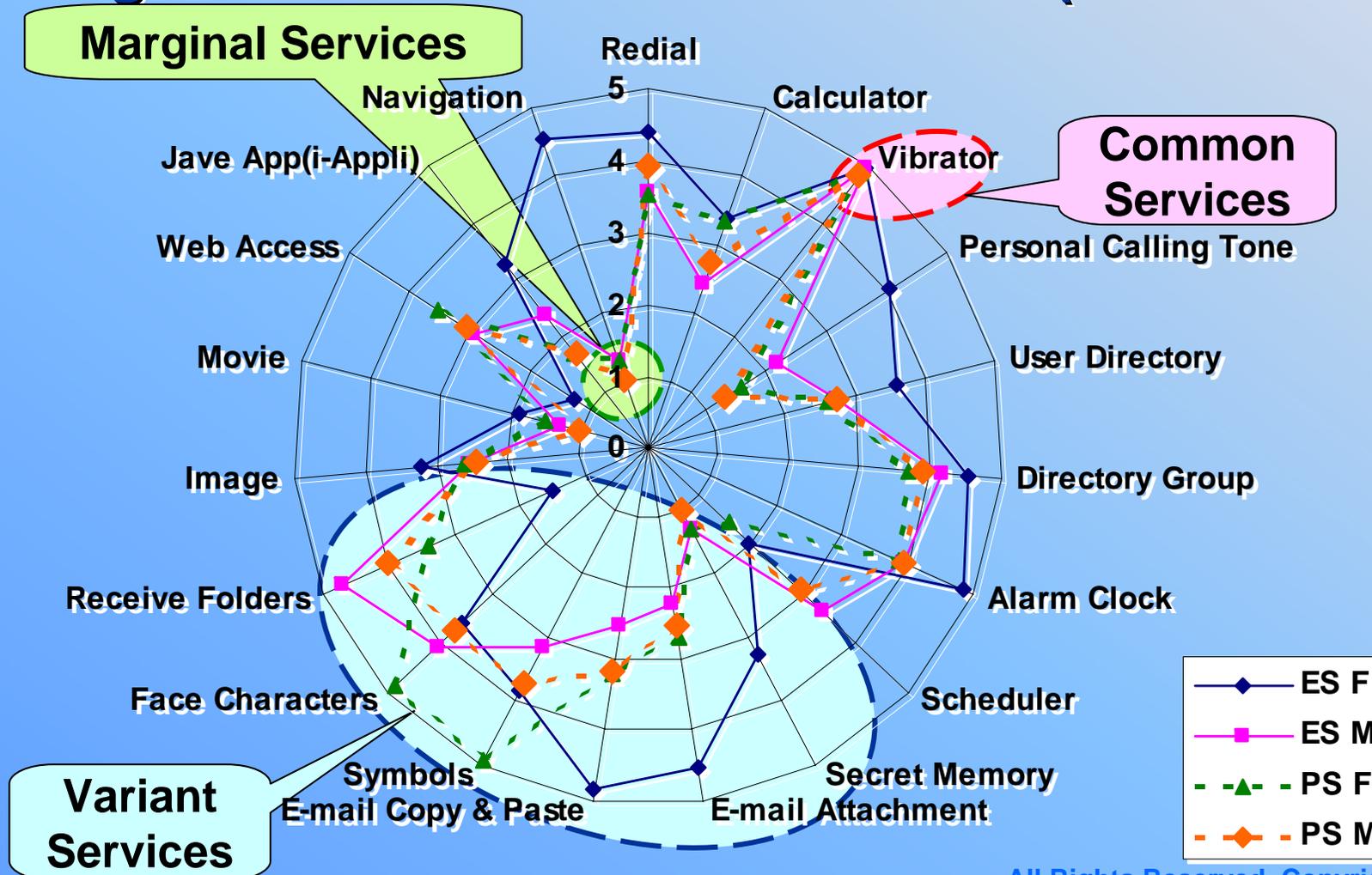
Field Studies
1st Field Study: Persona Identification

☞ **Finding Persona as the Highest Responding User Category**

- ✍ **Service Coverage (Total Score of Usage)= Sum (V_i)**
    - ✋ **V_i: Average Usage Ratio for Each Service per Cluster**
    - ✋ **i: For All Services per User Cluster**

☞ ***Simple* Primary Persona: Female Engineering Students (ES F)**

- ✍ **Identified as the Significantly Outperforming Single Cluster of Users**

Category	ES (Eng. Students)	PS (Policy Studies Students)
Male	55.5[0.867] (ES M)	53.4[0.834] (PS M)
Female	64.0[1.00] (ES F)	55.8 [0.872] (PS F)

Note: [] Denotes Ratio

Field Studies
1ˢᵗ Field Study: Persona Description

Persona
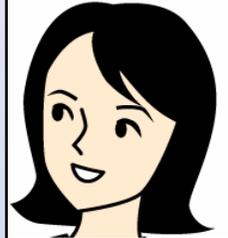
Name: Hiroko Niwa

Group: Senior Female Student Major in Engineering

1) Personal Profile

- Come to school 5 days a week, works part time job at a restaurant during weekend

- Study computer eng., and working for a term paper on software eng.

- Play tennis once a week

- Working with her personal Web page

2) Profile of Mobile Phone Usage

- Daily use of e-mail, browsing the web

- Use the phone to some extent without reading manual

- Buy new phone at every one year and a half

- Send or receive some 15 e-mail per day(4lines/e-mail)

- Call 3 times a week (less than 10 min. per call)

3) Specific Requirements to Mobile Phone

- To make e-mail better

Field Studies
2nd Field Study: Overview

☞ **Time: Summer 2004**

☞ **Goal: To Analysis New Features of 3G Mobile Phones**

☞ **Participants: 15 Persons * 7 Groups = 105**

Category	Eng. Students	Pol. Stud. Students	Business (>=35)	Business (<35)	House Wife	Total
Male	15 (ES M)	15 (PS M)	15	15	0	
Female	15 (ES F)	15(PS F)	(BP35+)	(BP 35-)	15	
Total	30	30	15	15	15	105

Service Groups		Services
Communi-cation	Voice	Redialing, Vibrator, Drive Mode, Call History, Call Hold, Personal Calling Tone, Call Directory, Call Group
	E-mail	E-mail, Face Characters, Mail Inquiry, Attachment
Contents/Multimedia		Image(Photo), Video(Movie), Web Access
Commerce/App.		Java Application (i-Appli), Navigation, Wallet

☞ **Overview of Preference Distribution**

Legend:
- ES Male
- ES Female
- PS Male
- PS Female
- BP over 35
- BP under 35
- House Wife
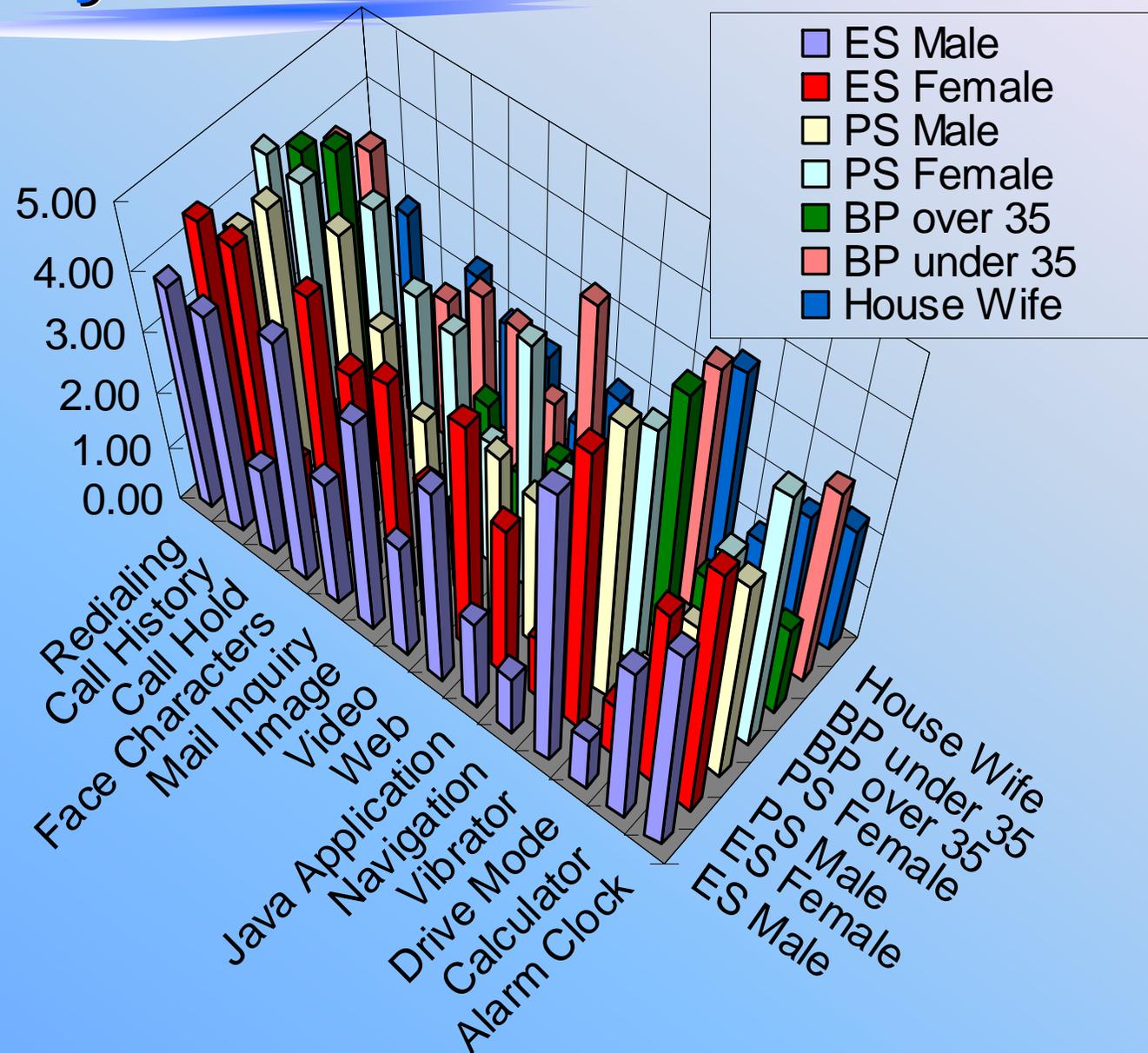
Field Studies
2nd Field Study: Persona Identification

☞ *Composite* Persona:

☞ Female Students = Engineering Female Students + Policy Study Female Students

- No Single Leading Cluster Identified
- but 2 Clusters of Female Students can Covers Most

Category	Eng. Students	Pol. Stud. Students	Business (>=35)	Business (<35)	House Wife
Male	40.5[0.873] (ES M)	41.9 [0.903] (PS M)	30.0 [0.647] (BP35+)	38.4 [0.828] (BP 35-)	NA
Female	46.4 (ES F)	46.3 (PS F)			27.9 [0.601]
	46.4 [1.00]				

Field Studies
2nd Field Study: 3 Usage Patterns

☞ 3 Usage Patterns
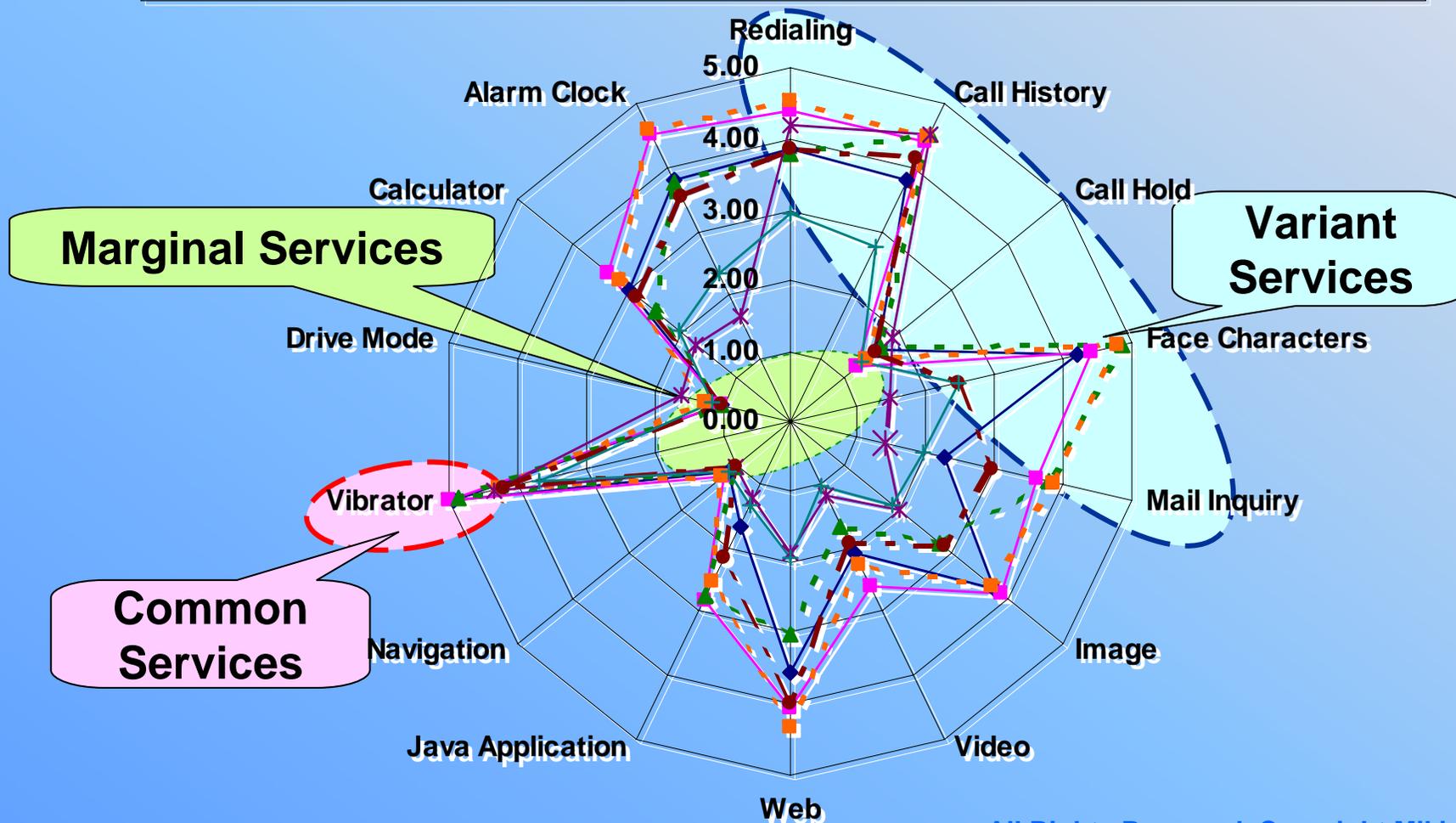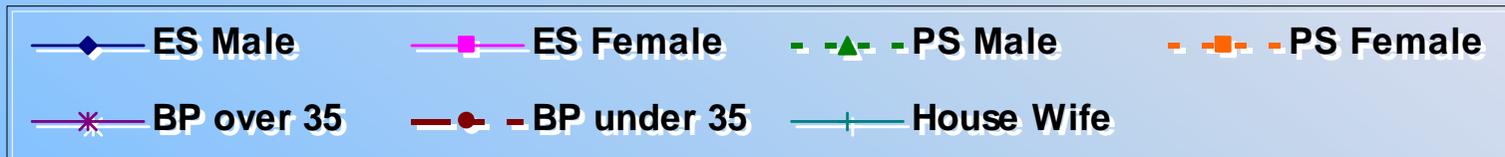
Field Studies
2nd Field Study: Persona-Scenario Analysis

☞ **Goal**

  ☝ **To Find out Obstacles of Slow Acceptance of 3G Mobile Phones and Possible Extension Points**

☞ **Approach**

  ☝ **Scenario Analysis with Primary Persona on the Usages of New Features of 3G Mobile Phones**

  ☝ **Trial Use & Benchmarking with Various 3G Phones**

☞ **Targeted Scenarios in Features for 3G Phones**

  ☝ **Features for Called Parties: Unique to Mobile Phones**

  ☝ **Deco-Mail: Mail with Decorations: For Female**

  ☝ **Wallet Feature: Brand New Features to 3G**

  ☝ **Menu-Guided Feature: Usability Improvement**

Field Studies
2nd Field Study: Persona-Scenario Analysis

☞ **Analysis of Scenarios of Services for Called Parties**

☞ **Finding:**

- ☝ A Set of Caller Identification Features are Hot Spot to Female Users, Primary Persona, Opportunity of Value
- ☝ Speed Dialing is Replaced by Dictionary Service

Legend:
- Men E S
- Women E S
- Men GA S
- Women GA S
- BP 35 or Over
- BP under 35
- House Wife

X-axis: Absence | Personal Calling Tone | Personal Calling Image | Don't Disturb | Speed Dialing

Y-axis: 0.00 to 1.00
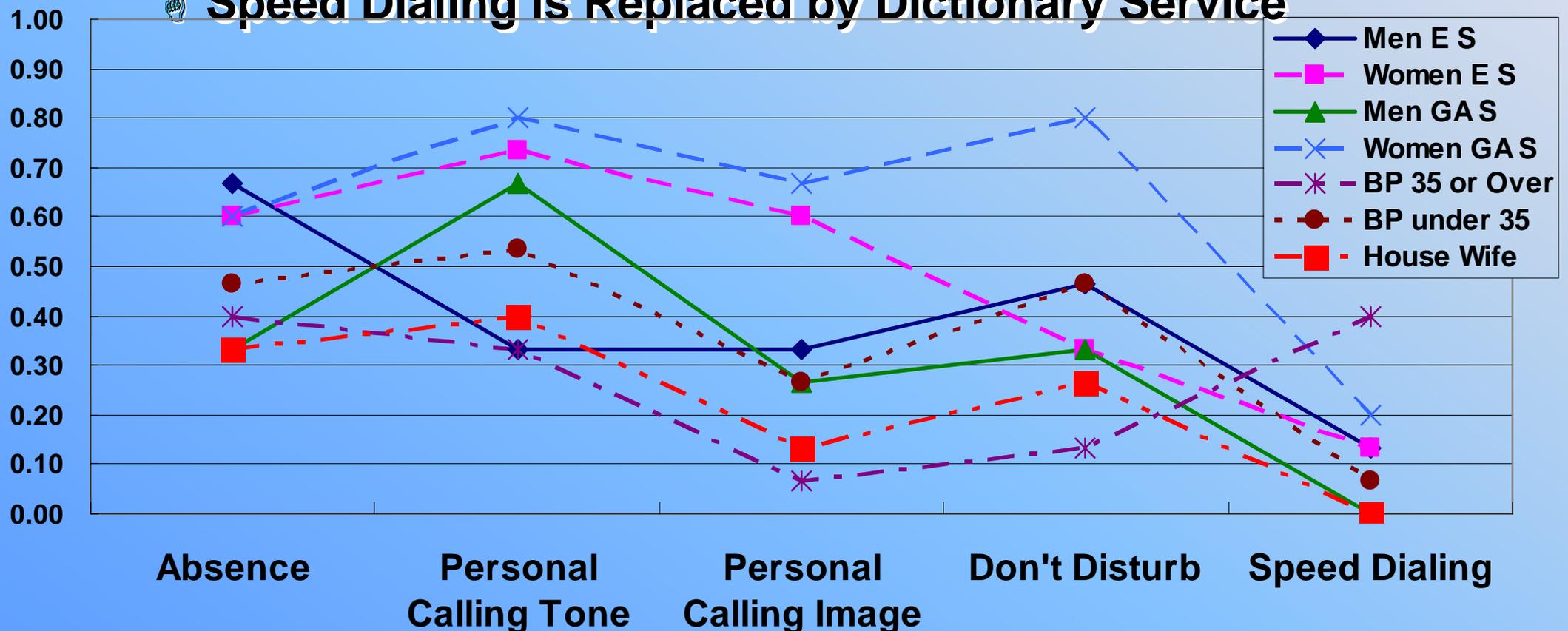
Field Studies
2nd Field Study: Persona-Scenario Analysis

☞ **Analysis of Deco-Mail Scenarios: Targeted to Female**

☞ **Finding: Hot Spot of Single Usage Patterns**

- **70% Users Use Only One Scenario: Input Text First, then Make Decoration: Intuitive Pattern of Human (Affordance)**
- **Other Scenarios are Not Preferred**
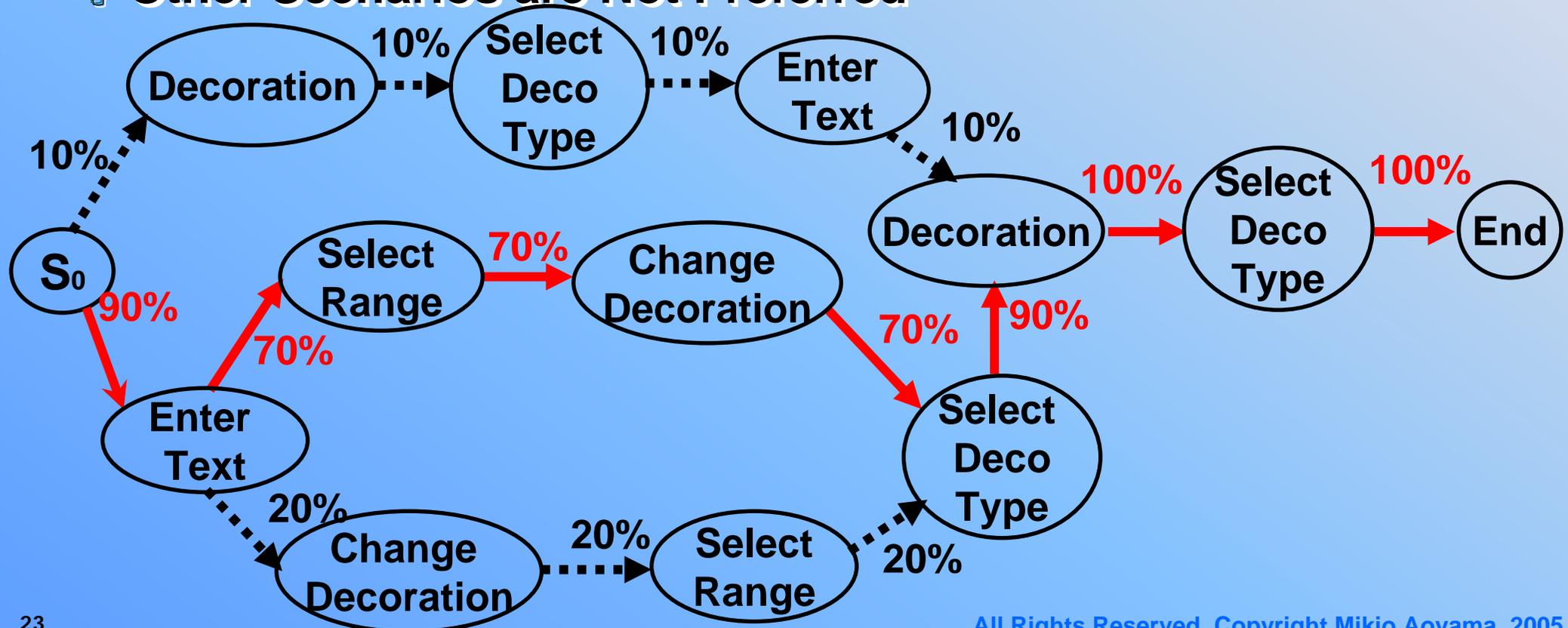
Field Studies
2nd Field Study: Verification of Field Studies

☞ **Consistency Checking of 10 Common Features**

☞ **Same Trend Observed in both 2003 and 2004**

Snake Graph
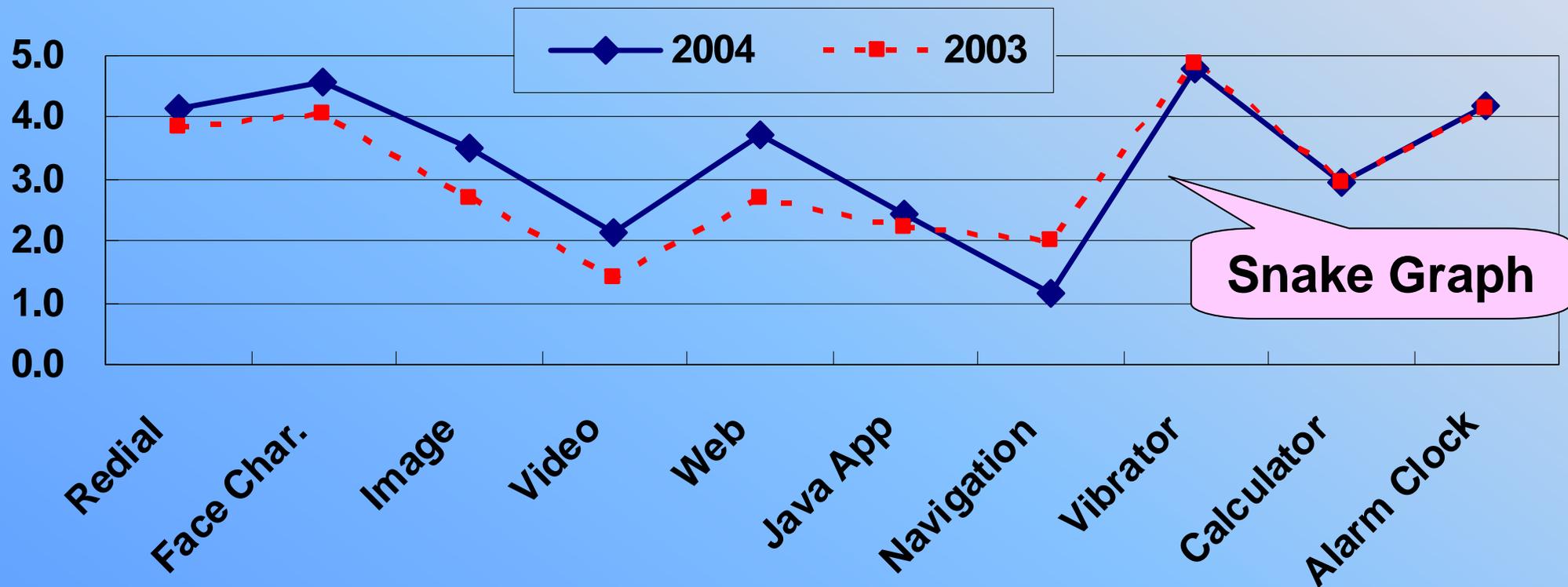
Discussions and Challenges

☞ **Effectiveness of Hanako Method**

 ☝ **Effective to Identify Persona and Hot Spots**

 ✋ **"Not Effective" Experience without a Method for Finding Persona [K. Rönkkö, et al., 2004]**

☞ **Rich Context of Persona**

 ☝ **Intuitive Understanding of Context by Calling Name, Like Design Patterns**

 ☝ **Risk of Rich Subjective Contextual Information**

☞ **Limitation**

 ☝ **With Some Heuristics, Needs Tool Support**

☞ **Response from Developers at a Workshop (Jan. 2005)**

 ☝ **Some 20 Developers & a Few Marketing People from Fujitsu**

 ☝ **Some Expected, Some Surprises, Some Need Further Proof**

Conclusions

- **Problems and Opportunities**
  - Requirements Engineering for Software Embedded in Digital Consumer Products
- **Hanako Methodology**
  - Finding User First: Finding Persona with (Inverse) Conjoint Analysis
  - Finding Requirements Hot Spots with Persona-Scenario Analysis
- **2 Field Studies in 2 Year**
  - Proof of the Effectiveness of Methodology
  - Some Findings
- **Integration of RE with Marketing Engineering**