

# USAGE OF TRIZ FOR PRODUCT PLANNING

-Build Up “Innovation-Oriented TRIZ”-

September 9th, 2010

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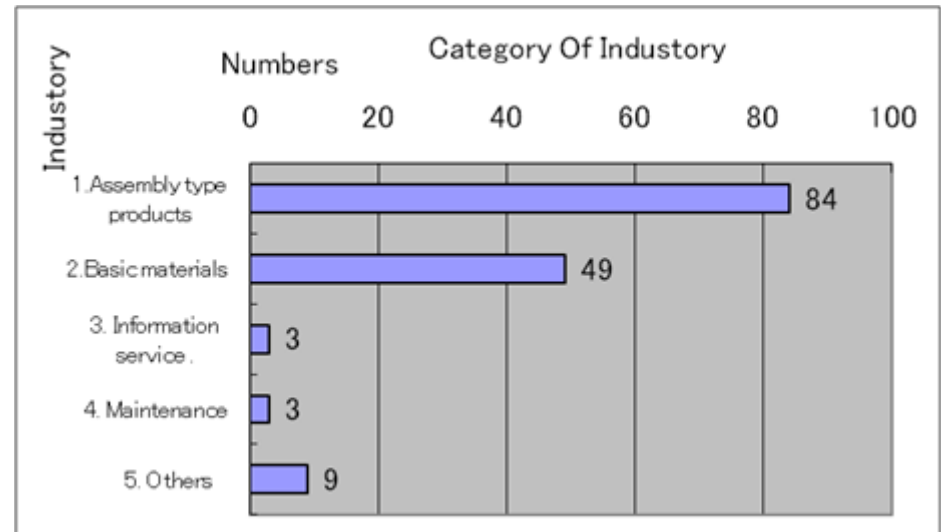
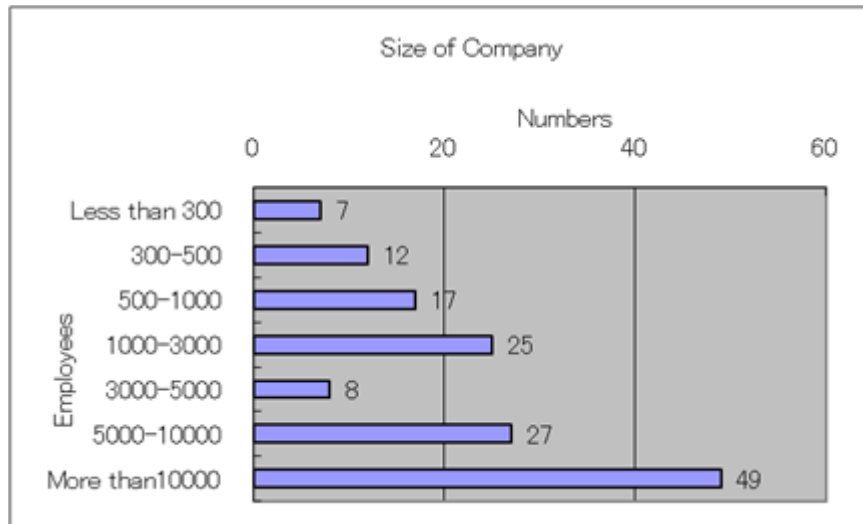
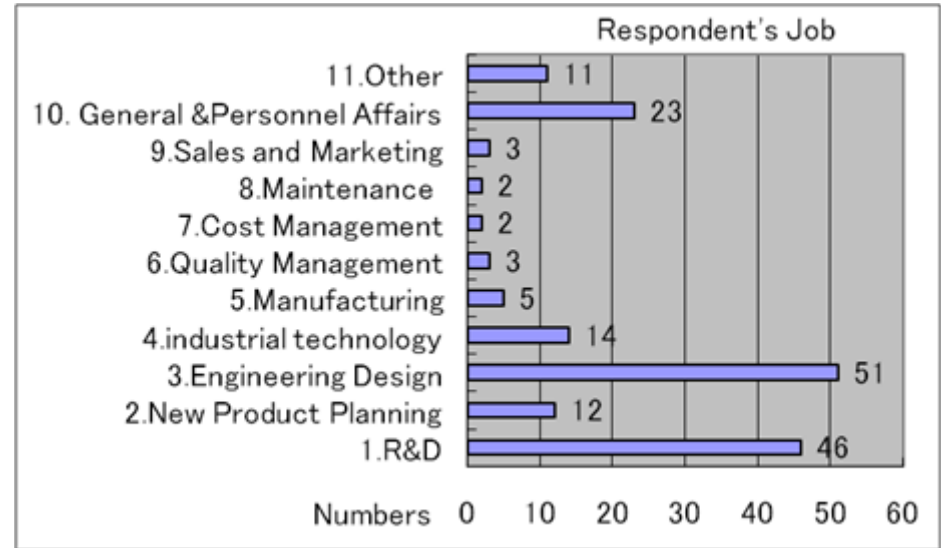
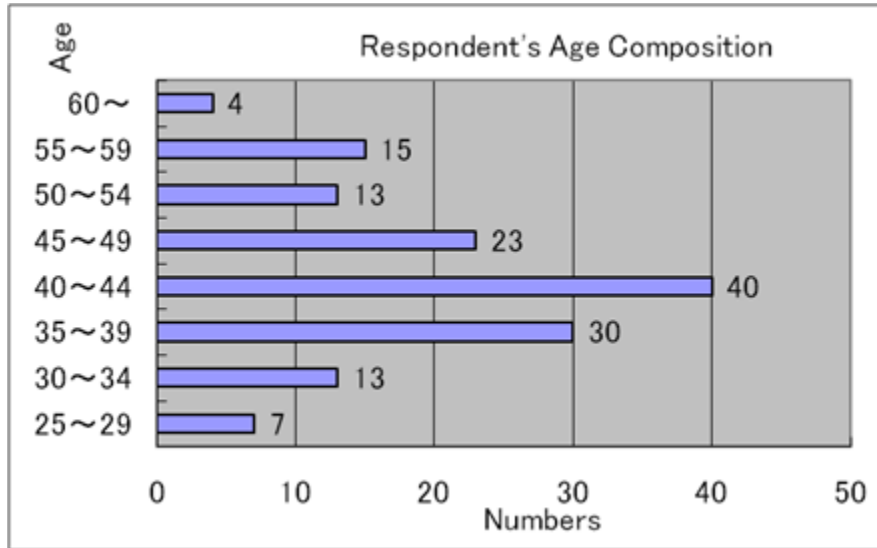
# **“Strengths And Weaknesses of Japanese Manufacturers”**

**Where is Direction for Growing  
Japanese Companies in the Future?**

# 1.Features of Japanese Manufacturers -through Questionnaire Survey

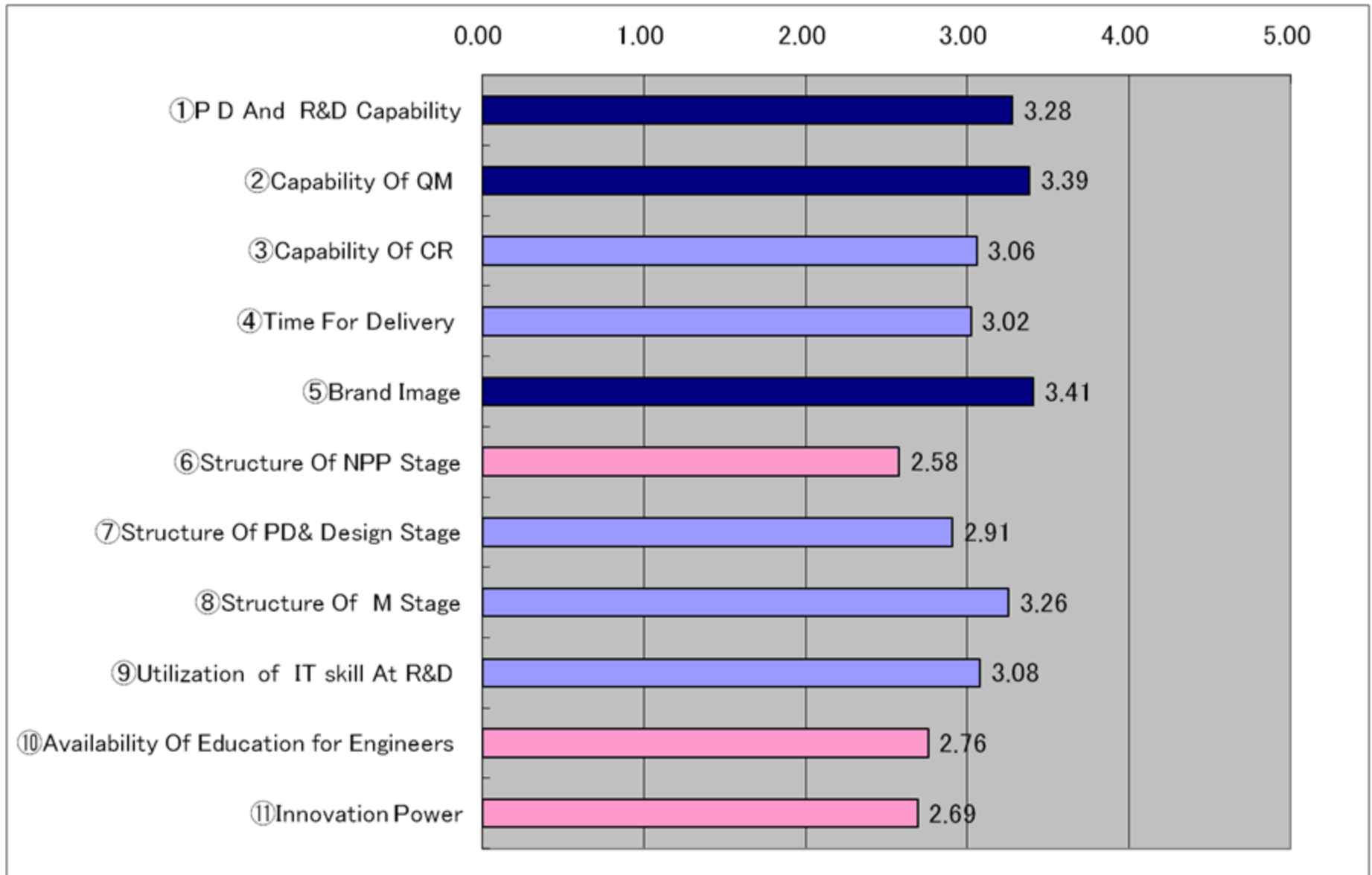
Ques. survey (sample:145)=participants at MOT seminar 82+ participant at pan-industry social event:63

## [Base Attribute]



# [Q1] About Current Challenges At Your Company (Respondents Are 95, But Partly 92,94)

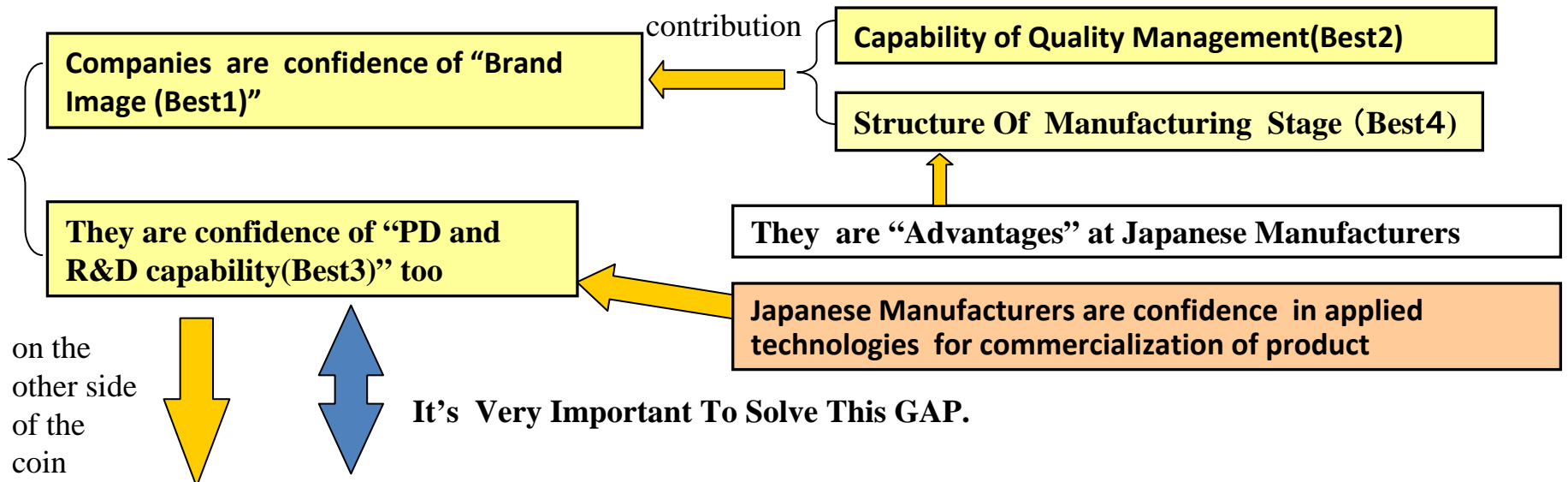
1: very low appraisal 2: low appraisal 3: average 4: high appraisal 5: very high appraisal



Highly Evaluated (Best 3)		Not evaluated highly (worst3)	
Brand Image	3.41	Structure Of New Product Planning Stage	2.58
Capability Of Quality Management	3.39	Innovation Power	2.69
Product Development And R&D Capability	3.28	Availability Of Education For Engineers	2.76

The Score Difference Between The best 3 And Worst 3 Differs Significantly (Level Of Significance:0.01) Through Statistical Hypothesis Testing.

### Consideration regarding [Q1]



**Very Low Appraisal To "The Structure Of New Product Planning Stage (Worst 1) =Most Important challenge!**

**[Q2]Question About Diagram Of “Cause –Effect Relationship” Regarding Each Challenge Showing at [Q1] :Utilization of ISM (Interpretive Structural Modeling) Method**

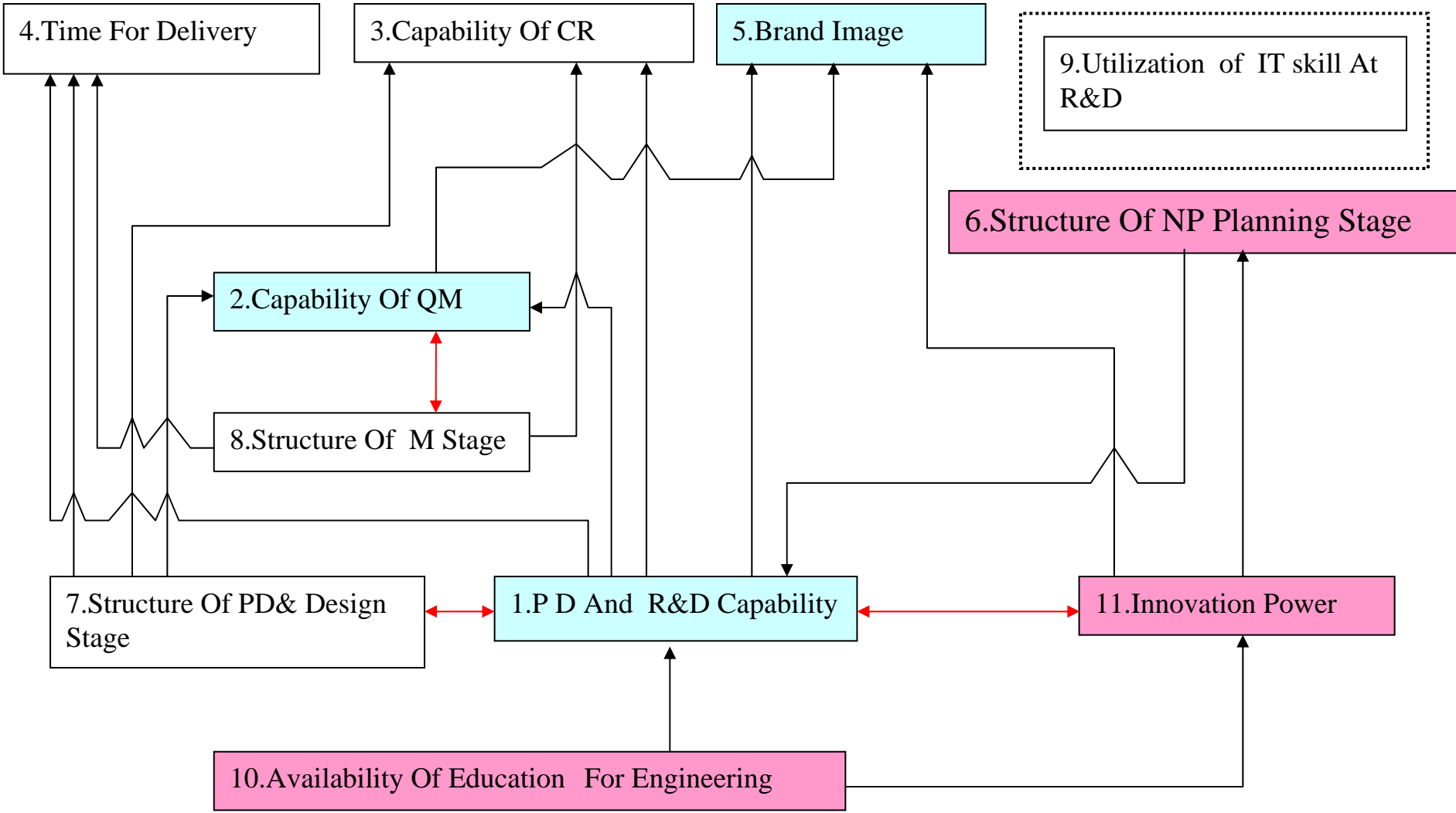
**Utilization Of ISM Method**

X ← Y	1	2	3	4	5	6	7	8	9	10	11
1.P D And R&D Capability		35	45	24	11	58	65	23	22	50	73
2.Capability Of QM	52		36	19	10	22	67	77	19	30	14
3.Capability Of CR	57	49		32	11	36	60	75	21	28	27
4.Time For Delivery	50	30	17		6	29	57	79	40	15	16
5.Brand Image	55	71	22	30		49	11	4	9	9	53
6.Structure Of NPP Stage	49	14	21	20	39		32	11	20	24	53
7.Structure Of PD& Design Stage	56	33	32	28	7	47		26	36	39	37
8.Structure Of M Stage	46	51	41	41	3	17	42		22	28	20
9.Utilization of IT skill At R&D	17	11	14	31	5	17	30	12		33	27
10.Availability Of Education (Eng)	43	24	14	7	9	21	34	11	28		37
11.Innovation Power	61	25	21	13	26	41	31	16	22	55	

We hypothesize that number of “1” on each grid at 11\*11 matrix (This matrix consist of 110 grid according to permutation) abide by normal distribution. To put it another way, the score on the grid in ranging “ $m + \sigma$ ” ranking in the top 15.8 % of all (normal distribution) should be defined as “1” on ISM Matrix. Consequently , score “50” is threshold level to define as “1” on ISM Matrix in this case.

Mean Value	31.6
Standard Deviation	18.2
( $m + \sigma$ )	49.7
threshold level to define as “1”	50

# Diagram Of “Cause –Effect Relationship” Regarding Challenges :Utilization of ISM Method

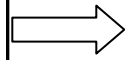


↔ Two way arrow     
 → One way arrow

## Speculations About[ Q2] (Diagram Of “Cause –Effect Relationship)

1)Companies having confidence about QM are sure of their own Brand Image

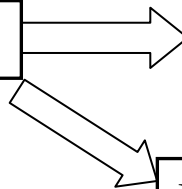
Capability Of QM (Best2:3.39)



Brand Image(Best1 : 3.41)

2)PD And R&D Capability contributes to both advancement of Quality and establishment of their own Brand Image.

P D And R&D Capability(Best3 : 3.28)



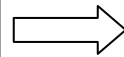
Capability Of QM (Best2:3.39)



Brand Image(Best1 : 3.41)

3)Low score of Innovation Power is not related to bad image of Brand yet.

Innovation Power(Wrost2:2.69)



Brand Image(Best1 : 3.41)

Do you think “Quality-oriented Kaizen Activities” always create “Brand Value”?

Don't you think Companies having Innovation power recently are getting “New Brand Value “. **How do Japanese Companies get “New Brand Value” from now ?**

Is it OK? No problem?



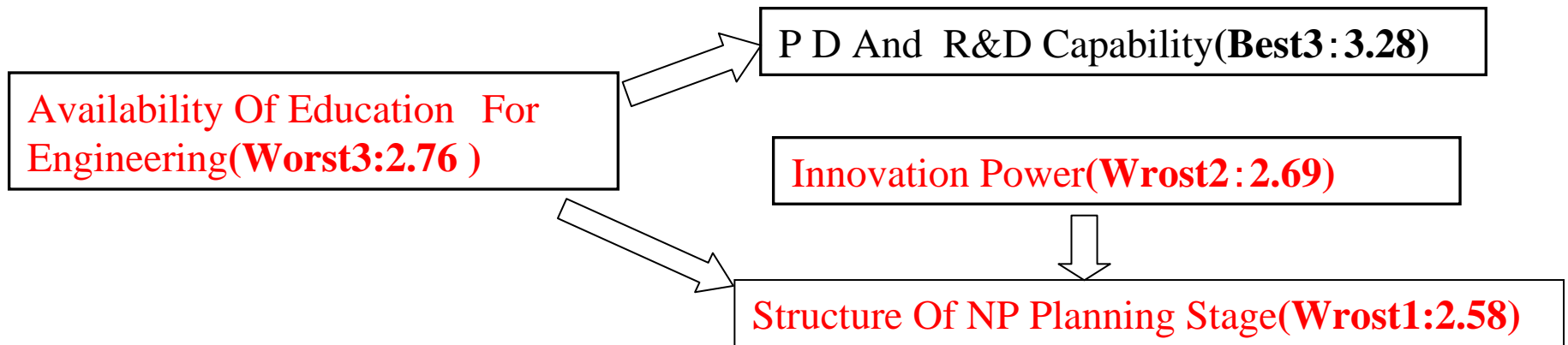
4) Although Utilization of IT skill is not low score, it is isolated from other challenges.



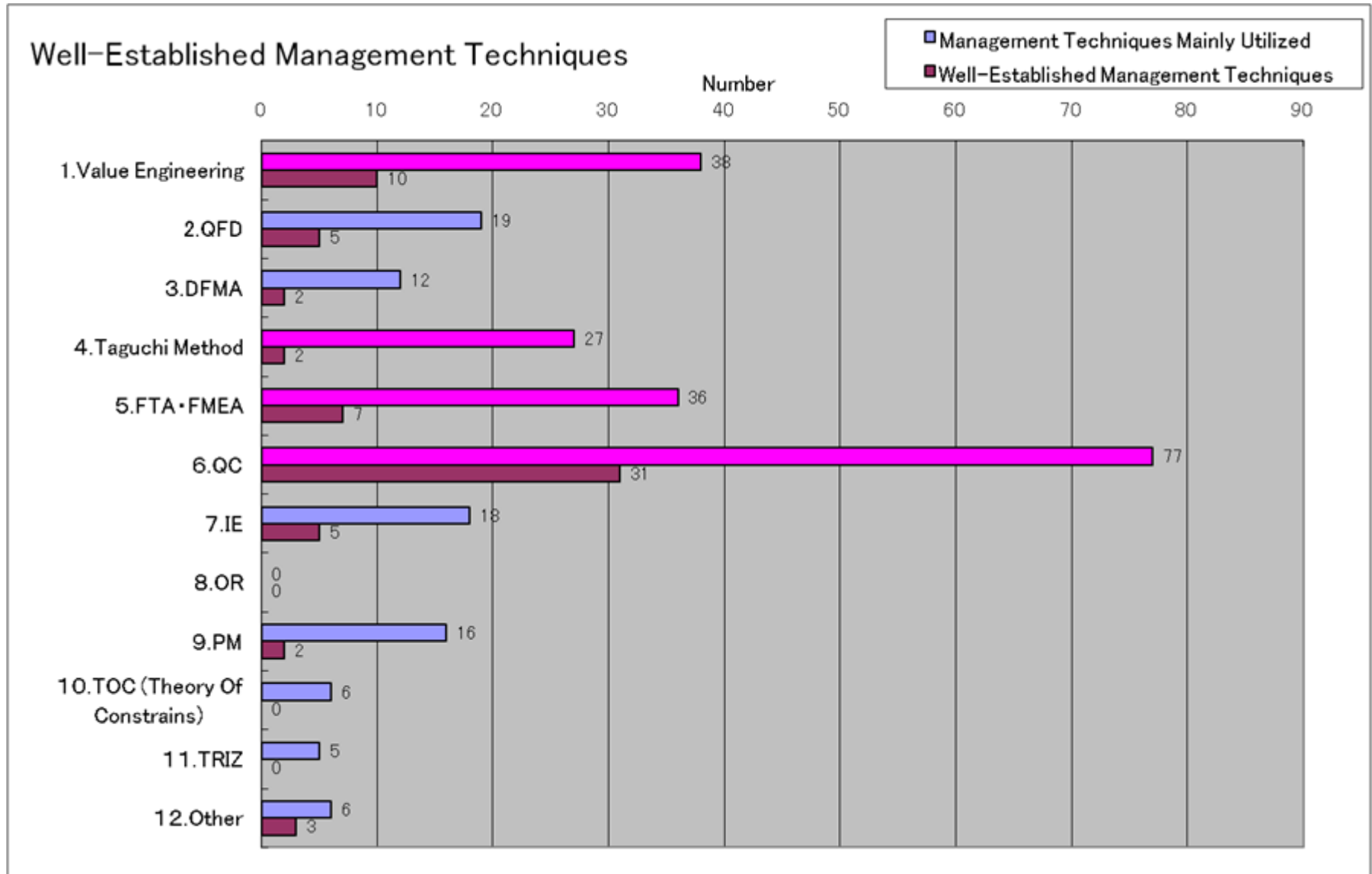
IT( is related to Power of content development ) >>>>New convenience and new value creation >>>>iPod and Wii appeared in new market place

5) Education System For Engineers might be “Bottleneck” to facilitate Innovation Power if we don’t improve availability of “ESE”.

“ESE“ is bottom cause of most challenges. Therefore , “**Systematic MOT-Education Programs**” meeting the needs of the times are required to develop as soon as possible.



# [Q3]About Management Techniques Mainly Utilized (multiple answers allowed)and Well-Established Management Technique



## Speculations About[ Q3](Management Techniques Mainly Utilized)

### Management Techniques Mainly Utilized

**Best1 : QC : 77 Respondents**

**Best2 : VE : 38 Respondents**

**Best3 : FTA/FMEA : 36 Respondents**

**Best4 : Taguchi Method : 27 Respondents**

### Well-Established Management Techniques

**Best1 : QC(31/77=About40%)**

**Best2 : IE(5/18=About28%)**

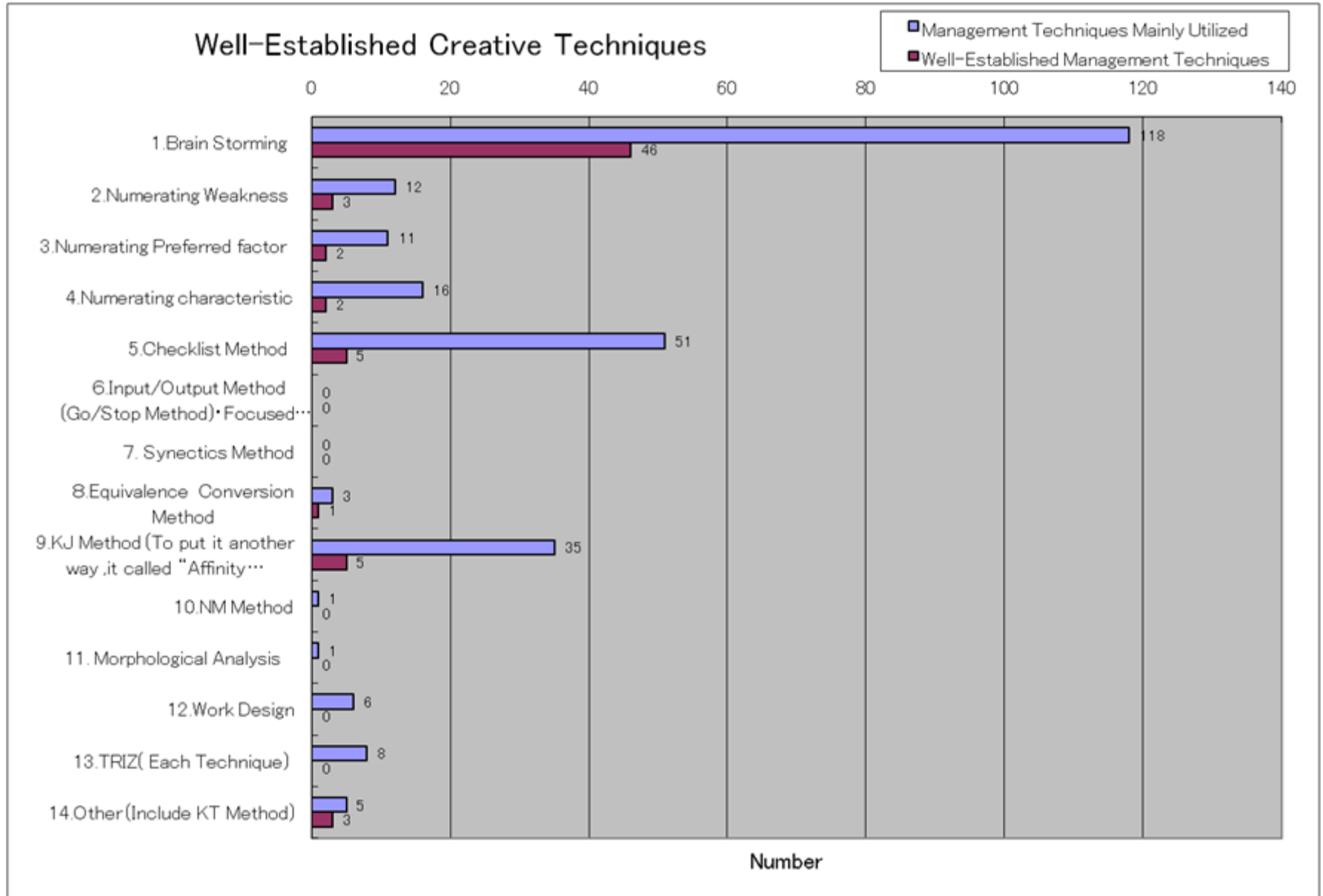
**Best3 : VE(10/38=About26%)**

**Best3 : QFD(5/19=About26%)**

Utilization of QC is outstanding among other management techniques' utilization. Moreover, QC is a distinguished management technique from the viewpoint of well-established management technique. Because of this factor, we accept the situation that "Capability of Quality Management" is relatively high score(Best2) in Japan.

VE is one of management techniques mainly utilized too. This result might show one of cost reduction activities in Japan.

# [Q4] About Creative Techniques Mainly Utilized (multiple answers allowed) and Well-Established Creative Technique



## Speculations About [Q4](Management Techniques Mainly Utilized)

### Creative Techniques Mainly Utilized

Best1 : Brain Storming: 118 Respondents

Best2 : Checklist : 51 Respondents

Best3 : KJ Method (Affinity diagramming) : 35 Respondents

### Well-Established Creative Techniques

Best1 : Brain Storming (46/118 = About 39%)

\*Best2 and below are too low score .

Therefore, we skip to write here

Utilization of Brain Storming is outstanding among other creative techniques' utilization. Moreover, Brain Storming is a distinguished creative technique from the viewpoint of well-established creative technique.

To put it the other way around, other creative techniques except Brain Storming are not utilized very much.

# General Speculations (Hypothesis)

**1) At one time (1960 to 1980's) : Age of “Kaizen Activities” based on “Catch Up Strategies “**

**>>> Mainly focus on “Education for Engineers” with sense of “Kaizen” to reduce “Mura(unevenness), Muri(burden) and Muda(wastefulness)” at downstream stage (manufacturing, manufacturing technique, quality management and so on) by SQC, TQM and so on) >>> Japanese companies have self-confidence against challenges at downstream stage .**

**2) At the present : Age of “Problem-solving” at upstream stage (R&D, new product planning, development & design and so on) based on “Front runner strategies” >>> Japanese companies have to organize “Education for Innovative Engineers” as soon as possible , improving “Innovation power with creativity”.**

## 2.The World's 10 Most Innovative Companies and Japanese company's competing power

### The World's 10 Most Innovative Companies(2007)

Company	HQ Country	Revenue Growth (2004-2007) (in %)	Margin Growth (2004-2007) (in %)	Stock Returns (2004-2007) (in %)	Most Known for its Innovative... (% who think so)
1. APPLE	USA	47	69	83	Products (52%)
2. GOOGLE	USA	73	5	53	Customer Experience (26%)
3. TOYOTA	Japan	12	1	15	Processes (36%)
4. GE	USA	9	1	3	Processes (43%)
5. MICROSOFT	USA	16	8	12	Products (26%)
6. TATA GROUP	India	Private	Private	Private	Products (58%)
7. NINTENDO	Japan	37	4	77	Products (63%)
8. P&G	USA	16	4	12	Processes (30%)
9. SONY	Japan	8	13	17	Products (56%)
10. NOKIA	Finland	20	2	35	Products (56%)

# IMD World Competiveness Year Book(2008 ver.)

## Object countries /regions for evaluation>>> 55

IMD(Swiss)

	Japan	USA	U.K	Germany	France	China	Taiwan	Korea	India	1 <sup>st</sup> rank
Total ranking	22	1	21	16	25	17	17	31	29	USA
1)Economic situation	29	1	16	6	13	2	21	47	18	USA
<b>2)Efficiency of Government</b>	<b>39</b>	18	24	26	45	12	16	37	23	Singapore
3)Efficiency of Business	24	3	19	28	35	33	10	36	20	Hong Kong
<b>4)Infrastructure</b>	<b>4</b>	1	20	6	11	31	17	21	49	USA
<b>Scientific Infra.</b>	<b>2</b>	1	13	3	12	10	4	5	29	USA
Technological Infra.	16	1	12	6	19	32	5	14	41	USA

**Japan 22nd (2008) >>> 17th(2009) >>> 27th(2010)**

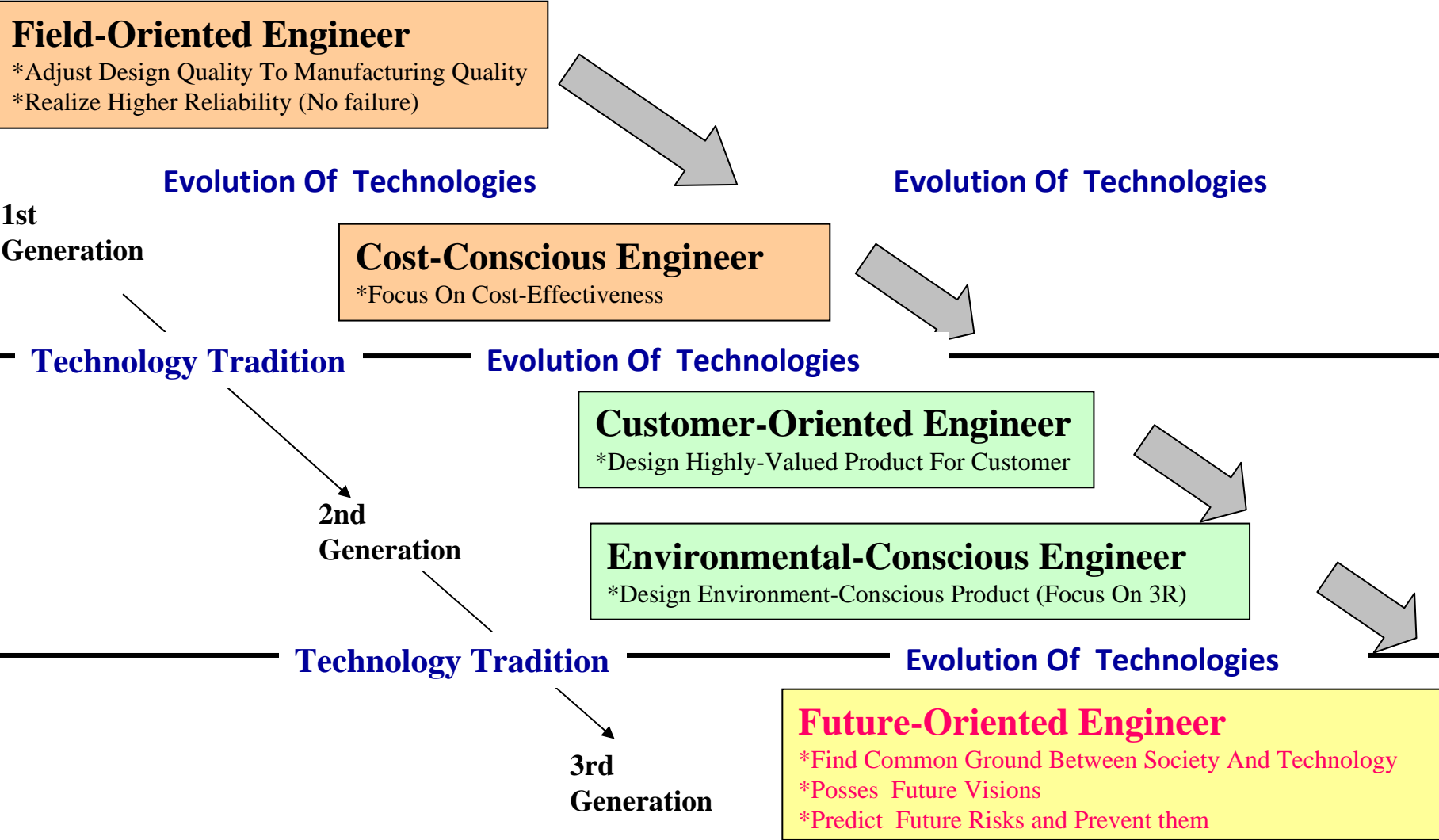
**USA 1st (2008) >>> 1st (2009) >>>3rd(2010)**

**China 17th (2008) >>>20th(2009) >>>18th(2010)**

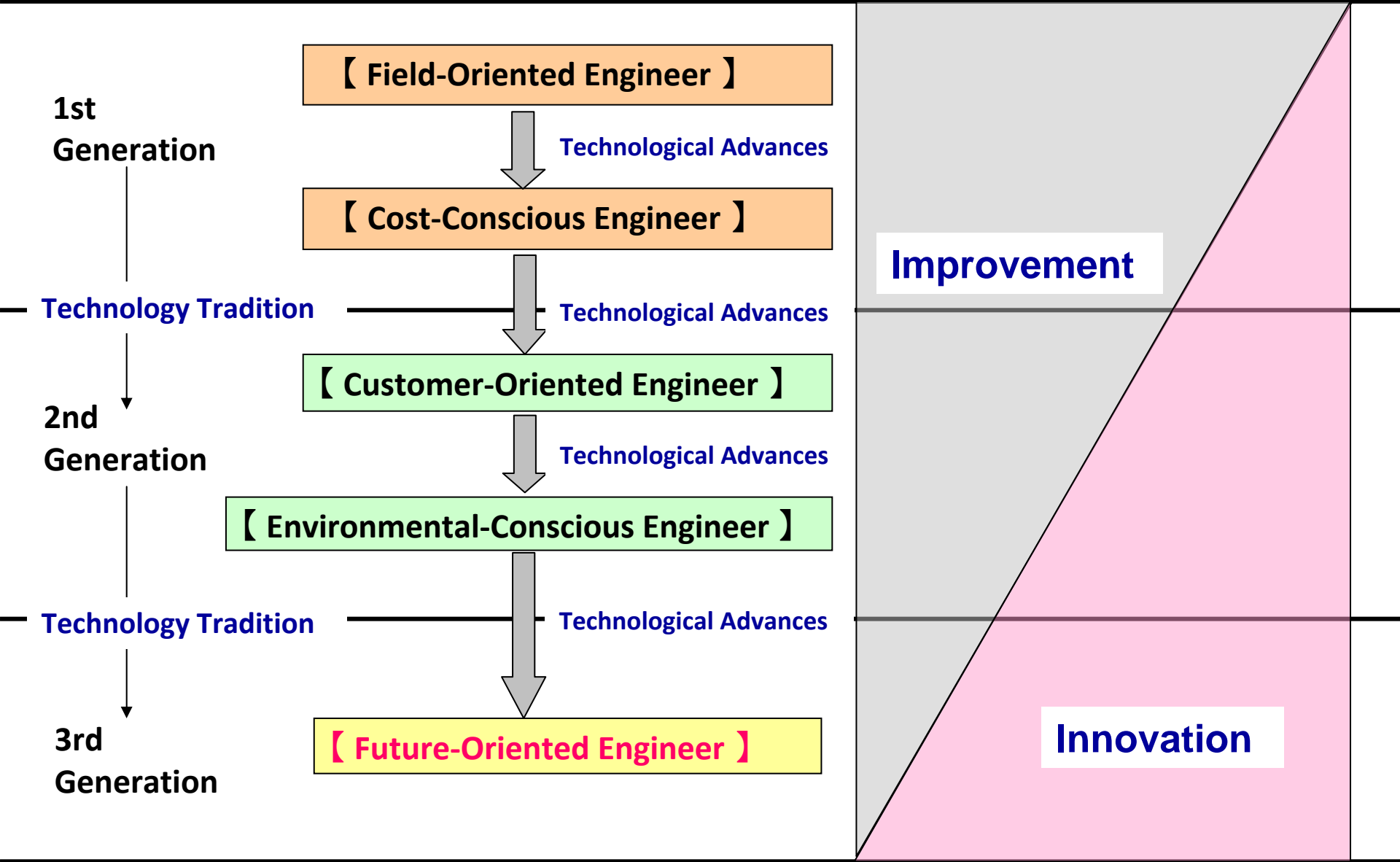
**Korea 31th(2008) >>>27th(2009) >>>23rd(2010)**



# 3. Trace The History of Expected Engineers



# 4. An Engineer's Evolution And Innovation



### Turning Point in society

### Required Engineers

### Main Activity

High economic growth  
1960's -1972

Field-Oriented Engineer

- Industrial Engineering
- Quality Control etc.

Stable-growth  
1973-1990

Cost-Conscious Engineer

- Value Engineering
- Taguchi (Design for Stabilization of Quality).

After bubble economy burst  
1991-1995

Customer-Oriented Engineer

- Quality Function Deployment
- Customer Satisfaction Activities

Present  
1996-

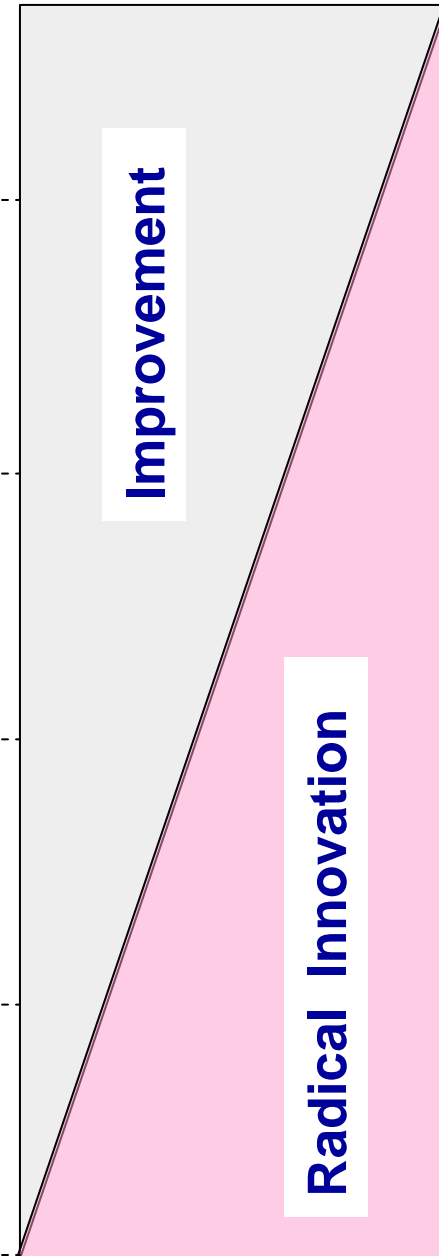
Environmental-Conscious Engineer

- 3R Activities for Environment
- Environmental Assessment .

Near Future  
-2020

Future-Oriented Engineer

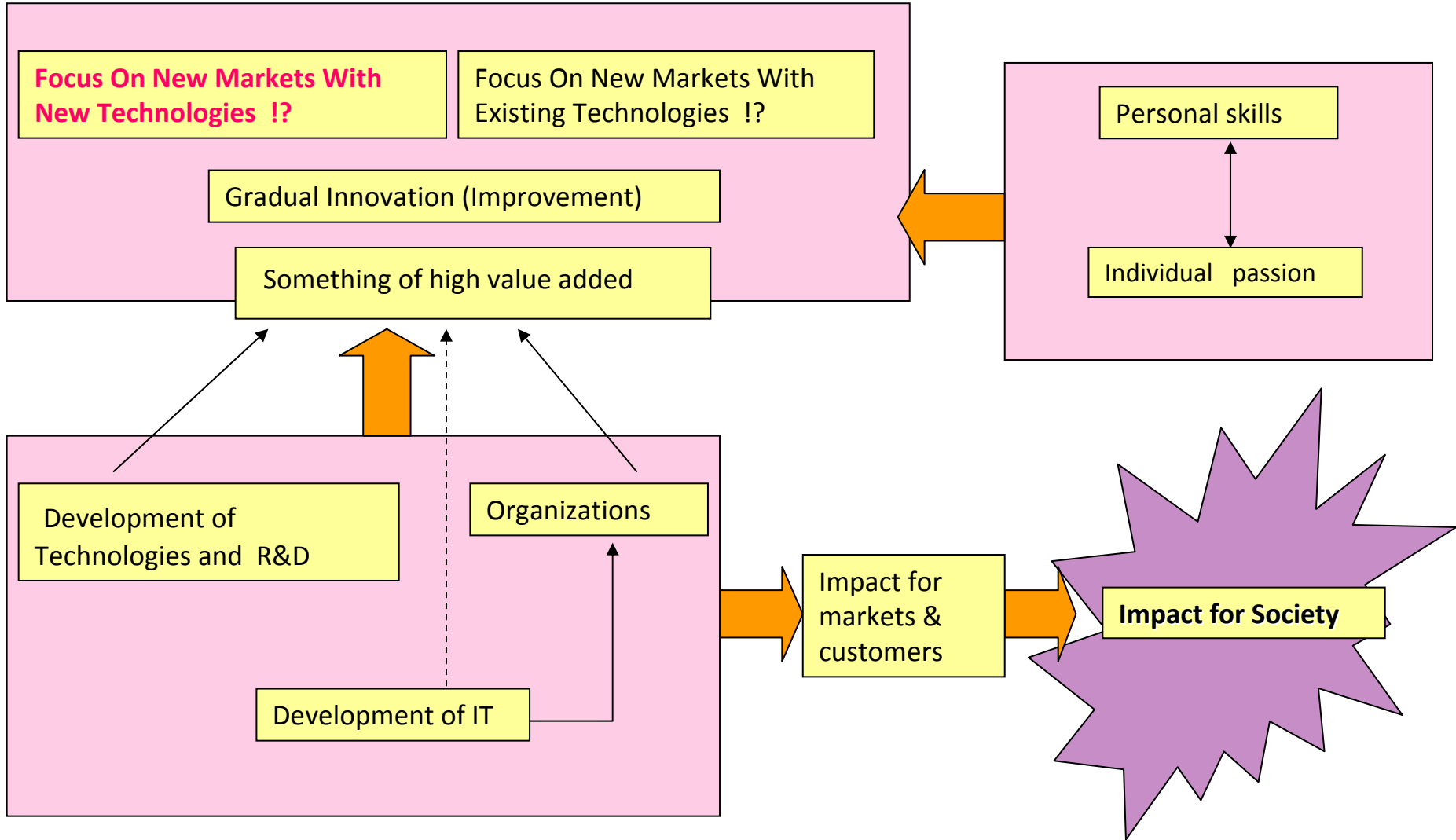
- R&D Activities for New Generation Product
- Risk Management for near future



# 5. What is “Innovation”!?

45 Respondents are engineers working at Japanese manufactures in first section market.

We wrote down their opinions about “Innovation” on each Post-it and tried to organize their opinions by utilizing KJ method( affinity diagram).



# 6. Basic Process of Ideal New Product Development

## Planning Stage: Technology prediction with Marketing

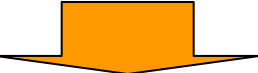
First Phase Analysis of Object System and Definition of Direction about Future to proceed

**< Future Prediction Activities >**

In order to make highly-valued scenarios, they have to Utilize their core technologies.

Creating scenarios focusing on near future

Viewpoint of technical, evolution systematic approach, S-curve analysis



Second phase Designing new product planning focusing on near future

**< New Product Planning Activities >**

They have to design highly-valued new product planning based on scenarios

Designing new product planning

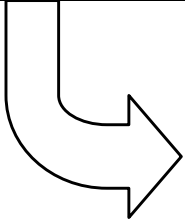
Viewpoint of marketing, social analysis, Customer analysis



# Development Stage: Design to Cost with Solution of Technical Contradiction

Third Phase Embodiment of new product plan

<Development and Designing Activities>



Designing Basic concept of New product

Viewpoint of problem solving    Idea generation, embodiment evaluation

# **“Systematic Innovation”**

## **A proposal of New Product Planning-oriented TRIZ**

## 7.Survey about Innovation Regarding “Big Hits 10”

Surveyed “Best 10 Big Hits(from 2000 to 2008) are selected from “Nikkei Trendy “ based on some criteria we defined.

Respondents are 168 (male 87, female :81) students, mainly first-year student, participated at lesson about “ Technology and Management “at SANNO university in 2009.

Other respondents are 28 (male 27, female:1) businessperson participated at pan-industry social event and other MOT seminars in2009

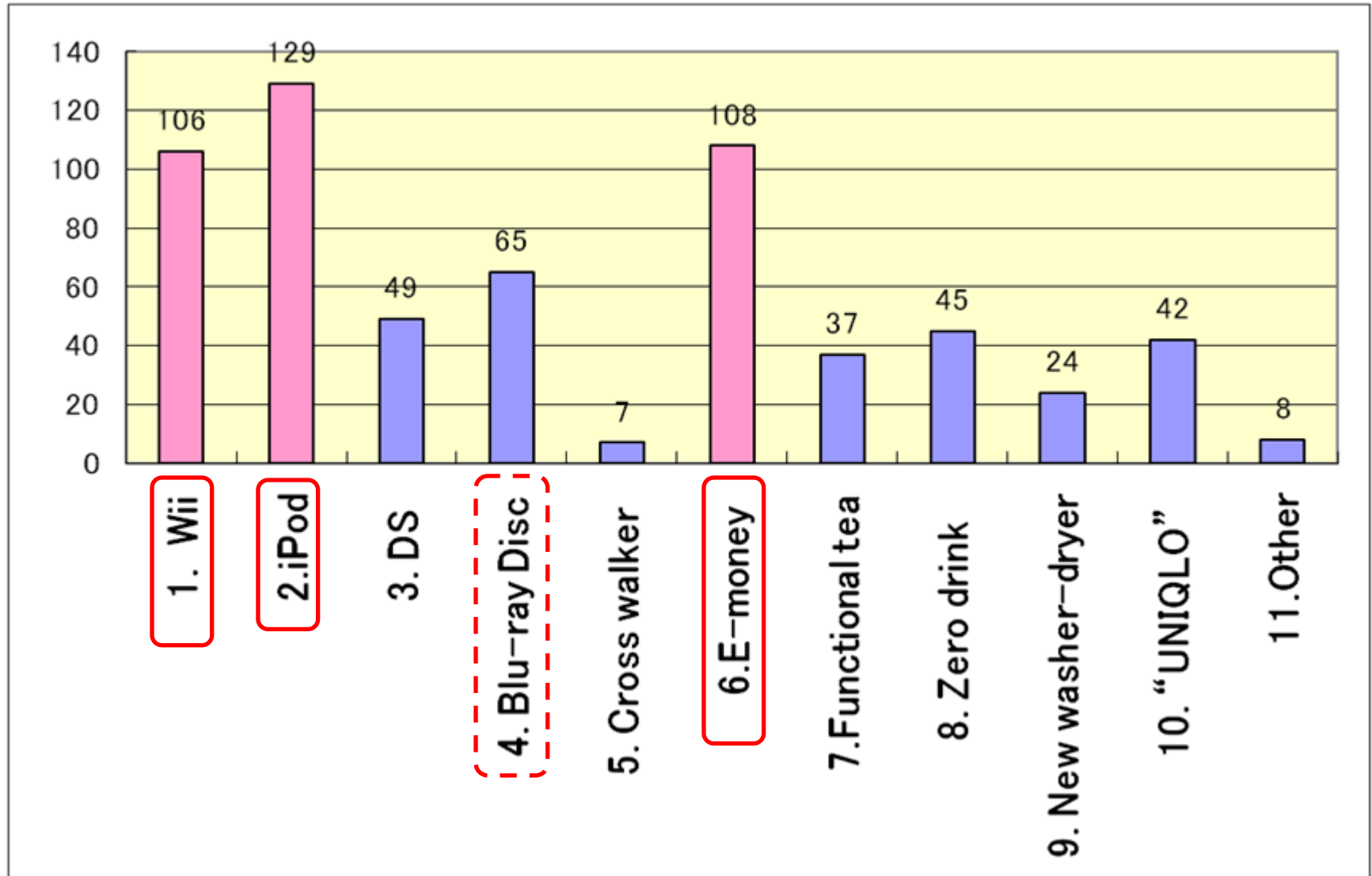
### Surveyed “Best 10 Big Hits”

1. <b>Wii</b> (Wii and its soft wares)	2. <b>i Pod</b> (A series of iPod including iPhone 3G)
3. <b>DS</b> (DS and its soft wares)	4. <b>Blu-ray Disc</b>
5. <b>Cross walker</b> in Wacoal	6. <b>E-money</b> (Electronic money based on card type in Japan )
7. <b>Functional tea</b> (For examples:Healthya green tea developed by “Kao” and Black oolong tea developed by Suntory in Japan)	8. <b>Zero drink</b> (Beverages based on “Zero concept ” like zero calorie or non-alcohol)
9. <b>New wash-dryer</b> (Drum typed washer-dryer)	10. <b>“UNIQLO”</b> in Japan (Pioneer of SPA)



**[Q1] Select new products bringing “Innovation” into reality(multiple answers allowed)**

**Total number of selected products are 620(Male: 315, Female selection: 305)**



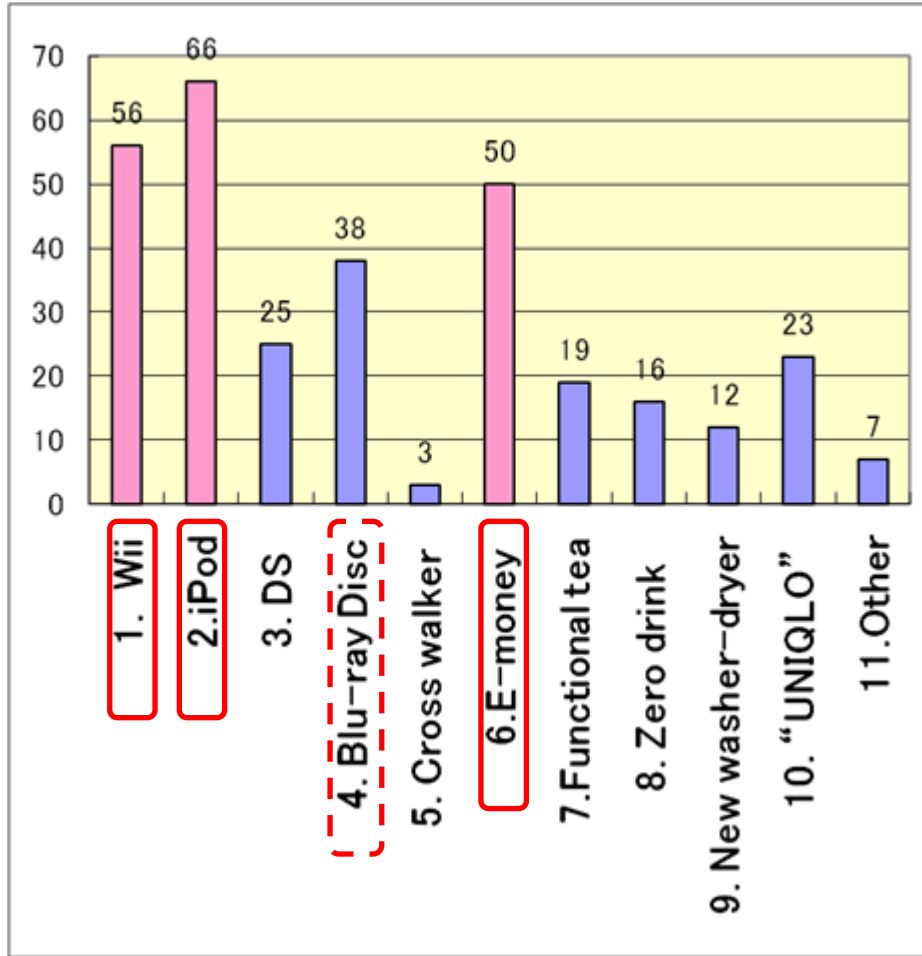
 Result of statistical ratio test : show a significant difference (level of significance 0.01%)

 show no significant difference

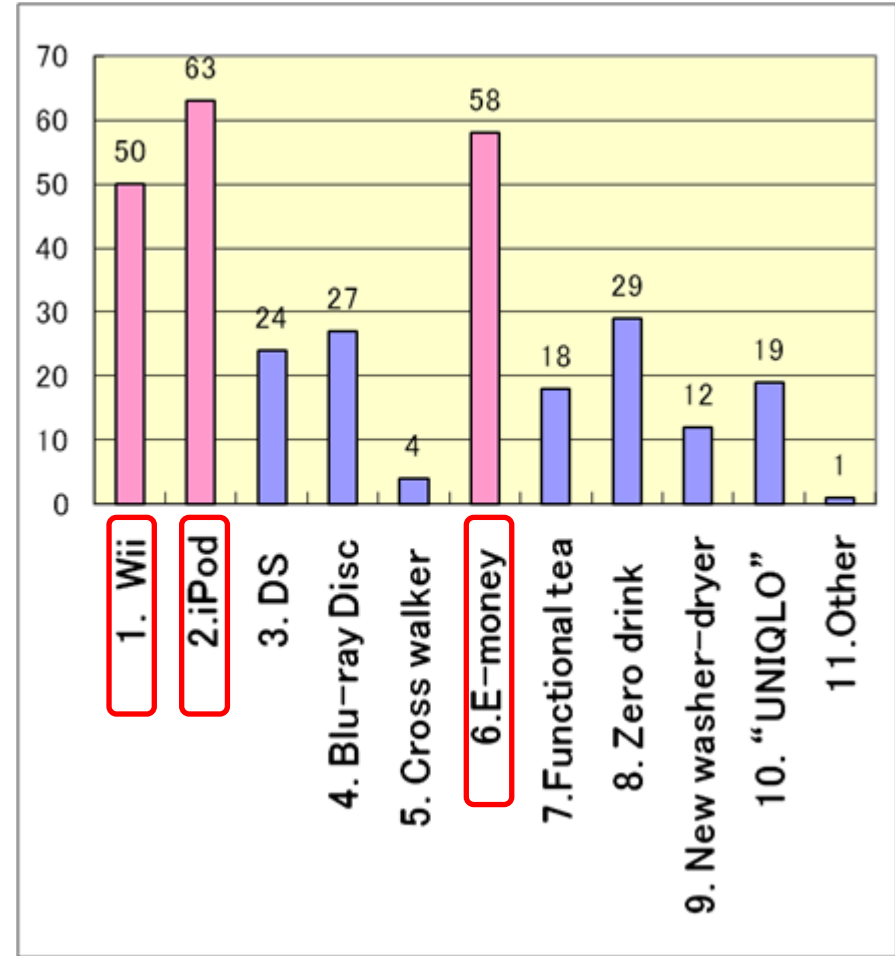
**[Q1] Select new products bringing “Innovation” into reality(multiple answers allowed)**

**By gender**

Male Student(82)



Female Student(78)

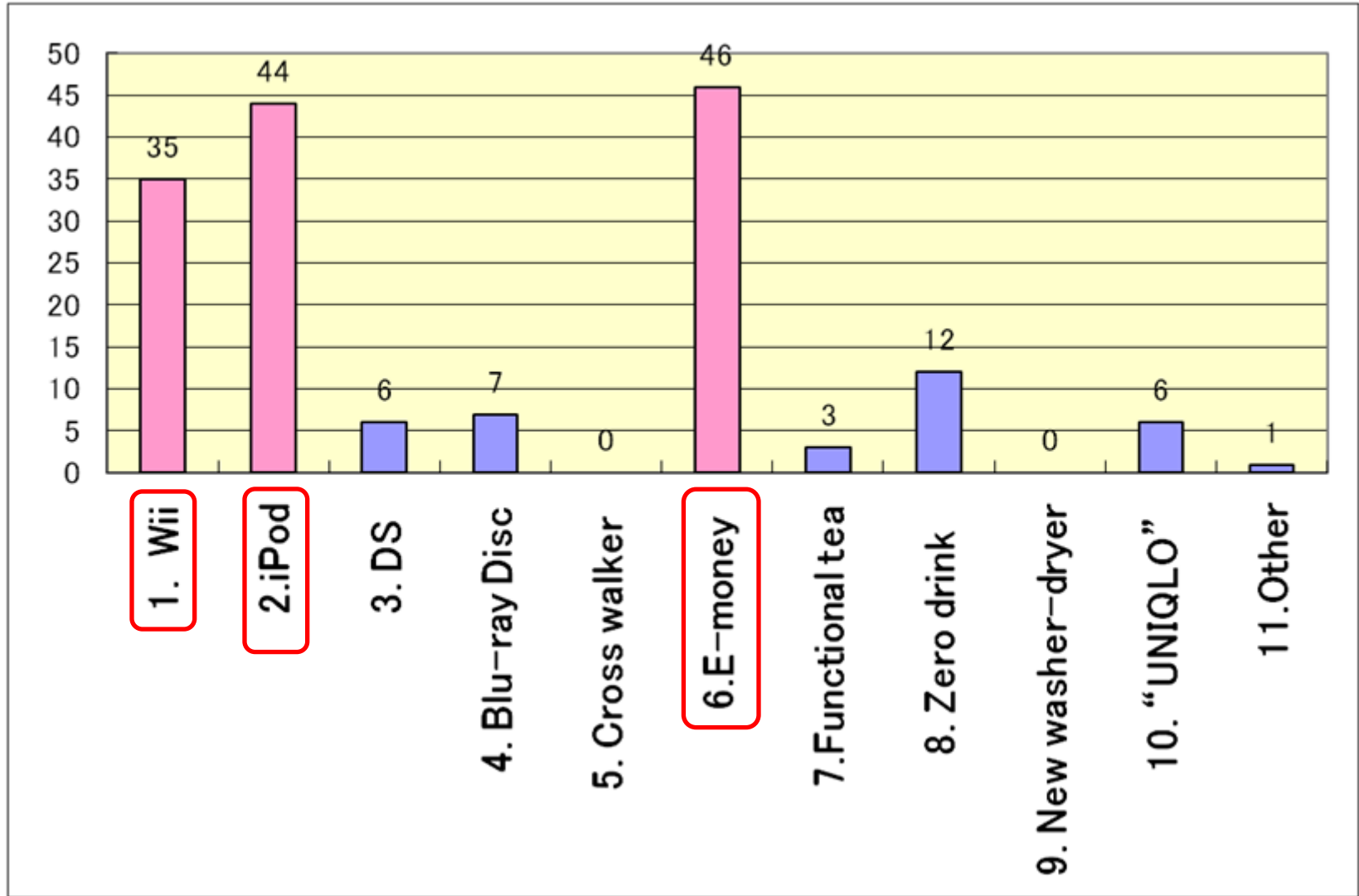


Result of statistical ratio test : show a significant difference (level of significance 0.01%)

show no significant difference

**[Q2] Select a new product as the most innovative one (only one number allowed).**

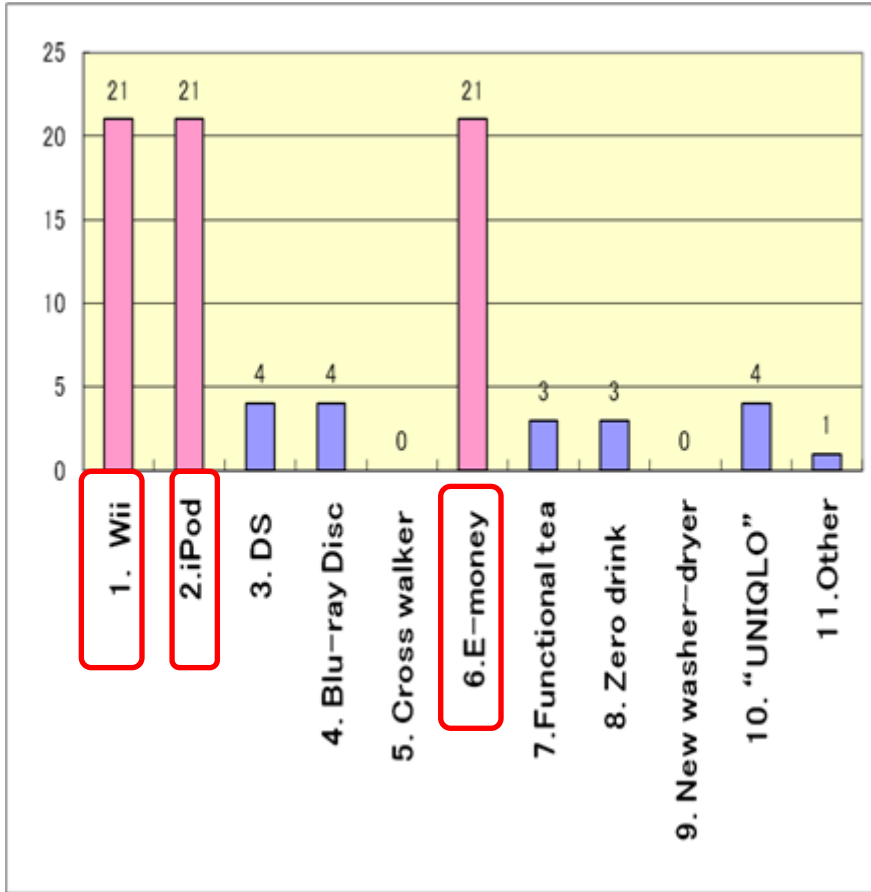
Total numbers of selected product are 160(Male: 82, Female: 78)



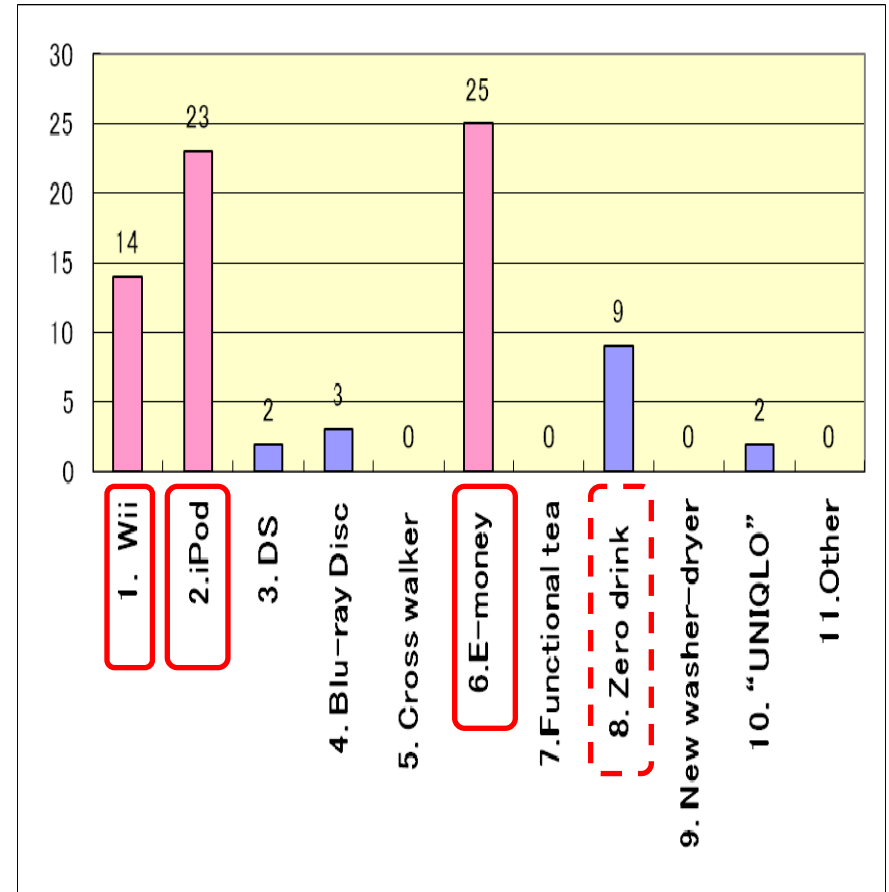
 Result of statistical ratio test : show a significant difference (level of significance 0.01%)

**[Q2] Select a new product as the most innovative one (only one number allowed).  
By gender**

Total numbers of selected product  
(in the case of male: 82)



Total numbers of selected product  
(in the case of female: 78)

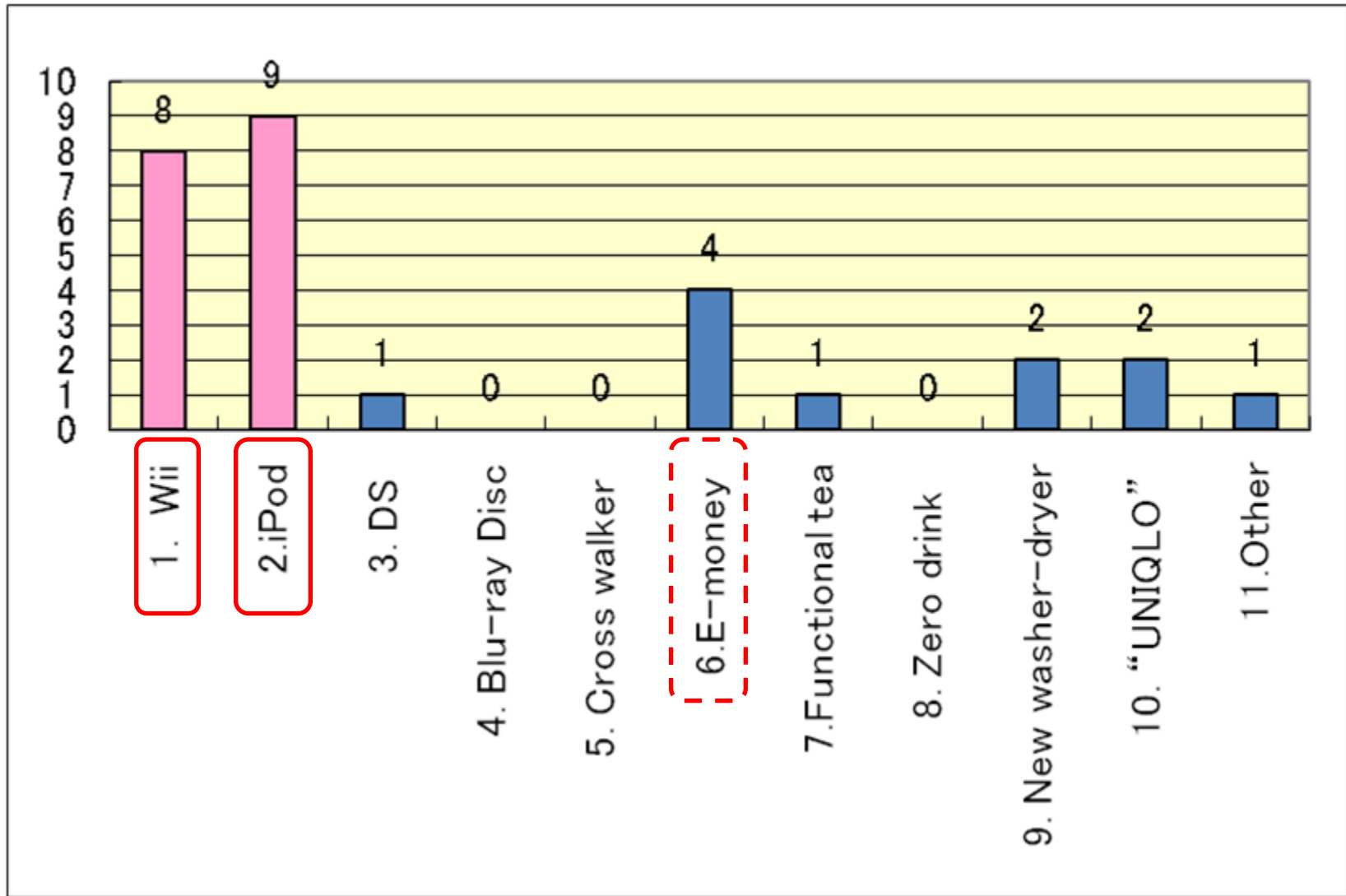


Result of statistical ratio test : show a significant difference (level of significance 0.01%)

show no significant difference

[Q2] Select a new product as the most innovative one (only one number allowed).

Total numbers of selected product are 28(Male: 27, Female: 1) In the case of businesspeople



  Result of statistical ratio test : show a significant difference (level of significance 0.01%)

  show no significant difference

## Speculations about [Q1,2]

1) “Best Three Big Hits” of Both “Selected Innovative Products” and “The Most Innovative Products” are same products . But ranking was changed a little.

### Selected Innovative Products

iPod(including iPhone3G):Occupancy(21.1%)  
1st ranking

E-money :Occupancy(17.6%) 2nd ranking

Wii &its software :Occupancy (17.3%)  
3rd ranking

### The Most Innovative Products

E-money :Occupancy(28.9%) 1st ranking

iPod(including  
iPhone3G):Occupancy(27.7%) 2nd ranking

Wii &its software :Occupancy (22.0%) 3rd  
ranking

### The Most Innovative Products (Businessperson )

iPod (including iPhone3G) :Occupancy(33.3%)1st ranking

Wii &its software:Occupancy (29.6%)2nd ranking

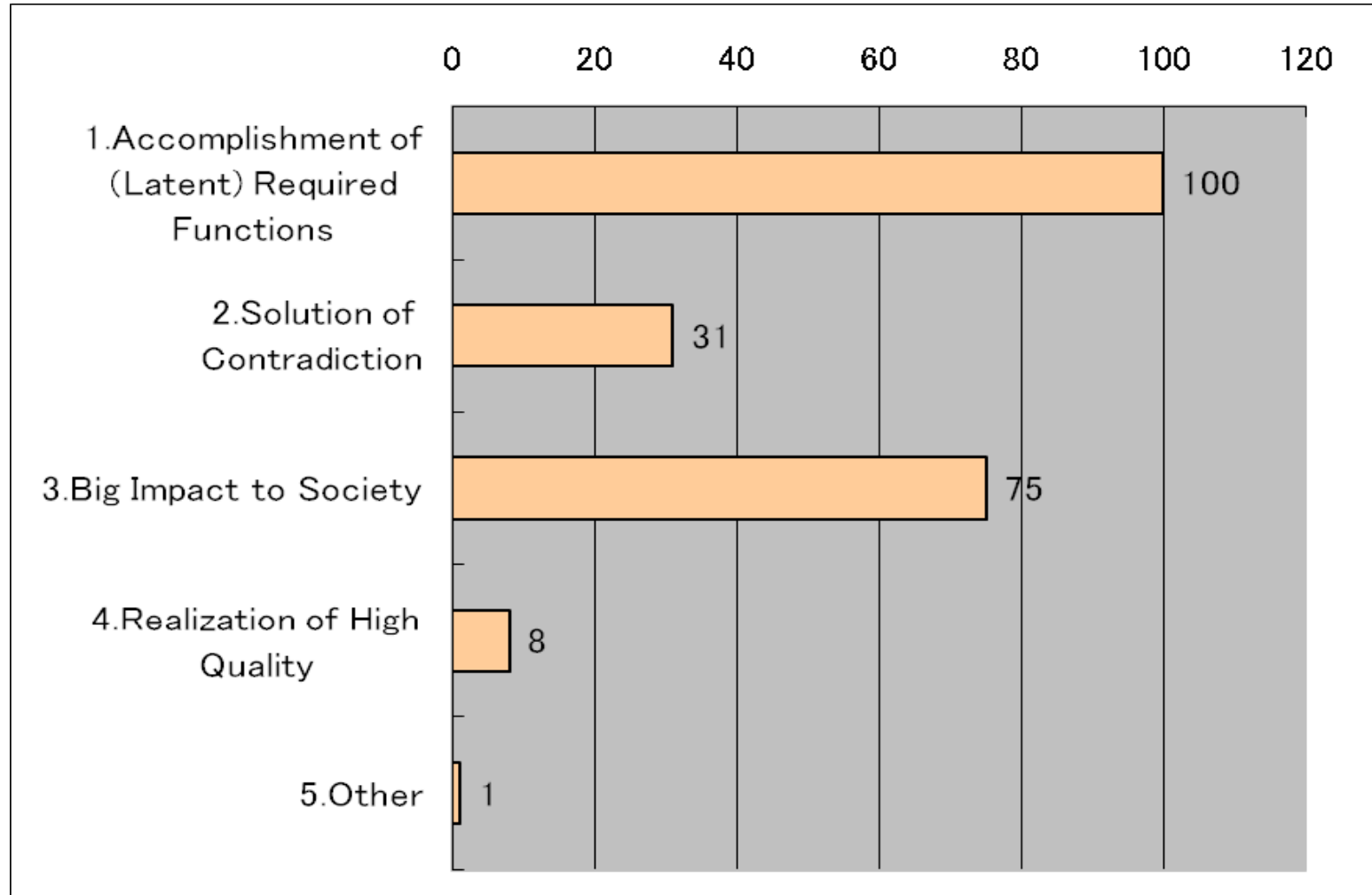
E-money :Occupancy(14.8%) 3rd ranking

2) Even by gender, “Best Three Big Hits” remains unchanged.

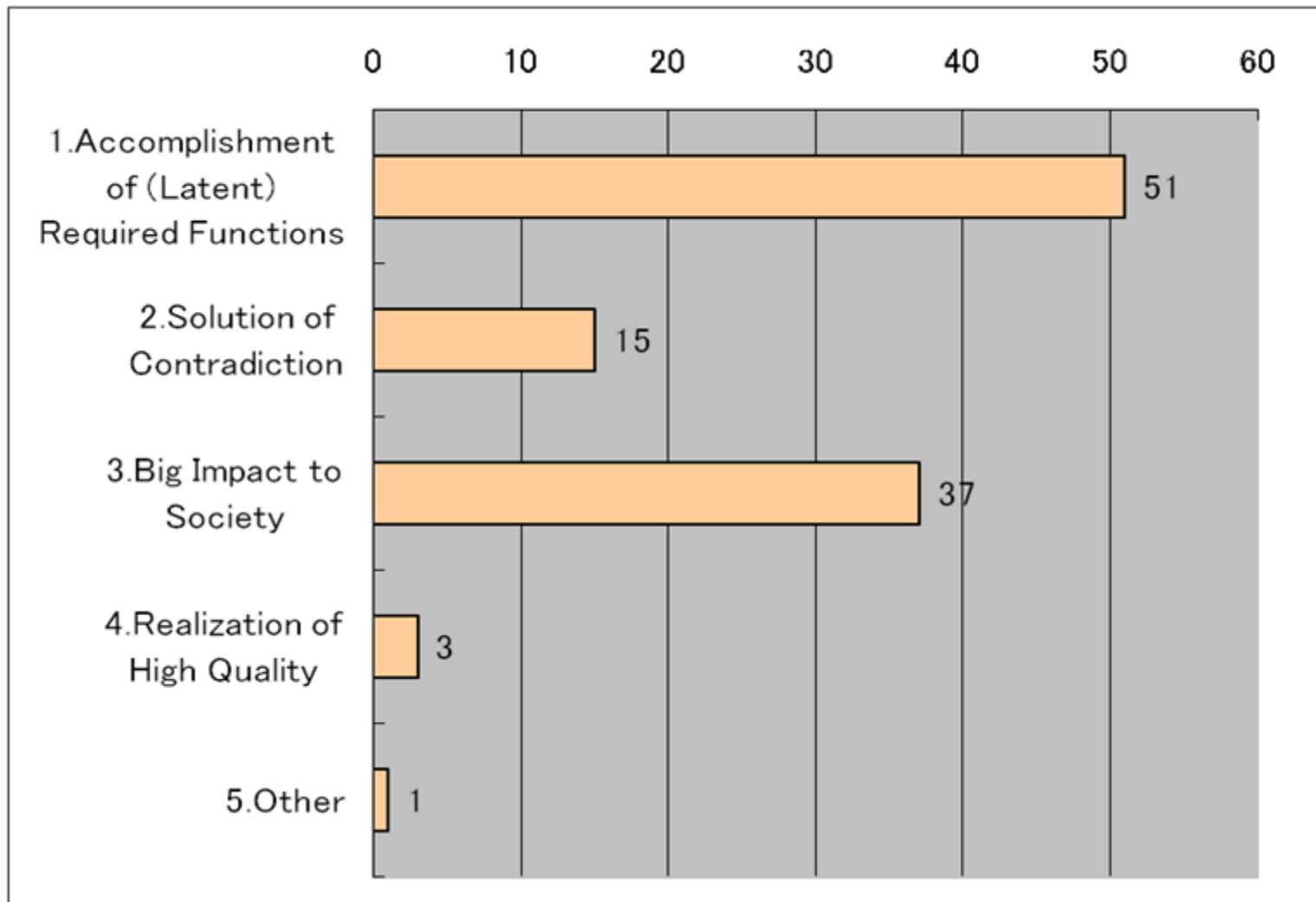
3) Even in the case of businessperson, “Best Three Big Hits” remains unchanged. But “E-money “ is not statistically proved to be high occupancy.

[Q3] Describe the reasons why you thought that your selected new product at [Q2] was the most innovative new product.

Total numbers of valid responses are 160 (Male: 82, Female: 78)

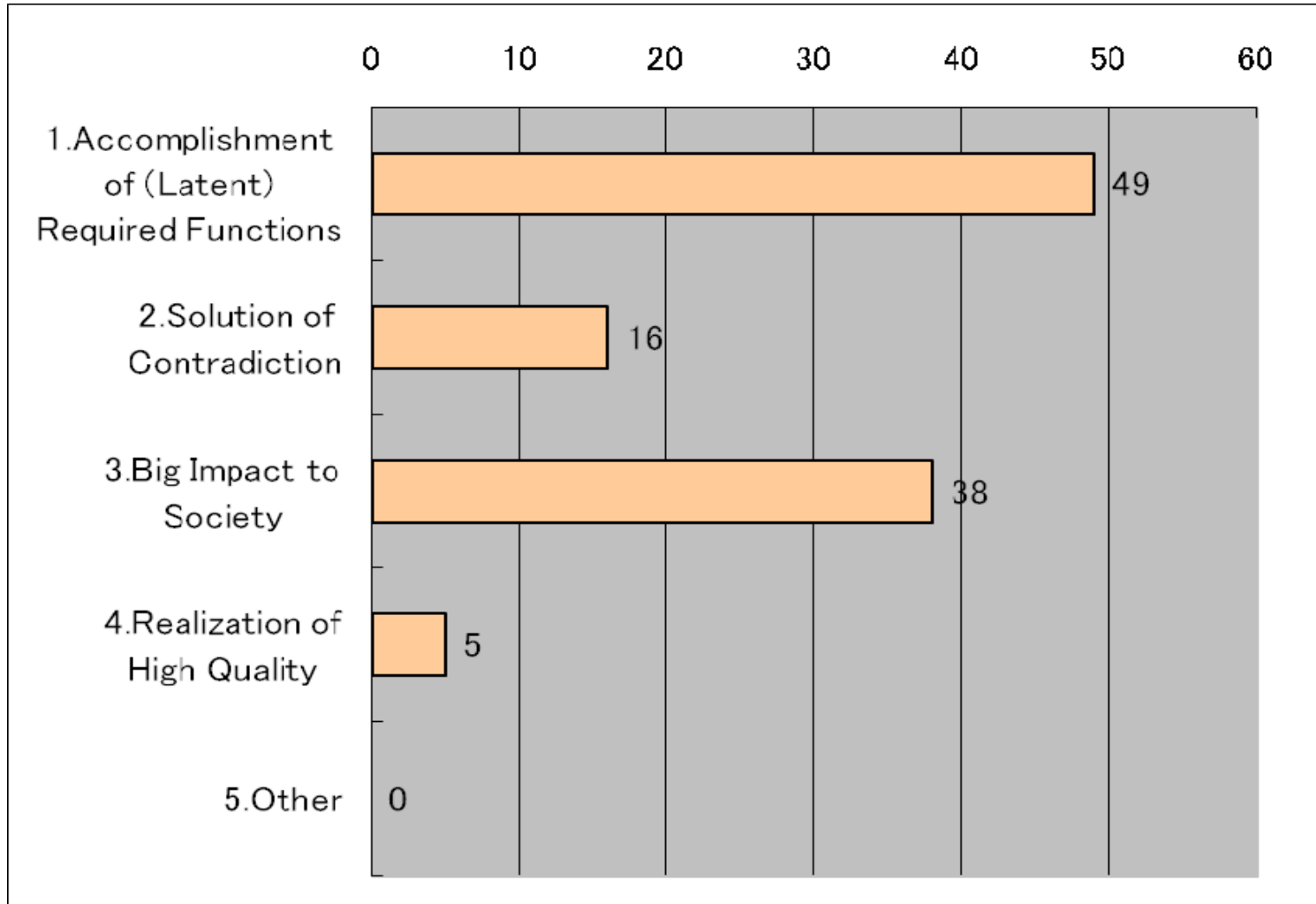


Total numbers of valid responses are 78 (In the case of Female)

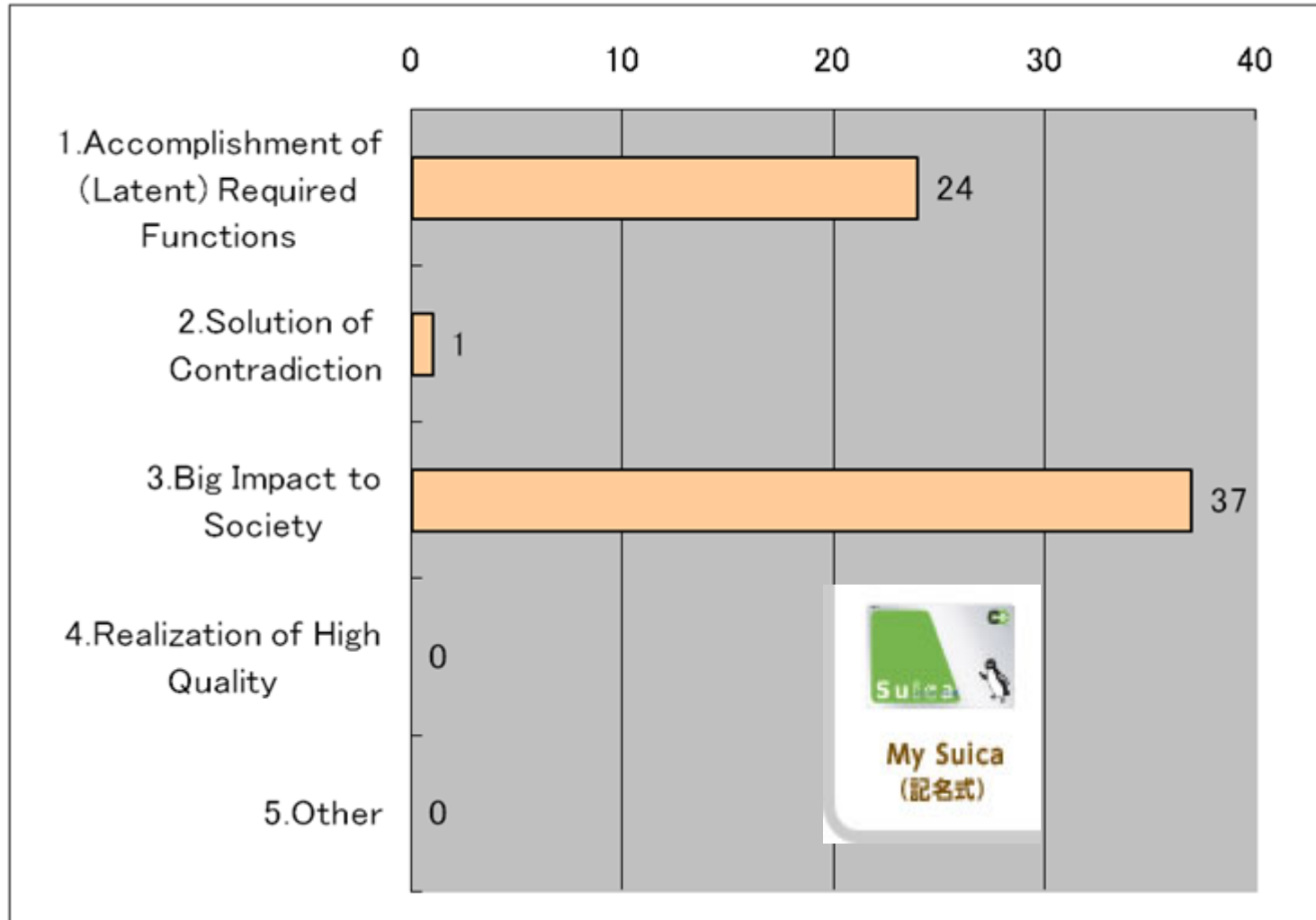




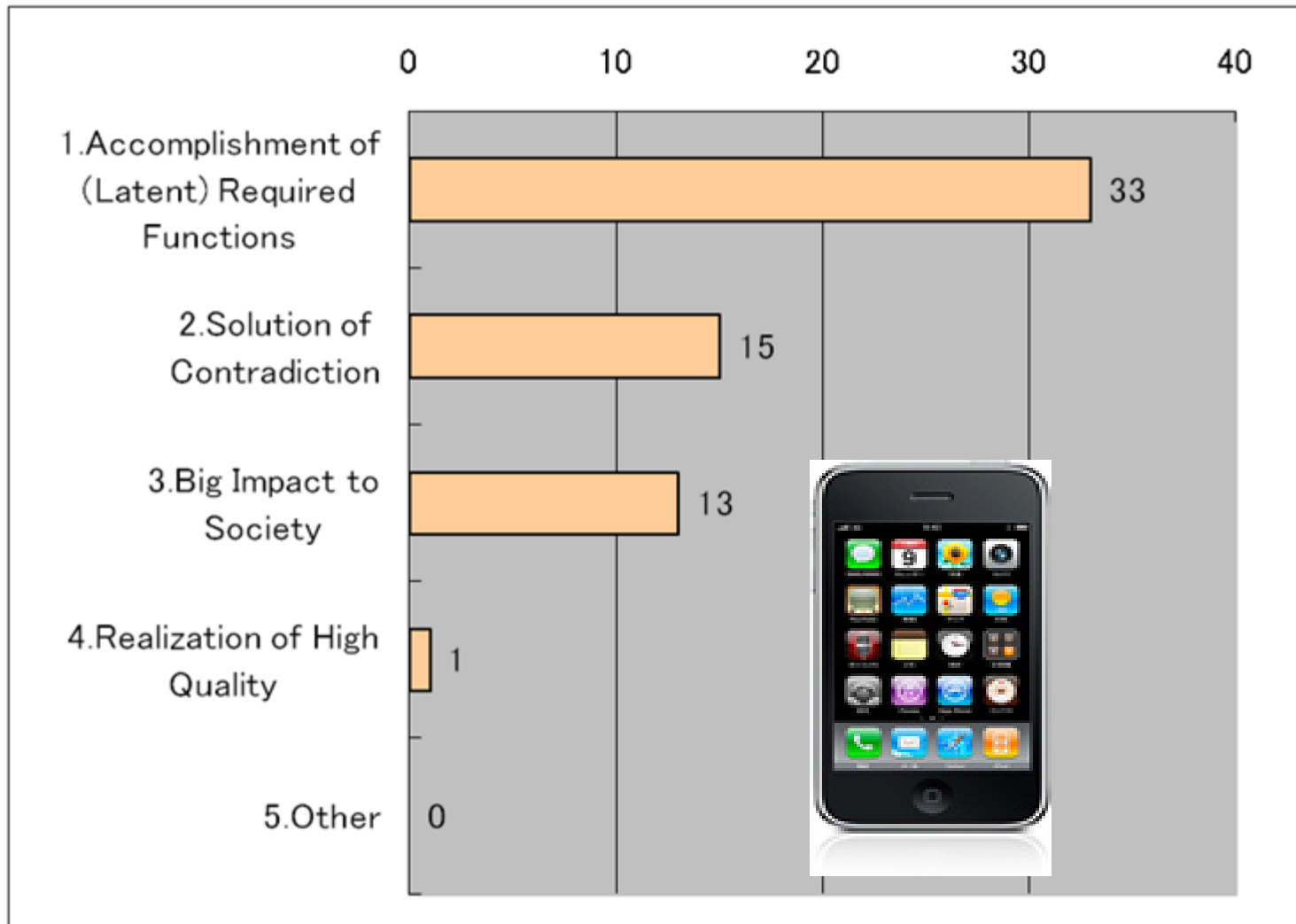
Total numbers of valid responses are 82 (In the case of Male)



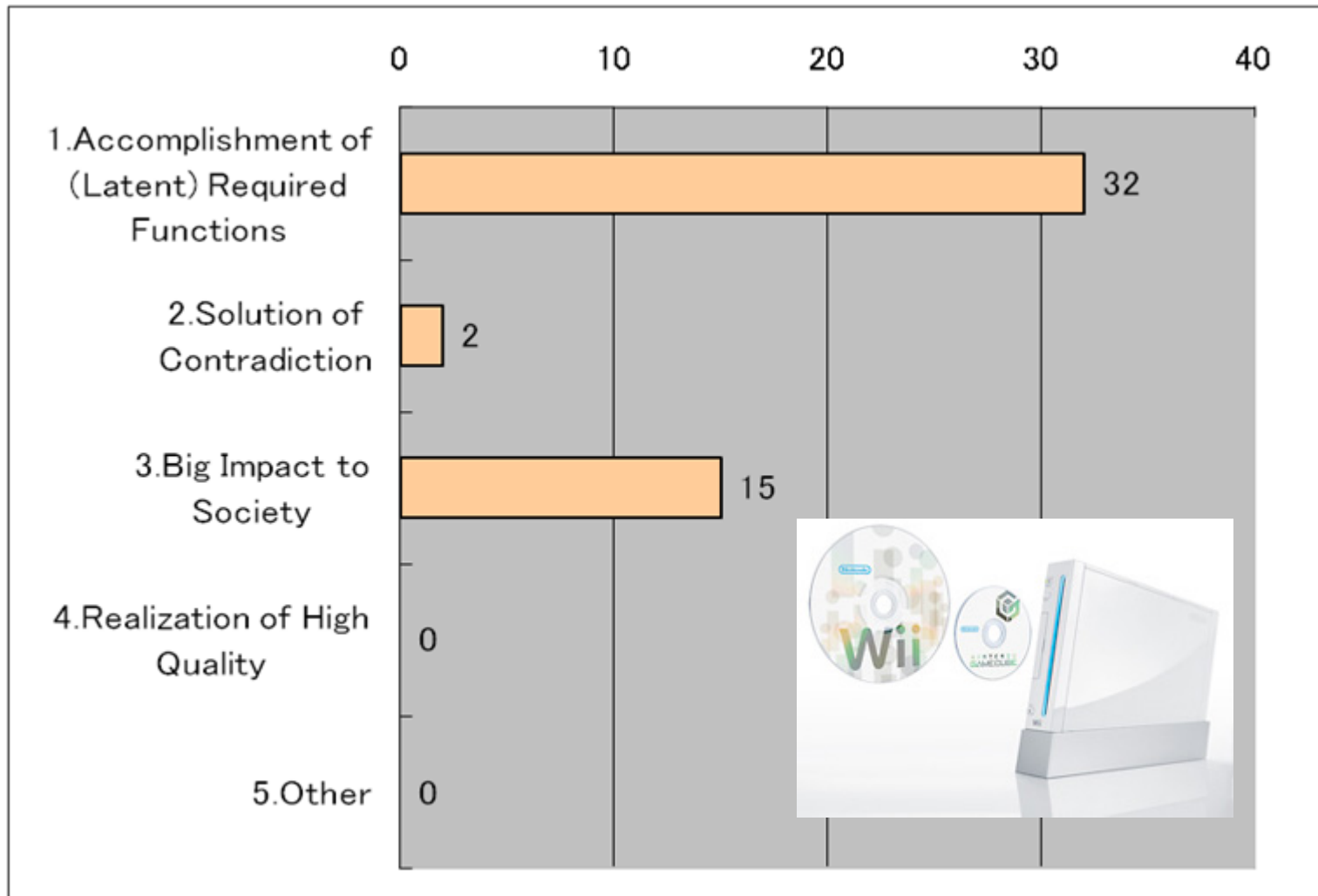
In the case of E-money (46 valid responses)-Best1



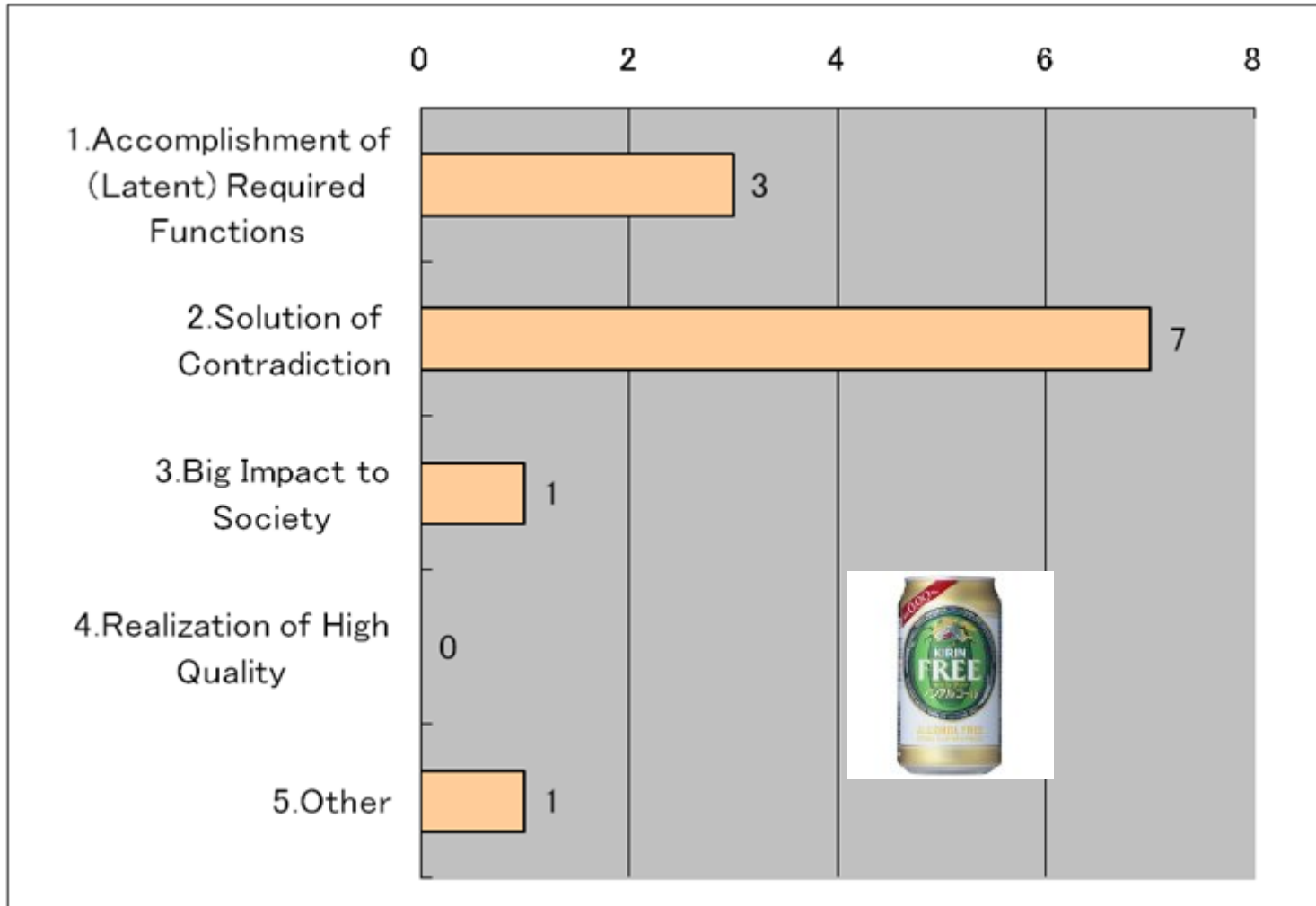
In the case of iPod & iPhone (44 valid responses)-Best2



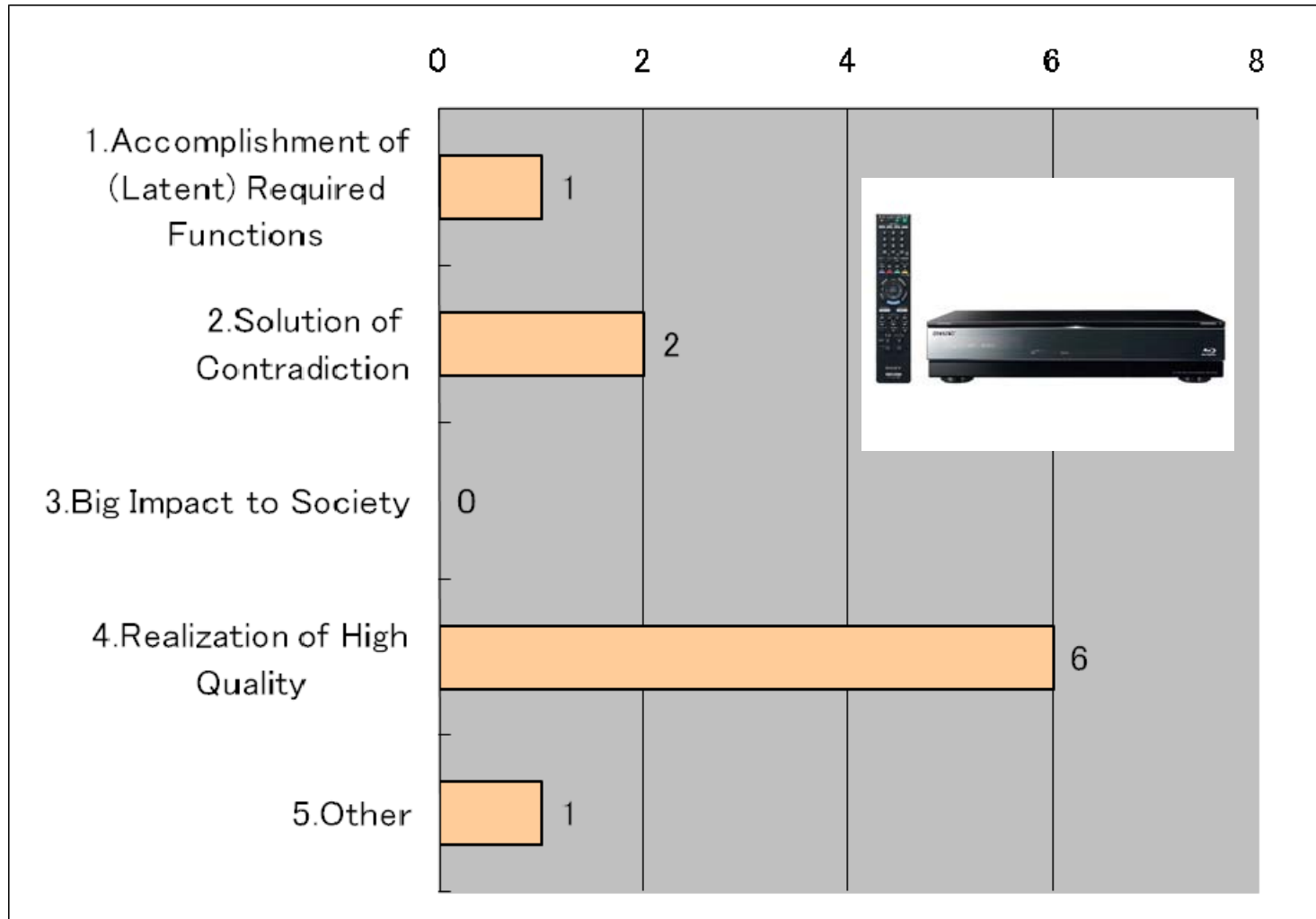
In the case of Will & its software (35 valid responses)-Best3



In the case of ZERO drink (12 valid responses)



In the case of Blu-ray Disc (7 valid responses)



## Speculations about [Q3]

**Features of E-money: Occupancy (28.9%) 1st ranking**

“No need wallet” ,”No crowded station near gate”. Latent required functions are realized in Japanese society.

E-money system gave “Big Impact to Society”, even existing technologies.

**Service –oriented Innovation**

⇒“Creation of new market place with applied existing technologies”

**Features of iPod (including iPhone3G):Occupancy(27.7%) 2nd ranking**

Mobile device with App store looks like innovative new business model. This business model realized a lot of latent required functions.

Solution of contradictions like Compact size VS Great capacity, Downsizing VS Enlarged character and so on

A variety of software for iPod have been supplied on Web.

**New business-oriented Innovation**

⇒“Creation of new marketplace with applied existing technologies

## Features of Wii & its software Occupancy (22.0%) 3<sup>rd</sup> ranking

Applied existing technologies in IT field were utilized to realize highly-valued unique software s for Wii.

Wii created new demand to play unique game like fitness in virtual field for not only younger generation but elderly

Service –oriented Innovation

⇒ “Creation of new market place with applied existing technologies”

### What is denominators of Best Three products ?

- 1) In order to realize such products, **“Innovators” don’t use New Technologies,** but existing technologies.
- 2) ”Innovators” realized **radical Innovation in Service or Business field.**
- 3) Provided service and business have **big impact to society** and realized Innovation with New market creation

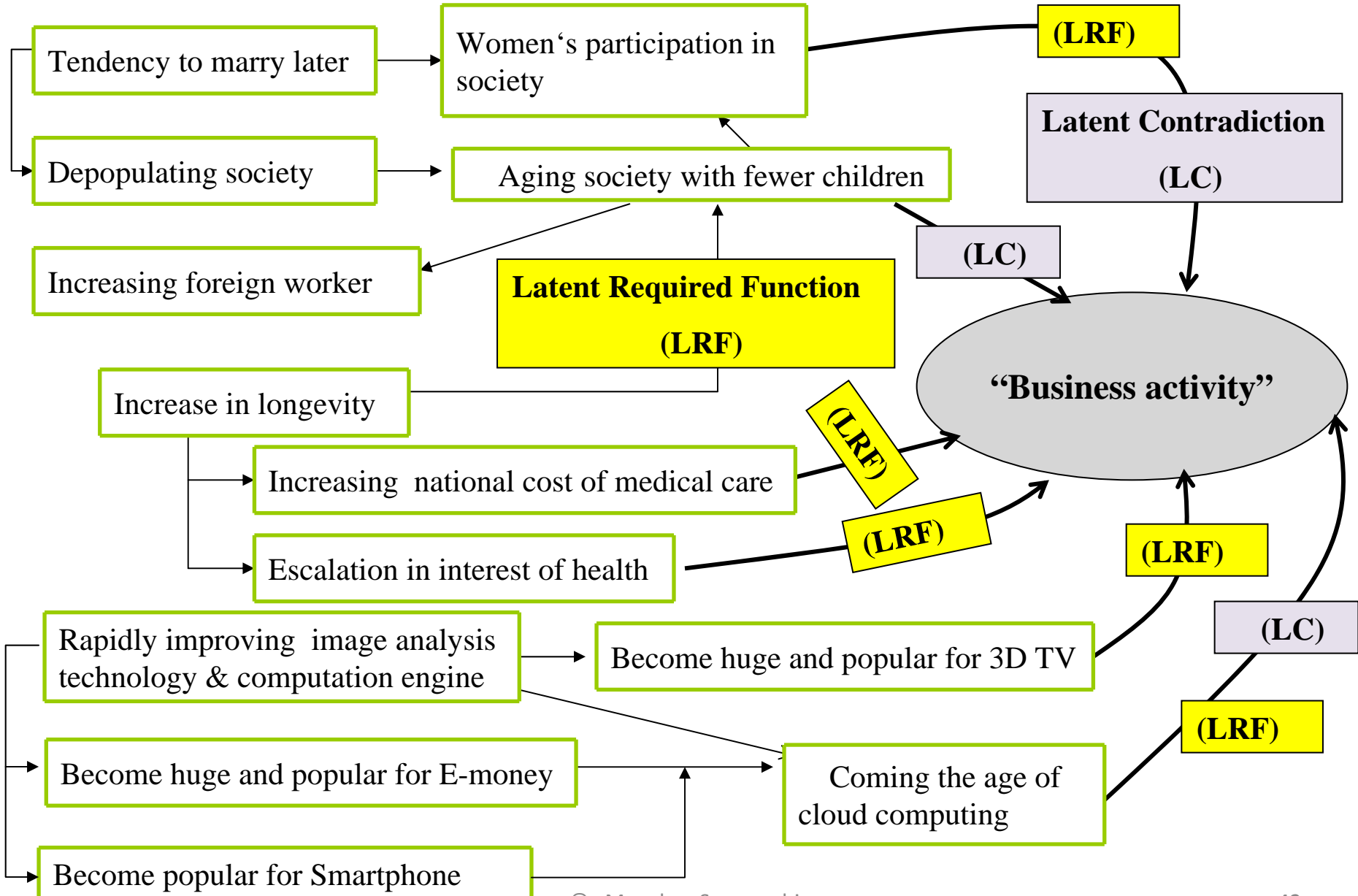


**(Conclusion)**

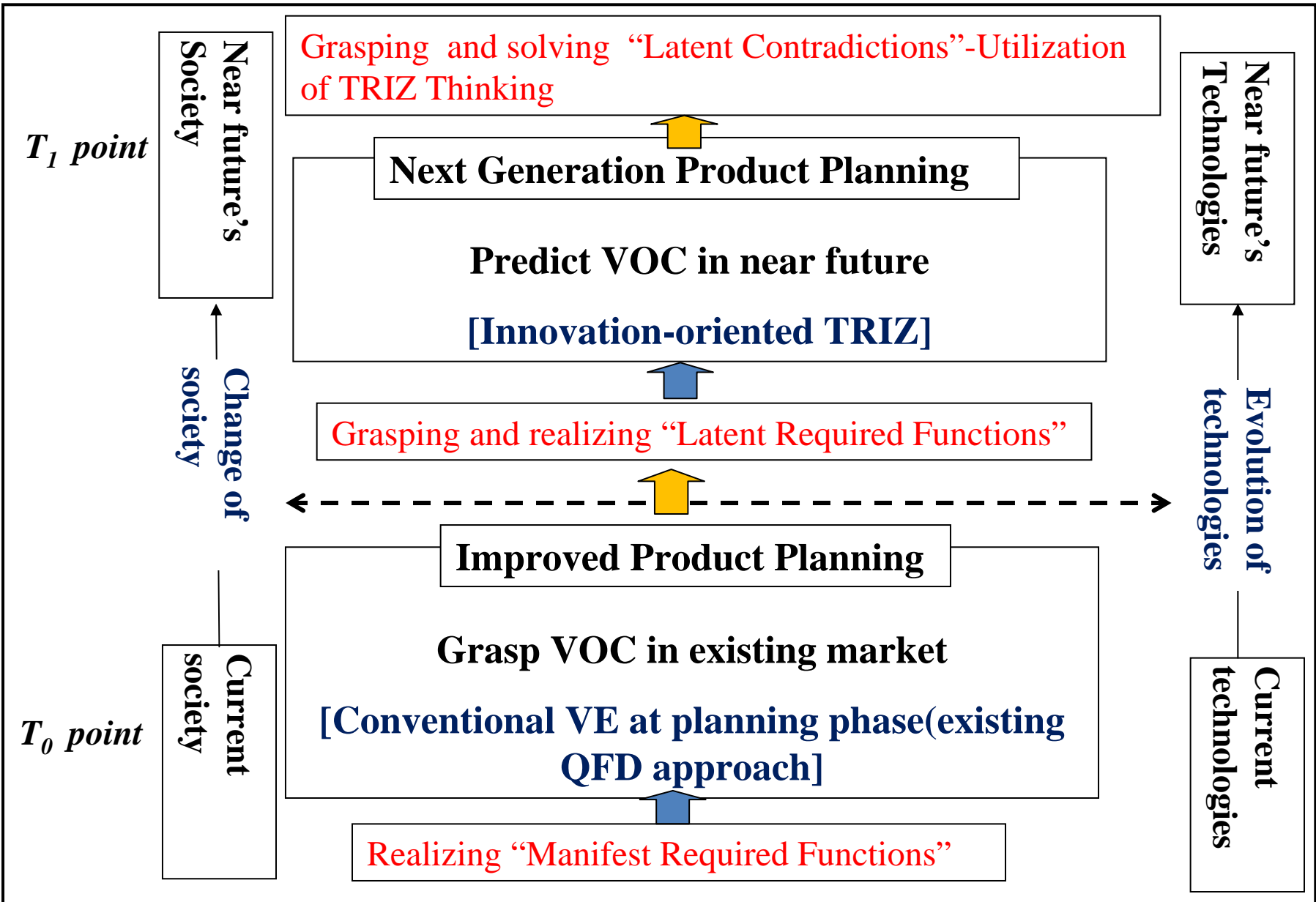
**It very important to practice **synchronous approach** like combination technologies with grasping the trend of society in near future.**

**On the way to creative Innovation , Innovators have to make a effort to **be highly valued technologies in near future** by **grasping Trend of society** .**

# 8. Mega Trends in Modern Japanese Society

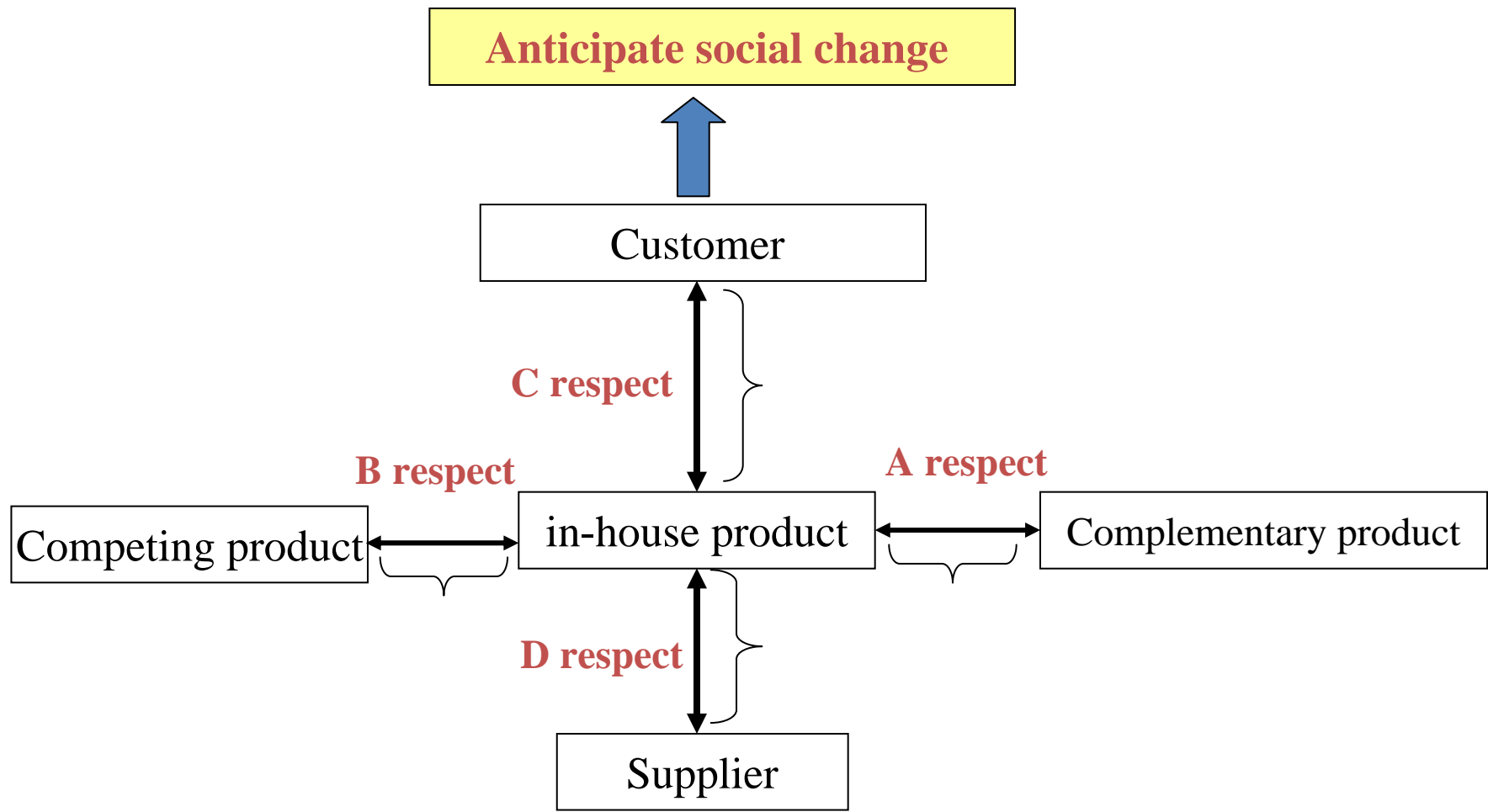


# 9. The Perspective of Innovation-Oriented TRIZ Activities

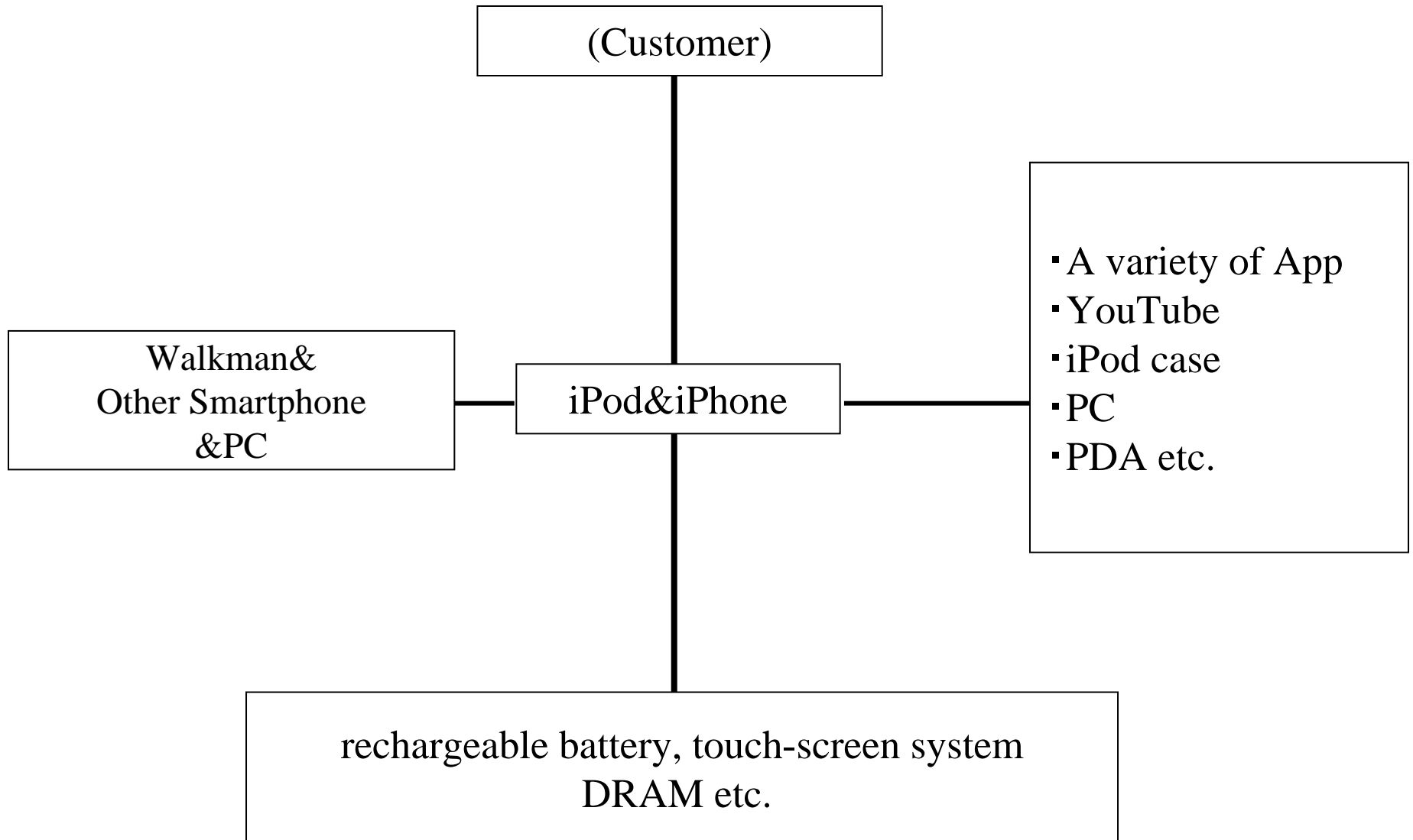


# 10.A Useful Technique for TP(Technology Prediction)

## Value Correlation Diagram Based on “Four Respects” to Predict Future



# Value Correlation Diagram about iPod& iPhone



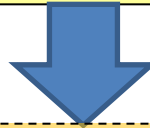
## Four points to predict future

**A Point :** Innovators have to find new complementary products

**B point:** Innovators have to practice differentiation strategy against competitors

**C point:** Innovators have to grasp Trend of society in near future

**D point :** Innovators have to make a effort to find good suppliers having attractive technologies to support their companies.



**(Conclusion)**

It very important to practice **synchronous approach** like combination technologies with grasping the trend of society in near future.

On the way to creative Innovation , Innovators have to make a effort to **be highly valued technologies in near future by grasping Trend of society .**