[®]Quantifying the service values₄

Application of Eco-Efficiency Factor to Mobile Phone and Scanner

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Outline

- 1. Why are FactorX and Eco-Efficiency?
- 2. Fujitsu's activities toward Eco-efficiency.
- 3. Case Study: Mobile Phone.
- 4. How to quantify the service value?
- 5. Discussion.
- 6. Conclusion.

1. Why are Eco-Efficiency and FactorX?



Fig. Transition of CPU, Memory, and HDD for Notebook PC

(History: Eco-Efficiency and FactorX)

[Eco-efficiency]

● 1992: A term invented by the WBCSD : World Business Council for Sustainable Development

"Eco-efficiency as being achieved by <u>the delivery of competitively priced goods and</u> <u>services</u> that satisfy human needs and bring quality of life, while progressively <u>reducing ecological impacts and resource intensity</u> throughout the life cycle, to a level at least in line with the Earth's estimated carrying capacity"

Application to the product

*WBCSD http://www.wbcsd.ch

Eco-efficiency =

The value of goods and services

Environmental Loads

[Factor Four]

Early 1990s: A term proposed by the Wuppertal Institute

"Doubling the wealth while halving the resource use"

*Factor Four, Ernst Ulrich v. Weizsäcker, Amory Lovins and L. Hunter Lovins

Application to the product

Factor X = Eco-efficiency of new product Eco-efficiency of old product

2. Fujitsu's activities toward Eco-efficiency [Various Eco-Indicators in accordance with ISO]

Type

The results of the label is expressed by passed/failed and the label is certified by the third party.

Type

Companies/Organizations assess and declare the environmental loads individually.

Type

The quantitative results of environmental loads based on Life Cycle Assessment (LCA) method.



Examples...



The Eco Mark Program: by JEA





EcoLeaf : by JEMAI

Certified for the <u>FIRST</u> time in the PC industry

2. Fujitsu's activities toward Eco-efficiency (Cont.2)

[Eco-efficiency/Factor X]

- Member of the Eco-efficiency Examination Committee sponsored by Ministry of Economy, Trade and Industry (METI)
- Eco-efficiency Factor =

Service (New product/Old product)

Environmental loads (New product/Old product)

[Application Examples]

- Personal Computer
- : 2002 Fujitsu Group Environmental Report

Scanner

- : EcoDesign 2002
- : ENVIRO-SHIGA 2003 : 2003 Fujitsu Group Sustainable Report

Mobile Phone

: EcoDesign 2003

3. Case Study : Mobile Phone



3-1. Product Selection

Straight type figure

No digital photo function



Product A

- Date: February, 2001
- Size: 125 × 40 × 15 mm
- Weight: 65g



Product B

Date: October, 2002
Size: 128 × 44 × 13 mm
Weight: 70g

3-2. Environmental Loads

- Life Cycle Assessment (LCA) method is applied for the calculation.
- Accessories, manuals, battery chargers, and packaging materials are excluded. Battery itself is included.
- Life stages include material acquisition and parts manufacturing, assembly, transportation, and use.
- Details

	Stage	Scope
÷	Materials and parts	Raw materials (metals, plastics, glass and etc.)
	(battery included)	Semiconductors, LCD panel *
	Assembly	Implementaion of mother board, final assembly
	Transportation	Assembling facility to end user
	Use	Calculate on the electricity use during the charge.
		Battery charge as 30min/day for total 2 years
Jerre and a second	End of life	Not investigated
THEFT AND		

* Yamaguchi, H. et al (2002) Proceeding of The Fifth International Conference on EcoBalance, S1-76

3-2. Environmental Loads (Cont.)

 Fujitsu basic unit, which Fujitsu Laboratories Limited has developed based on 1995 Input-Output Tables, is mainly used as a LCA database.

Results



3-3. Quantifying the Service

Product function]

Services		Ratio of ne	ew/old	
(Item X)	(Item Y)	S=(b)/(a)	$= \{1/n \cdot \Sigma S'$	^2}^0.5
Data	Telephone book size	1.00] 1.93)
Saving	# of dawnloadable music	2.00		
_	Max. inbox mails	1.50		
	Max. outbox mails	2.00		
	# of mail address	1.00		
	# of screen memo	3.33		
	# of bookmark	1.67	J	
Input	# of function key	1.00	J 1.01	
_	Key size	1.01		
	Key pitch	1.03	J	
Power	Continuous conversation	1.11	} 1.01	1.84
Source	Continuous waiting	0.90	J	
Indication	LCD size	1.13	2.62	
	# of characters (browser)	1.00		
	# of characters (sound)	1.14		
	Point number	1.89		
	Scrolling speed	1.10		
	Indication speed	1.04		
	LCD brightness	6.20	J	
Portability	Size	1.02	} 0.98	
	Weight	0.93	J	J

-The pros and cons-

- The data based on the product catalogue
- Evaluating the functions
- Unable to adapt for the new function

3-3. Quantifying the Service (Cont.2)

Scoring method]

Service				
Item X	Item Y	Score	A	В
1 Inbox mail folder	from 50-199	1		
(number)	200-499	2	*	*
	over 500	3		
2 Downloadable	from 10-29	1	*	
melodies	30-49	2		*
(number)	over 50	3		
3 Dictionary	Eng. to Japanese	1		*
	Japanese to Eng.	1		
	Japanese	1		
4 Schedule	from 50-199	1		*
(number)	over 200	2		
5 Max. number of	less than 60	1	*	
characters on	61-100	2		*
display (character)	over 101	3		
6 Weight	over 120	1		
(g)	80-120	2		
	less than 80	3	*	*
7 Continuous	less than 120	1		
conversation	120-160	2	*	*
(min)	over 160	3		
8 Digital photo	from 0.1-0.3M	1		
Resolution	0.3-1.0M	2		
(pixel)	over 1M	3		
9 Digital photo	less than 300	1		
Saving capacity	300-999	2		
(shot)	over 1000	3		
10				
11				
		Sum	9	13

-The pros and cons-

- Simple and quick
- Able to adapt for the new functions
 - Semi-quantitative
 - **Subjective**

1.44

3-3. Quantifying the Service (Cont.3)

Hardware specification]

Accepted !

Services		Ratio of ne	ew/old	
(Item X)	(Item Y)	S=(b)/(a)	$= \{1/n \cdot \Sigma S'$	2}^0.5
Computing	CPU clock 1	1.67	} 2.64	
Speed	CPU clock 2	3.33		
			-	
Memory	Memory	1.61	1.61	2.50
				}
LCD	Brightness	6.20	} 3.78	
	Size	1.13		
	Resolution	1.78	J	
Battery	Battery capacity	1.10	} 1.05	
	Electricity consumption	1.00	J	,

Average of square root =

$$= \sqrt{\frac{1}{n} \cdot \sum_{i=1}^{n} S_i^2}$$

S: the ratio of an old and new criterion n: the number of criteria

-The pros and cons-

- A small number of criteria
- Able to adapt for the new functions

The difficulties to access the data

3-3. Quantifying the Service (Cont.4) [Comparison between the various methods]



- Comments -

The results of the service value <u>differ</u> from criterion to criterion.

It necessary to <u>fix</u> the evaluation method and <u>disclose</u> clearly to the public. 3-4. Result of Eco-efficiency Factor

Eco-efficiency Factor
$$= \frac{Service(\sqrt{\frac{1}{n} \cdot \sum_{i=1}^{n} S_i^2})}{CO2emission(B/A)} = 2.50/1.21 = 2.07$$



Fig. Eco-efficiency Factor of mobile phone





4. How to quantify the service value? (Cont.2)



Product Function

(Direct evaluation)

Scanner

Printer

Uni-function

5. Discussion

Integration of Eco-indicators



6. Conclusion

- It is essential to evaluate the <u>service value</u> in the framework of Eco-efficiency, especially for <u>IT products</u>.
- The Eco-efficiency Factor becomes <u>twice</u> in one and half years for the mobile phone.
- Core Hardware Specification is suitable for multifunctional products, while <u>Product Function</u> can be applied for uni-functional products.
- Factor X is <u>a crucial communication tool</u> in order to purchase excellent and environmentally sounds products.



THE POSSIBILITIES ARE INFINITE