

User Centered Design Approach Applying CPV in Mobile Service Design

Chang K. Cho^{1,2}, Cheol Lee^{2,*}, and Myung Hwan Yun²

¹ CIRCLEONE Consulting Inc., Seoul, Korea

² Department of Industrial Engineering, Seoul National University
Seoul, 151-744 Korea
iehis@snu.ac.kr

Abstract. In this paper, applicability of CPV in mobile service design has been investigated in both phase of divergent and convergent thinking. During the scenario-based ideation, potential customer values can be used as ideation stimuli in the process of structured brainstorming. In divergent thinking, CPV can be applied as evaluation criteria in comparing new ideas with alternative services. For the efficient implementation, work templates for accelerated front-end UCD are developed in co-operation with mobile service staffs in Korean mobile operator.

Keywords: mobile service, user centered design, new service design, customer perceived value (CPV).

1 Introduction

From the view point of usability, phone-based mobile internet has very poor device and network capability in comparison with traditional PC-based internet. Additionally, high cost for internet access is also a major disadvantage of mobile internet. However, characteristics of mobile internet such as personalization, localization, instant accessibility and ubiquity can be utilized to enhance the value of mobile internet. Understanding of the trade-off between pros and cons of mobile internet and leveraging the advantageous characteristics of mobile internet is the key to the successful mobile internet service development. Several needs for user-centered approach for mobile service development can be identified in new business opportunity auditing in fuzzy front end, context-based idea generation during divergent thinking, CPV-based concept evaluation during convergent thinking, usability evaluation during service development, and post-launch management in service improvement. Especially application of CPV concepts can be strategically applied to design useful and usable mobile services that offer a high enough value to users to overcome the usability and performance constraints. In this paper, applicability of CPV in mobile service design has been investigated in either phase of divergent and convergent thinking.

* Corresponding author.

2 Literature Survey

Customer perceived value has recently gained much attention from researchers and marketers because of its important role in predicting purchase behavior and achieving sustainable competitive advantage [1,2,3,4]. Customer value management has been used widely by market oriented firms to differentiate themselves from competitors [4,5,6]. The most common definition of value is the ratio or trade-off between quality and price, which is a value-for-money conceptualization [7,8,9]. Another definition of perceived value a consumer's overall assessment of the utility of a product or service based on perceptions of what is received and what is given [2]. CPV is the result of the customer's evaluation of all the benefits and all the costs of an offering as compared to that customer's perceived alternatives, which is the basis on which customers make decision to buy things [9]. According to their analogy every user has balance scale in mind, then weigh the benefit in one side and cost or sacrifice in the other side when he or she makes decision whether to buy or not.

Although quality and price have different and differential effects on perceived value for money, many other studies pointed out that viewing value as a trade-off between only quality and price is too simplistic and existing value constructs can be too narrow and that dimensions other than price and quality would increase the usefulness [3,8,10]. A more sophisticated measure is needed to understand how consumers value products and services and to apply it in developing and evaluating new product or service concept. Efforts on developing value measurement scale have been carried out based on utilitarian and hedonic value components [11,12]. Consumer choice is regarded as a function of multiple consumption value dimensions and these dimensions including social, emotional, functional, epistemic, and conditional value make varying contributions in different choice situations [13].

There are four characteristics of CPV. Firstly, customer value is market-perceived and customer's perception of value is most important. Secondly, customer value is complicated. Complex nature of CPV including identification of components of benefit and cost attribute, relative weight, value evaluation process, and aggregated value makes customer research more important. Thirdly, customer value is relative. It should be evaluated as compared to alternatives which also include do-nothing option as well as competitive offerings. Finally, customer value is dynamic. Customer perceptions of value keep changing and evolving due to the changes of circumstances [9]. During the new product development (NPD) process, CPV can help in identifying customer wants and needs early in the ideation or fuzzy front end, identifying factors or attributes that influence customer's judgment of a product value, determining the relative importance of value-related attributes, and determining how offerings are viewed on each of these attributes relative to the customer's alternative.

Although there are several variations considering sub-attributes and accompanying factors other than customer value, in general measurement of CPV can be classified into ratio model and additive model. In ratio model, attributes of benefit and sacrifice are compared relatively. It is intuitive and useful in visualizing the implications where CPV is represented as a slope in benefit-sacrifice space. As the slope of customer value is steeper, the service is considered as more acceptable and more satisfactory for customers. In comparison with competitive services also can be possible in the same space of benefit and sacrifice dimension. In additive model, benefit and sacrifice

are considered as existing along to the same dimension [10]. Since in many cases benefit and sacrifice are interconnected, separate evaluation cannot be possible. Therefore weighted summation of CPV for each value dimension is the criteria for the evaluation. In either case, relative importance and relative performance of value attributes or value dimensions should be calculated by direct or indirect customer judgment. Surveys, choice modeling, or market experiments are used in determining relative importance and relative performance. Questionnaire, interview and conjoint analysis are frequently used in measurement of perceived value and analytic hierarchical process can be a potential alternative for determination of relative importance.

In summary, the concept of CPV is expected to be a potential answer for the current problems of mobile internet which has high penetration but low usage, low utility and high cost, limited and biased use of mobile internet services. By using the CPV, perceived quality of mobile service can be managed effectively. In combination with the principles of user centered design, CPV can be effectively applied in the stages of new mobile service design such as concept generation, concept evaluation, market survey, market performance estimation and launching plan.

3 Applying CPV in Mobile Service Design

3.1 Concept Generation

From the literature survey on customer value components, basic value components are selected in hierarchical structure including hedonic and utilitarian dichotomy [14], functional, emotional, social, and epistemic value components in PERVAL [8,13], and conditional or contextual value [10,13] as shown in table 1. From the successful mobile services in terms of high user acceptance in market which are supposed to deliver relatively high customer value, potential value components and sub-entities are derived by expert group discussion which is composed of five mobile service staffs in Korean mobile operator and three mobile service consultants. In order to reflect the market perception, results of internal and external market surveys are reviewed before and during the discussion. After mapping between generic set of value components and existing successful mobile services, potential mobile value components are grouped together and coupled with their representative example respectively for efficient association during idea generation. Seventeen potential mobile values are selected and their descriptions and examples are summarized in table 1. These potential mobile values can be used as ideation stimuli in the process of structured brainstorming techniques such as Osborn's checklist, Small's checklist and TRIZ [15].

For the perspectives on the relationship between potential mobile values and mobile characteristics, mobile characteristics are also considered based on the definition of mobility[16], which are subscription-based user characteristics, mobile phone oriented device characteristics, communication characteristics focused on phone calling as a main function of mobile phone, and personal characteristics. For example, mobile device has its own feature of battery, LCD display, key pads, memory storage, processing unit, and physical dimension of size. These can be thought as device characteristics of mobile service.

Table 1. Potential value components in mobile contexts

Potential value in mobile service		Descriptions in mobile context	Mobile service example
Cost	Economic	cost-saving	Membership discount
Quality	Available	urgent use, anytime, anywhere	Camera phone
	Effective	goal achievement, multi-purposed	CNID
	Efficient	time reduction, minimal efforts	SMS P2P
	Convenient	ease of use	SMS W2P
Social	Superior	superior to others	New phone
	Different	different from others, unique	Ring-tone
	Homogeneous	empathy, sympathy	Screensaver
	Isolated	private, with no interaction with others	Adults contents
	Etiquette	considering others	Ring-back-tone
Emotional	Fun	fun, exciting	Mobile Game
	Relief	peaceful, trustworthy, reliable	Kids phone
	Preferable	preference, taste, esthetic,	Ring-tone, Screensaver
Epistemic	Educational	knowledge, useful	Mobile news
	Curious	newness, curiosity	Mosquito repellent
Contextual	Magnifying	situation increasing value	CNID for salesperson
	Minifying	undesirable situation decreasing value	Stalking block

Characteristics of mobility and potential mobile values are compared and relationship analysis was carried out so as to find potential value drivers that enhance potential customer value from the characteristics of mobility. For example, by comparison between subscription-based user characteristics of mobile service and cost saving economic value, integrated billing capability was identified as a mobile value driver. Micro-payment services can be another typical service example incorporated with value driver of billing capability. Mobile operators already have their customers' billing address and account so that it makes possible for users to buy goods or services using micro-payment service with saved cost relative to credit card in terms of interest or commission. When it comes to device characteristics exemplified above, availability with no preparation can be a potential mobile driver to almost functional value. Features of mobile phone such as battery, display, key pad can be a source of new service opportunities that deliver functional value on availability such as portable power supply, portable display unit, and portable input device, respectively. Potential mobile value drivers derived from the characteristics of mobility used with potential mobile values during scenario-based ideation will be helpful to draw numerous promising new mobile service ideas by providing more perspectives on internal relationship among mobile characteristics, mobile potential values, and value drivers.

3.2 Concept Evaluation

Concept evaluation of mobile service design involves CPV and usability. For the application of CPV in concept evaluation, CPV measurement methods are

investigated and proposed for mobile service development. During concept generation stage, lots of ideas are generated through new opportunity clues, target domain, related stakeholders, target users, related contextual attributes and most frequent and important scenario. Service ideas are clustered and ready for evaluation. Considering the relative nature of CPV, even for non-existing innovative service concepts, alternatives are selected for comparison in terms of perceived value. CPV measurement methods are classified into additive method and ratio method. During the conceptual evaluation, two ways of application of CPV are recommended. In the case that comparable competing service can be found, the sub entities of benefit and cost or sacrifice factors for each service should be broken down and the part worth or relative importance are calculated by use of conjoint analysis or analytic hierarchical process. In case that ratio method can be applicable, new service ideas are compared with competing services in terms of ratio of benefit over cost. When it is difficult to find comparable competing services, additive method can be useful. Value components are investigated and by summation of them magnitude of CPV can be evaluated whether it is positive or negative. In this context, CPV is considered as a representative measure of user acceptance. Market attractiveness can be evaluated by market volume in terms of potential customers and scenario frequency, which means that service ideas which are relevant in frequent situation and many potential users are considered as promising concept. By combining a series of considerations such as CPV, market volume, and scenario frequency, most promising concepts are selected and proceed forward to the next step of formal NPD.

Considering the compatibility with international standards on UCD, measures of usability defined in ISO 9241-11, which are effectiveness, efficiency, and satisfaction can be taken into consideration during the CPV evaluation since most benefit components involve effectiveness, efficiency, and satisfaction attributes. Effectiveness can be defined as the accuracy and completeness with which customers achieve specified goals. Efficiency is the accuracy and completeness of goals

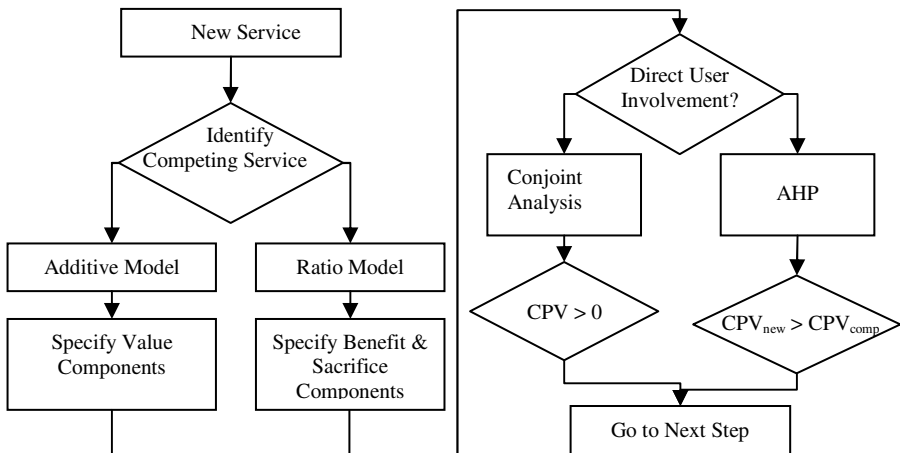


Fig. 1. Concept evaluation process using the concept of CPV

achieved in relation to resources. Satisfaction is the freedom from discomfort, and positive attitude towards the use of mobile service. Attributes of key performance indicators can be expressed in adjective such as useful, usable, unique, fun, efficient, attractive, simple, quick to learn etc. These attributes can be quantified by measurement of CPV. There are two main reasons for usability evaluation. One is to improve the service as part of development process by identifying and fixing usability problems (formative evaluation). The other is to find out whether people can use the service successfully (summative evaluation). In the front-end UCD, formative concept evaluations are focused, and precise summative evaluation would be implemented in later stage of formal NPD process as shown in figure 1.

4 Implementation

For the efficient implementation of CPV concept during front-end mobile service design, work templates are developed in co-operation with mobile service staffs in Korean mobile operator as shown in fig. 2 and 3. Template approaches are accepted as an efficient tool for process implementation and data management in new product or service process [17,18]. Templates include guidelines, checklists, work direction, and process data filled in by new service personnel. The proposed process was separated into separable activities and initial version of templates was provided. Pilot workshop was performed by five mobile service staffs. By forced relationship analysis with potential customer values in mobile context, new service ideas were generated. In convergent thinking during concept evaluation, customer perceived value is suggested as a critical criterion for the acceptance of end-user. Potential values in new service opportunity and competing service alternatives are identified and rated in terms of relative importance or part-worth by using analytic hierarchical process. Half day of pilot workshop was assigned to discussion on the problems of work templates. Based

Scenario Components		Scenario Description by _____		
Persona				
Others				
Artifacts				
Goal				
Activities				
Environment				
Customer Value	Description	Example	Related Idea	
Economic	cost-saving	Membership discount		
Functional	Available	urgent use, any time, any where	Camera phone	
	Efficient	time reduction, minimal effort	SMS P2P	
	Effective	goal achievement, multi-purpose	CNID, manner call	
Social	Convenient	ease of use	SMS W2P	
	Superior	superior to others	New phone	
	Different	different from others, unique	Ring-tone	
	Homogeneous	empathy, sympathy	Screensaver	
	Isolated	private, with no interaction	Adults contents	
Emotional	Etiquette	considering others	Ring-back-tone	
	Fun	fun, exciting	Mobile Game	
	Relief	peaceful, trustworthy, reliable	Kids phone	
Epistemic	Satisfaction	preference, taste, esthetic	Ring tone, Screensaver	
	Educational	knowledge, useful	Mobile news	
Contextual	Curious	newness, curiosity	Mosquito repellent	
	Positive	situation increasing value	CNID for salesperson	
	Negative	undesirable situation, situation decreasing value	Stalking Block	

Fig. 2. Work template for scenario-based ideation with potential customer value

on the time measurement and discussion, total time required for the whole process is less than three hours. Considering individual differences and allowance time for break, it took about four hours which is equivalent to half day of working time to explore new service opportunity. During the discussion among participants in implementation workshop, concept of CPV, and the proposed work templates were referred to accelerate the iteration between divergent and convergent thinking.

Potential Value in ()	Relative Importance (%)	Part-worth in NSO ()	Part-worth in Competing Service ()	Monetary Cost	
				NSO (C)	Competing SVC (D)
	100 %	(A)	(B)		

CPV	
NSO (E)	Competing SVC (F)
(A) / (C) =	(B) / (D) =

Relative Competitiveness	
Competitiveness of NSO	
(E) / (F) =	

Fig. 3. Work template for concept evaluation with competing service

5 Conclusion

Pros and cons of mobile internet can be strategically applied to design useful and usable mobile services that offer a high enough value to users to overcome the usability and performance constraints by using the concept of CPV. During the implementation workshop, applicability of CPV in conceptual design stage in either way of divergent and convergent has been considered in mobile service design. Integrated conceptual design process from opportunity identification to concept evaluation incorporating scenario-based ideation and CPV-based concept evaluation were proposed and implemented in field so as to accelerate the iteration between divergent and convergent thinking. It is expected that the proposed framework can be used in managing mobile service development, identifying new mobile service opportunities, creating new service items, developing service scenarios, and evaluating user acceptance. CPV measurement research focused on direct and indirect user involvement can be the first suggestion for future research. Various CPV measurement methods by addition and ratio have been suggested by many researchers in various research area including marketing, service quality, cognitive science and so on. However, a majority of previous studies are focused on the constructs among CPV and related attributes such as loyalty, satisfaction and customer attitude are perceived value. Therefore, further research on direct or indirect CPV measurement is still required.

Acknowledgments. This work was supported in part by the Research Institute of Engineering Science at Seoul National University.

References

1. Parasuraman, A., Zeithaml, V.A., Berry, L.L.: A conceptual model of service quality and its implications for future research. *J. of Marketing* 49, 41–50 (1985)
2. Zeithaml, V.A.: Consumer perceptions of price, quality, and value: A means–end model and synthesis of evidence. *J. of Marketing* 52, 2–22 (1988)
3. Bolton, R.N., Drew, J.H.: A multistage model of consumers' assessments of service quality and value. *J. of Consumer Research* 17, 375–384 (1991)
4. Ulaga, W., Chacour, S.: Measuring Customer-Perceived Value in Business Markets. *Industrial Marketing Management* 30, 525–540 (2001)
5. Day, G.S., Fahey, L.: Valuing market strategies. *J. of Marketing* 52, 45–57 (1998)
6. Woodruff, R.B.: Customer value: The next source for competitive advantage. *J. of the Academy of Marketing Science* 25, 139–153 (1997)
7. Cravens, D.W., Holland, C.W., Lamb, C.W., Moncrieff, W.C.: Marketing's role in product and service quality. *Industrial Marketing Management* 17, 285–304 (1988)
8. Sweeney, J.C., Soutar, G.N.: Consumer perceived value: The development of a multiple item scale. *J. of Retailing* 77, 203–220 (2001)
9. Miller, C., Swaddling, D.C.: Focusing NPD research on customer perceived value. In: Belliveau, P., Griffin, A., Somermeyer, S.M. (eds.) *PDMA toolbook for new product development*, pp. 87–114. John Wiley & Sons, New York (2002)
10. Heinonen, K.: Reconceptualizing customer perceived value: the value of time and place. *Managing Service Quality* 14(3), 205–215 (2004)
11. Babin, B.J., Darden, W., Griffin, M.: Work and/or fun: measuring hedonic and utilitarian shoeing value. *J. of Consumer Research* 20, 644–656 (1994)
12. Richins, M.: Valuing things: The public and private meanings of possessions. *J. of Consumer Research* 21, 504–521 (1994)
13. Sheth, J.N., Newman, B.I., Gross, B.L.: Why we buy what we buy: A theory of consumption values. *J. of Business Research* 22, 159–170 (1991)
14. Batra, R., Ahtola, O.T.: Measuring the hedonic and utilitarian sources of consumer attitude. *Marketing Letters* 2, 159–170 (1990)
15. Crawford, M., Benedetto, A.: *New products management*, Boston. McGraw-Hill, New York (2003)
16. Dix, A., Rodden, T., Davies, N., Trevor, J., Friday, A., Palfreyman, K.: Exploiting space and location as a design framework for interactive mobile. *ACM Transactions on computer human interaction* 7(3), 285–321 (2000)
17. Miller, C.W.: Hunting for hunting grounds: forecasting the fuzzy front end. In: Belliveau, P., Griffin, A., Somermeyer, S.M. (eds.) *PDMA toolbook for new product development*, pp. 37–62. John Wiley & Sons, New York (2002)
18. Travis, D.: *E-commerce usability: tools and techniques to perfect the on-line experience*. Talor and Francis. London (2003)