Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2009 Proceedings

Americas Conference on Information Systems (AMCIS)

2009

Antecedents to User Acceptance of Wireles Phone Services

Peng Liu
Michigan State University, liupeng@msu.edu

Roger Calantone
Michigan State University, rogercal@msu.edu

Follow this and additional works at: http://aisel.aisnet.org/amcis2009

Antecedents to User Acceptance of Wireless Phone Services

Peng Liu
Michigan State University
liupeng@msu.edu

Roger Calantone
Michigan State University
rogercal@msu.edu

ABSTRACT

Wireless phone services acceptance may be fundamentally different from traditional systems acceptance or online purchase adoption, partly because it includes acceptance of both technology products and services, and partly because the characteristics of wireless service providers also have roles to play. To understand these differences we study antecedents to Technology Acceptance Model's (TAM) perceived usefulness and ease of use in wireless phone services context. Two characteristics of wireless service providers are identified: company affect and perceived company helpfulness. We collected data from 1,667 U.S. citizens. Results reveal that both company affect and company helpfulness are significant antecedents to user acceptance of wireless phone services. Moreover, our study of these antecedents has practical applicability as it deepens the understanding of the phenomenon and can provide advices for wireless service providers.

Keywords

Service, usefulness, ease of use, helpfulness, affect, technology acceptance.

INTRODUCTION

With widespread wireless services use, many research studies have explored wireless service innovation and adoption (Shim et al., 2006). Wireless services include both technology products and services. For example, wireless phone services include cell phone products, basic services such as phone communication and text messaging, and advanced services such as wireless Internet access and other value-added services. Because so many people rely on wireless phone services, understanding the antecedents to wireless phone services acceptance is important for researches as well as practitioners: telecommunication companies and other wireless services providers.

Numerous research studies examine business information systems and online shopping acceptance. These research studies have used various theories to develop research models to explain and predict acceptance. The technology acceptance model (TAM) is one of the most frequently used models. TAM is based on the theory of reasoned action (TRA). Derived from the social psychology, TRA suggests that individual behavior is determined by an intention to perform the behavior. This intention is a function of attitude toward the behavior and subjective norm (Ajzen and Fishbein, 1980). Intention is the most immediate antecedent of behavior. Intention is the cognitive representation of a person's readiness to perform a given behavior. TAM, introduced by Davis (1989), is an adaptation of TRA specifically tailored for modeling user acceptance of information systems. It is one of the most influential extensions of TRA in the literature (Davis, 1989). TAM replaces many of TRA's attitudes with two technology-related beliefs: perceived usefulness (PU) and perceived ease-of-use (PEOU). Perceived usefulness is defined as the prospective user's perceptions that using a specific application will increase his or her performance within an organizational context (Davis, 1989). Perceived ease of use refers to the degree to which the prospective user expects the target system to be free of effort. (Figure 1)

Many researchers have modified TAM and validated derivatives of TAM. Intention and use are the dependent variables; PU and PEOU are independent variables across those studies (e.g. Venkatesh et al., 2003, Karahanna et al., 1999). We now know that PU is an important determinant of technology acceptance and that PEOU is an antecedent of PU and another important determinant of technology acceptance. However, TAM-based research has paid less attention to antecedents of PU and PEOU (Benbasat, 2007). Repeatedly demonstrating key constructs -- PU and PEOU are influential without understanding how to influence such constructs is of limited value (Benbasat, 2007). It would be fruitful to study some of the antecedents of PU and PEOU to provide practitioners with advices. Previous research has identified intrinsic motivation (enjoyment) as the antecedents to PU and PEOU (Venkatesh et al., 2002), image as an antecedent to PU (Venkatesh and Davis, 2000), trust as an

antecedent to PU (Gefen et al., 2003) and computer self-efficacy as an antecedent to PEOU (Venkatesh and Davis, 1996). Our research concentrates on identifying company level antecedents of wireless services acceptance.

Many empirical tests have shown that TAM is a parsimonious and robust model that predicts technology acceptance behaviors in work-related technology contexts such as word processing (Davis et al, 1989), ERP (Hwang ,2005), and office automation systems (Venkatesh and Davis, 2000). The model has also been applied to other diverse non-organizational technologies including online shopping websites (Gefen et al., 2003), instant messaging devices (Li et al., 2005), text messaging services (Nysveen et al., 2005), wireless mobile devices (Hung et al., 2003), and camera mobile phone devices (Rouibah et al., 2006). However, there is little research on antecedents to wireless phone services acceptance. This study fills this research gap by indentifying antecedents to PU and PEOU in this context.

Because only a few wireless phone service providers exit, users might have different attitudes towards different services providers. Thus our study investigates how to incorporate the characteristics of these telecommunication companies into TAM. These characteristics include company affect and perceived company helpfulness. Company affect is defined as the feeling of joy, elation, or pleasure associated with a particular wireless service phone provider. Perceived company helpfulness is defined as the degree to which users believe that dealing with a wireless provider would be helpful in their lives. Our paper proceeds as follows. The next section presents the research model and hypotheses, followed by the explanation of methods. Then we analyze the data and present the results. We conclude the paper with research and practical implications, and study limitations.
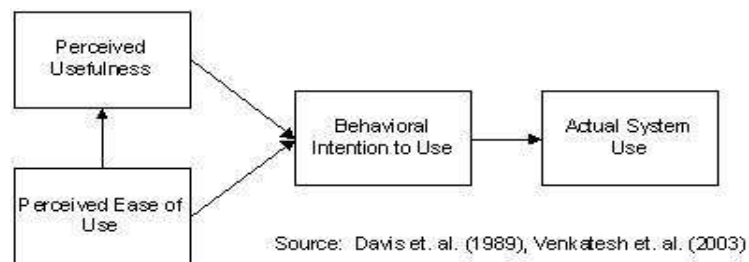

Figure 1 Technology Acceptance Model (TAM)

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Our research model is shown in Figure 2. It includes two variables based on TAM: perceived service usefulness, and perceived service ease of use. It also includes two antecedents to TAM -- company affect and perceived company helpfulness. The following paragraphs explain these variables and develop the hypotheses.

TAM has been discussed in detail in previous research (e.g. Gefen et al., 2003, Gefen and Straub, 2000). We hypothesize that path between perceived usefulness and perceived ease of use in TAM applies to wireless phone services context. In TAM, perceived usefulness and perceived ease of use determine behavioral intention. While perceived usefulness was originally related to one's productivity and performance at work, in this research we define perceived service usefulness to capture enhanced performance in life and enhanced productivity in a general sense. Perceived service ease of use was also defined to embrace ease of use and ease of communication. We define perceived service usefulness as the degree to which a user believes using a wireless phone service will be useful in one's life. We define perceived service ease of use as the degree to which a user believes using a wireless service will be free of effort. The easier it is to use a wireless phone service, the more useful a wireless phone service is.

H1: Perceived service ease of use will positively influence perceived service usefulness

To better understand user acceptance of wireless phone services, this study concentrate on the left side of TAM. In other words, identifying some external variables and testing the relationships between these antecedents and PU and PEOU rather than confirming the relationship among PU, PEOU, intention and use. Apart from perceived service usefulness and perceived service ease of use, this model also includes company affect and perceived company helpfulness. These two constructs represent characteristics of wireless phone service providers. Perceptions about the providers may be important because they represent prospective users' opinions about the context behind the service. The company image of the service provider probably affects user perceptions about the service itself.

We predict that company affect will influence perceived service usefulness. Affective constructs like attitude and enjoyment have been included in technology acceptance research to capture user's feeling associated with using a particular system. Affect in this paper was defined at the company level. While affect can sometimes influence intention directly, we propose that there is no direct relationship between company affect and behavioral intention. Instead we predict that company affect influences perceived service usefulness. For example, if students believe a prestigious marketing professor is interesting and cool, they might think that his courses are useful. Likewise, if users think a wireless service provider is cool and it knows the service very well, they might regard its wireless phone services as useful.

H2: Company affect will positively influence perceived service usefulness.

Perceived company helpfulness is another company level construct. A wireless service provider can be helpful by providing responsive customer service, supportive business value, and low cost. If a wireless service provider offers good customer service, it will be easier for the user to resolve service problems. If a wireless service provider is helpful by providing business value, the user might also regard its services to be useful. Thus we predict that perceived company helpfulness influences both perceived service usefulness and perceived service ease of use.

H3: Perceived company helpfulness will positively influence perceived service usefulness.

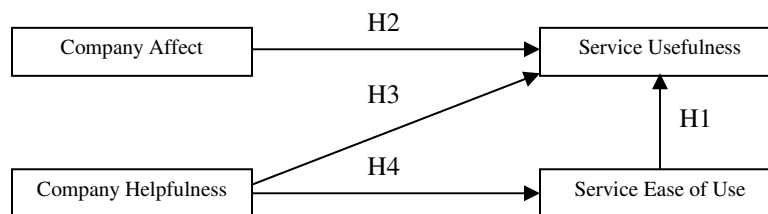H4: Perceived company helpfulness will positively influence perceived service ease of use.

Figure 2 Research Model

RESEARCH METHODOLOGY

Based on previous TAM research (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003), we either tailored previous measures or developed new measures.

Perceived usefulness was measured mainly in working contexts in previous research; that is, how a system helps people to be more productive in their works or how a system improves people's productivity in their jobs. In contrast, wireless services are frequently used in both people's professional roles and their private lives. So we excluded the word "job" from items. Perceived service usefulness in this research measured productivity in a more general and comprehensive sense. For example, the first item is using this wireless service helps me be more productive. And the third item is using this wireless service helps me to balance demands in my life. Perceived ease of use was measured by three items. In developing items, we tried to capture the aspects of perceived ease of use that were most relevant to the wireless phone services context. First item "ease to use" is the most frequently used measure item from previous research. Due to the complexity of services, we couldn't cover all types of services (e.g. phone communication, Internet access). Since wireless services are used to help people communicate, we use the voice quality of communication as a measure of the basic aspect of easy-to-use services. If a wireless service has a clear voice quality, people can easily follow others. If a wireless service doesn't have a clear voice quality, people might have to repeat words, phases or sentences or redial a number when they communicate with each other. So "clear voice quality" was included as the second item. The third item is "latest technology". Technology makes life easier, so the latest technology can help people use the wireless services more easily. (e.g. touch screen)

Two more constructs are used as antecedents to TAM. Company helpfulness is introduced to measure user's perception of how a wireless service provider is helpful in general. We wanted to measure company helpfulness from five aspects: user's interactions with company, user's community, customer service, business value and cost. Company affect is used to measure feelings of joy or pleasure associated by a user with a wireless service provider. Compared to previous research (Thompson, et al. 1991), this paper measures affect towards a wireless provider rather than a particular act or behavior. So company affect includes a user's impression of a wireless provider. Five-point scales were used to measure all the constructs in the research model.

1667 respondents provide answers to questions about three big telecommunication companies in America. The questions are the same across these three companies. The survey instructions ask subjects to answer how well some phrase or sentences describe the telecommunication companies or their products and services. The measurement scales are shown in Appendix A. The items show good internal consistency reliability.

ANALYSIS AND RESULTS

The research models were tested through structural equation modeling (SEM) with EQS. Follow Anderson and Gerbing (1988), two-step approach was used to first assess the quality of measures through the measurement model, and then test the hypothesis through the structural model.

Measurement model

We assessed the goodness of fit for measurement model. The non-normed fit index (NNFI), the comparative fit index (CFI), the goodness of fit index (GFI) and adjusted GFI (AGFI) are all greater than 0.90 across three companies. The root mean squared error of approximation (RMSEA) is lower than 0.08 for all three companies. Table 1 indicates adequate fit of measurement models for the 3 companies.

Reliability

The Cronbach's α for all construct is above 0.774, and the item-correlations were high for most of the items, shows internal consistency of items in each construct. Cronbach's α provides a lower bound estimate of the internal consistency, so we also exam the internal consistency reliability (ICR). The ICR values for company affect are 0.75, 0.78, and 0.75 for company 1, company 2, and company 3 respectively. The average variance extracted (AVE) for company affect are 0.50, 054, and 0.50 for company 1, company 2 and company 3 respectively. These values show company affect has a comparatively lower reliability. Then the rest of ICR values are above the 0.8 minimum values. Moreover the rest AVEs are higher than to the recommended minimum value of 0.50, which provide evidence of the scales reliability for rest of the constructs (Bagozzi,1980).

Construct Validation

The high factor loading indicates convergent validity, and the low cross loading supports discriminant validity of the proposed factors. In addition, convergent validity was assessed using AVE criteria: the AVE for each construct should be higher than the recommended minimum value of 0.50. These results demonstrate convergent validity for the constructs. All items are significantly related to their specified constructs, and the data support the convergent validity of the CFA model.

Discriminant validity was assessed by testing whether the correlations between pairs of construct items were significantly different from unity (Anderson and Gerbing, 1988). The χ^2 differences between the fixed and the free solutions for each pair of constructs were much higher than the cut-off value of 3.84. Then we found that the correlations between all latent constructs were less than the corresponding square root of the AVE. (See Table 2). So all the criteria adequately demonstrate discriminant validity of the models.

Structural Model

Measures of fit of the structural model were in acceptable range and above the minimum recommended values. The non-normed fit index (NNFI), the comparative fit index (CFI), the goodness of fit index (GFI) and adjusted GFI (AGFI) are all greater than 0.90 across three companies. The root mean squared error of approximation (RMSEA) is lower than 0.08 for all three companies. Table 3 indicates adequate fit of measurement models for the 3 companies.

	NNFI	CFI	GFI	AGFI	RMSEA
Company1	0.924	0.939	0.936	0.910	0.067
Company2	0.931	0.945	0.942	0.919	0.064
Company3	0.941	0.952	0.948	0.926	0.060

Table 1 Goodness of Fit for the Measurement Model

	NNFI	CFI	GFI	AGFI	RMSEA
Company1	0.926	0.939	0.935	0.912	0.066
Company2	0.932	0.944	0.941	0.919	0.063
Company3	0.942	0.952	0.947	0.927	0.059

Table 3 Goodness of Fit for the Structural Model

Company 1	ICR	AVE	1	2	3	4
1. Company Affect	.75	.50	**.71**			
2. Company Helpfulness	.93	.59	.61	**.77**		
3. Service Usefulness	.80	.58	.56	.75	**.76**	
4. Service Ease of Use	.82	.60	.40	.65	.67	**.78**
Company 2	ICR	AVE	1	2	3	4
1. Company Affect	.78	.54	**.73**			
2. Company Helpfulness	.92	.59	.56	**.77**		
3. Service Usefulness	.81	.59	.50	.71	**.77**	
4. Service Ease of Use	.82	.61	.37	.66	.70	**.78**
Company 3	ICR	AVE	1	2	3	4
1. Company Affect	.75	.50	**.71**			
2. Company Helpfulness	.93	.59	.61	**.77**		
3. Service Usefulness	.81	.59	.54	.72	**.77**	
4. Service Ease of Use	.82	.61	.41	.67	.72	**.78**
All correlations are significant at p < .05. The bolded diagonals are the square root of the AVE.						
Table 2. Internal Consistency (ICR), Average Variance Extracted (AVE), and Correlation Matrix						

All four hypotheses are supported across three companies. Company affect has the smallest influence on perceived service usefulness. Perceived service ease of use has the strongest influence on perceived service usefulness in company 2 and company 3, and company helpfulness explains the most variance in perceived service usefulness in company 1. Company helpfulness has evident and consistent influence on perceived service ease of use in all three companies. In all these three companies, totally over sixty percent of the variance of perceived service usefulness is explained by its antecedents --- perceived service ease of use, company affect and company helpfulness , and over forty percent of the variance of perceived service ease of use is explained by its antecedent—company helpfulness. (Table 4.)

Hypotheses	Company1	Company2	Company3
H 1: SEOU --> SU	0.303***	0.413***	0.434***
H 2: Affect-->SU	0.141***	0.142***	0.169***
H 3: Helpfulness-->SU	0.486***	0.355***	0.322***
H 4: Helpfulness-->SEOU	0.649***	0.658***	0.670***
SU R^2	0.656	0.609	0.634
SEOU R^2	0.421	0.433	0.449
* P < .05, ** P< .01, *** P< .001			
Table 4 Research Model Hypotheses Results and Variance Explained			

DISCUSSION

The primary goal of this paper is to indentify antecedents to TAM's PU and PEOU in wireless phone service context. We find that company affect and company helpfulness are significant antecedents to user acceptance of wireless phone services. Perceived service ease of use and perceived company helpfulness are the two most important predictors of Perceived service usefulness in our model. Company helpfulness is also a strong predictor of perceived service ease of use. Our research shows that company affect is also a predictor of perceived service usefulness. Our research contributes to identifying company level antecedent to wireless phone service acceptance, so wireless service providers can take actions from both company level and service level in order to enhance the user acceptance of wireless phones services.

Venkatesh, Speier, and Morris (2002) found intrinsic motivation (enjoyment) was the antecedents to PU and PEOU, Venkatesh and Davis (2000) identified image as an antecedent to PU, and Venkatesh and Davis (1996) also found computer self-efficacy was an antecedent to PEOU. Intrinsic motivation, image and self-efficacy are user level antecedents. Our research complements their findings by offering company level antecedents. Gefen et al. (2003) identified trust toward vendor as an antecedent to PU, and Wang and Benbasat (2005) tested trust in technology as an antecedent to PU, so future research can test whether "company trust" is an antecedent to wireless service acceptance.

Wireless services providers should try to understand their role in enhancing users' perceptions of service usefulness and service ease of use. One way of increasing perceived service usefulness and perceived service ease of use is through improving perceived company helpfulness. Therefore, wireless services providers can improve customer service, develop good customer service center, and provide local customer service at provider's local stores and so on. Wireless service providers should understand customers and their needs and build mechanism that report customers' feedbacks to R&D to tailor service to meet customers' needs. Moreover, wireless services providers should reach out to customers rather than waiting for customers. For example, providers can support more community activities. During those activities, wireless services providers can offer gifts or services to customers. Wireless services providers can also offer value added services or lower cost service to loyal customers.

Another way of increasing perceived service usefulness is to improve the company affect. For example, wireless services providers can use some cool advertisements to improve users' attitudes toward wireless service providers. Wireless services providers can also build service center online and in local stores to let customers try different service. Wireless service providers can also cultivate cool and fun corporate cultures that emphasize customers. A third way of increasing perceived service usefulness is to use some new technology in the services to increase perceived ease of use. For example, a wireless service provider can make full use of web 2.0 to create wikis to let customers share experiences, create fun photos, and cool videos. Providers can use online billing checking and payment services to let customers manage their services easily. So wireless service providers have important role to play to enhance the user acceptance of wireless phones services.

This study has several limitations. First, because this study is cross-sectional, causality is not proven and can only be inferred from the theory. Second, since measures of all measures in the study were collected by the same method at the same point in time, the potential for common method variance exists. Third, behavioral intention and actual user behaviors were not measured. Thus, future research should address the effect of service usefulness and service ease of use on intention to sign up with a provider and actual sign up behavior. Fourth, company affect has a comparatively lower reliability; future research needs to develop a more reliable measure for this construct.

CONCLUSION

Wireless phone services acceptance differs from traditional systems acceptance or online purchase adoption, partly because it includes acceptance of both technology products and services, and partly because the characteristics of wireless service providers also have roles to play. By indentifying the antecedents to TAM in wireless phone services context, both researchers and practitioners can have a better understanding of user acceptance of wireless phone services. By studying how to influence perceived service usefulness and perceived service ease of use, our research has avoided repeated demonstration that PU and PEOU are influential to technology acceptance. It is fruitful to study some of the antecedents of PU and PEOU to provide practitioners with advices. Survey results reveal that both company affect and company helpfulness are significant antecedents to user acceptance of wireless phone services. Moreover, our study of these antecedents has practical applicability as it deepens the understanding of the phenomenon and provides advices for wireless service providers. The study indicates that wireless phone services providers might increase user acceptance by improving two company level characteristics: perceived company helpfulness and company affect.

ACKNOWLEDGMENTS

REFERENCES

1. Ajzen, I. and Fishbein, M. (1980) Understanding Attitudes and Predicting Social Behavior, Prentice-Hall, Englewood Cliffs, NJ.

2. Ajzen, I. (1985) From Intentions to Actions: A Theory of Planned Behavior, Berlin and New York: Springer-Verlag

3. Anderson, J. C. and Gerbing, S. W. (1988) Structural equation modeling in practice: A review and recommended two-step approach. Psych. Bull. 103(3) 411–423

4. Bagozzi, R. P. (1980) Causal Models in Marketing. Wiley, New York.

5. Benbasat, I. and Barki, H. (2007) Quo vadis, TAM?, *Journal of the Association for Information Systems*, 8, 4, 211-218

6. Browne, M. W. and Cudeck, R. (1993) Alternative ways of assessing model fit. In Bollen, K. A. and Long, J. S. eds. Testing structural Equation Models, Chapter 6. Sage, Newbury, Park, CA.

7. Davis, F. D. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13, 3, 319-340.

8. Davis, F. D., Bagozzi, R., and Warshaw, P. (1989) User acceptance of computer technology: a comparison of two theoretical models, *Management Science*, 35, 8, 982-1003.

9. Gefen, D., Karahanna, E. and Straub, D. W. (2003) Trust and TAM in online shopping: in integrated model, *MIS Quarterly*, 27, 1, 51-90.

10. Gefen, D. and Straub, D. W. (2000) The relative importance of Perceived Ease-of-Use in IS adoption: A study of E-commerce adoption, *Journal of the Association for Information Systems*, 1, 8, 1-30.

11. Hung S., Ku C., and Chang C. (2003) Critical factors of WAP services adoption: An empirical study. *Electronic Commerce Research and Application* 2, 42-62.

12. Hwang Y. (2005) Investigating enterprise systems adoption: uncertainty avoidance, intrinsic motivation, and the technology acceptance model, *European Journal of Information Systems*, 14, 150-161

13. Karahanna, E., Straub, D. W. and Chervany, N. L. (1999) Information Technology Adoption Across Time: A cross-sectional Comparison of Pre-Adoption and Post-Adoption Beliefs, *MIS Quarterly*, 23, 2, 183-213.

14. Li D., Chau, P.Y.K. and Lou, H. (2005) Understanding individual adoption of Instant Messaging: An empirical investigation, *Journal of Association for Information Systems*, 6, 4, 102-126.

15. Nysveen H., Pedersen P.E. and Thorbornsen H. (2005) Intention to use mobile services: antecedents and cross-service comparison, *Journal of the Academy of Marketing Science*, 33, 3, 330-346.

16. Rouibah, K. and Abbas, H. (2006) A Modified Technology Acceptance Model for Camera Mobile Phone Adoption: Development and validation, *ACIS 2006 Proceedings,* 13.

17. Shim, J. P., Varshney, U. and Dekleva, S. (2006) Wireless Evolution 2006: Cellular TV, Wearable Computing, and RFID, *The Communications of the Association for Information Systems*, 18, Article 24.

18. Thompson, R. L., Higgins, C. A., and Howell, J. M. (1991) Personal Computing: Toward a Conceptual Model of Utilization, *MIS Quarterly*, 15, 1, 124-143

19. Venkatesh, V. and Davis, F. (1996) A model of the antecedents of perceived ease of use: development and test, *Decision Science*, 27, 3.

20. Venkatesh, V. and Davis, F. (2000) A theoretical extension of the technology acceptance model: four longitudinal field studies, *Management science*, 46, 2, 186-204.

21. Venkatesh, V., Morris, M. G., Davis, G. B. and Davis. F. D. (2003) User acceptance of information technology: Toward a unified view. *MIS Quarterly,* 27, 3, 425–478.

22. Venkatesh, V., Speier, C. and Morris, M. G. (2002) User acceptance enablers in individual decision making about technology: toward an integrated model, *Decision Sciences*, 33, 2.

23. Wang W. and Benbasat, I. (2005) Trust in and adoption of online recommendation agents, *Journal of the association for information systems*, 6, 3, 77-101.

24. Werts, C. E., Linn, R. L. and Jöreskog. K. G. (1974) Intraclass reliability estimates: Testing structural assumptions. *Educational and Psychological Measurement*, 34, 25–33.

APPENDIX A - MEASUREMENT ITEMS

In your opinion, how well does each phrase describe the company's products and services?

Perceived Service Usefulness:

1. Using the wireless phone service helps me be more productive.

2. The wireless phone service comes in packages that meet my needs.

3. Using the wireless phone service helps me to balance demands in my life.

Perceived Service Ease of Use:

1. The wireless phone service is easy to use.

2. The wireless phone service has clear voice quality

3. The wireless phone service uses the latest technology.

In your opinion, how well dose each phrase describe the following companies?

Company Affect:

1. The wireless phone service provider knows service.

2. The wireless phone service provider is fun.

3. The wireless phone service provider is cool/ a trend setter.

Company Helpfulness:

1. The wireless phone service provider makes me feel like part of a community.

2. The wireless phone service provider knows what the customer wants.

3. The wireless phone service provider is the leader in customer service.

4. The wireless phone service provider is easy to do business with.

5. The wireless phone service provider provides good value for money.

6. The wireless phone service provider offers the lowest price.

All scales are 5-point Likert from (1) Does not describe at all to (5) Describe extremely well)