Satisfaction with mobile services in Canada: An empirical investigation

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Abstract

While customer satisfaction and loyalty regarding most physical goods and services have been well explored in academic literature, there exists little research on these factors with respect to mobile telecommunications services. Nevertheless, standardized satisfaction measures are suggested to be useful for various telecom-industry stakeholders. However, such a global standard measure of satisfaction with mobile services does not exist. This study taps into these voids and examines the antecedents of customer satisfaction and loyalty through an empirical investigation of 210 young adult cellular subscribers in Canada by adapting the American Customer Satisfaction Model. Based on this model, the satisfaction index of young adult Canadians was calculated. Overall, this study offers insights for service providers, policymakers and subscribers; and forms the foundation for future benchmarking of the performance of wireless network operators in terms of user satisfaction and loyalty.
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1. Introduction

The remarkable diffusion of mobile services has outperformed experts' expectations. From a marginal industry "in the shadow" of other telecommunications providers (e.g., fixed lines and the Internet), it has become a leading sector, providing commoditized services. As such, the penetration of mobile phones is almost twice as high as that of personal computers. While only 9.9% of the world's population owned PCs in 2002, 19% possessed cell-phones (ITU, 2003).

At the beginning of 2004, there were over 1.3 billion cell-phone users. Over the next 3 years, the demand for mobile services is predicted to grow at an average annual rate of 9.1% (Lonergan, 2004). This growth mainly results, however, from the deployment of new networks in developing countries rather than from an increase in cellular access lines in developed states.

In the latter group of countries, mobile service markets are almost saturated; on average, 80% of the population already uses mobile services.

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For instance, at the end of 2003, 88.3% of the UK population had cell-phones. According to the Yankee Group, the penetration rate of cellular access lines in Canada is expected to grow from 45.6% in 2003 up to 53.7% in 2007. However, the annual growth rate is predicted to decline from 10.8% in 2004 to 5.1% in 2007.

The saturated markets in developed countries, the de-regulation of the telecommunications industry and the increasing number of wireless service providers drive competition. To exemplify the increasing rivalry, the average number of wireless operators in most OECD countries doubled from 1998 to 2000 (Paltridge, 2000). Accordingly, subscriber acquisition costs rise. For instance, in 2001, new subscriber acquisition costs of Vodafone, UK, were over $180 (Yunus, 2002). Thus, to be competitive and cost efficient, mobile operators need to adjust their marketing strategies and focus on customer retention rather than on acquiring new subscribers and increasing market shares.

This retention battle is further fueled by the elimination of switching barriers. Partial regional standardization (e.g., CDMA in the Far East and GSM in Europe) allows individuals to switch service providers while keeping a previous handset. In addition, emerging Number Portability regulations allow users to keep the same phone number when switching service providers. The recently adapted American legislation, Wireless Local Number Portability (WLNP), will predictably increase wireless markets competition (FCC, 2003).

The aforementioned changes in the competitive landscape in developed countries demonstrate the importance of identifying factors affecting customer loyalty in the mobile services industry. The motivation for understanding and improving loyalty stems from the empirically validated links between loyalty, retention and profitability (Dawkins & Reichheld, 1990; Reichheld, 1996; Reichheld & Sasser, 1990). Specifically, several mobile service studies that were conducted regionally attempted to explore the antecedents of customer satisfaction, loyalty and retention (for example, see Gerpott, Rams, & Schindler, 2001; Kim, Park, & Jeong, 2004). These studies build on the notion that retention measurement and analysis of factors affecting it are vital for business success of every product or service (DeSouza, 1992).

Nevertheless, the aforementioned studies were conducted in different countries, and provide no standard global measure for satisfaction and loyalty. This may prevent an adequate cross-national comparison of users' perceptions. Several attempts to provide such standardized satisfaction measures have recently emerged. For example, the American Customer Satisfaction organization[1] has lately reported on satisfaction scores with mobile services in the USA in Q1, 2004. Nevertheless, the predictors and consequences of the obtained satisfaction level are not reported.

A standard measure (or "barometer") is of primary importance to both wireless carriers and regulators. First, wireless carriers can utilize a standardized satisfaction measure for strategic benchmarking with other telecommunications service providers. Second, they may self-assess their performance through the application of longitudinal satisfaction studies. Third, the use of such a measure may help regulators better achieve their objectives by overcoming the flaws of extant service-level regulations. To ensure acceptable service levels, regulators typically enforce a maximum number of disconnections, coverage constraints or technical standards (Wigglesworth, 1997). These regulations, however, are applied mainly because they are easy to measure, even though they are believed to only partially explain the public need. The improvement of service quality is the focus of telecommunications regulations for both social and economic reasons. From a social perspective, services should be available on reasonable terms. From an economic viewpoint, services should satisfy a full range of consumer demand (Melody, 1997). Overall, it is believed that satisfaction better captures the range of services, prices and quality than any other single measure. Consequently, a standard satisfaction measure more adequately addresses user needs and better captures public interest. Fourth, vague objectives are one of the failures of modern regulation (Giandomenico, 1994). A standardized satisfaction measure provides the means for accurate regulatory objectives that both capture consumers' interest and overcome the vagueness issue. Regulators can adapt this standard measure for national benchmarking, competitive country assessment, longitudinal studies of regulation implications, etc.

To fill this void and provide standardized measures accounting for several major factors which affect the behavior of cell-phone users, this research adapts the American Customer Satisfaction Model (ACSM) methodology. The adapted model is then applied to a population of young Canadian wireless subscribers. It is

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[1] http://www.theacsi.org

believed that the usage of the ACSM may yield an accurate depiction of the perceptions and behaviors of mobile phone users, provide recommendations for practitioners and offer valuable insights for future research. In addition, it is suggested that an application of the ACSM outside of the USA may further demonstrate nomological validity of the model and pave the path for extending the employment of the ACSM for examining the global wireless sector.

The rest of the paper is structured as follows. The next section provides the study's background and introduces research hypotheses. The following two sections outline research methodology and offer statistical results. The last section presents a summary of the findings, conclusions, and directions for future research.

2. Theoretical background

2.1. The American Customer Satisfaction Model

The ACSM is a general, cross-industry model that provides market-based performance measures for firms, industries, sectors and nations. It measures the quality of goods and services as experienced by consumers (Fornell, Johnson, Anderson, Cha, & Bryant, 1996) and gauges their actual and anticipated consumption experiences (Anderson & Fornell, 2000). Fig. 1 presents the model adapted in this study.

According to the model, there exists a positive association between perceived customer expectations (PE) and perceived quality (PQ), perceived value (PV) and satisfaction. In turn, satisfaction has a positive association with loyalty and a negative association with complaints (the "voice" of customers). As such, loyalty is directly explained by customer satisfaction and customer complaints (CC) regarding the product or service.

Model operationalization requires a defined set of constructs. The PE construct represents both previous service experience and forward-looking beliefs regarding a provider's ability to offer the desired quality. PQ is the served market evaluation of recent service usage experience. It is derived from the degrees of personalization and reliability of the service. PV adds the price dimension to PQ and, therefore, addresses the perception of quality for money. In addition, it controls for income differences and budgetary constraints and enables cross-industry comparisons (Fornell et al., 1996). These three constructs lead to customer satisfaction labeled as the American Customer Satisfaction Index (ACSI). It is determined by the difference between the actual usage experience and service expectations. Thus, satisfaction is the subscribers' reaction to their
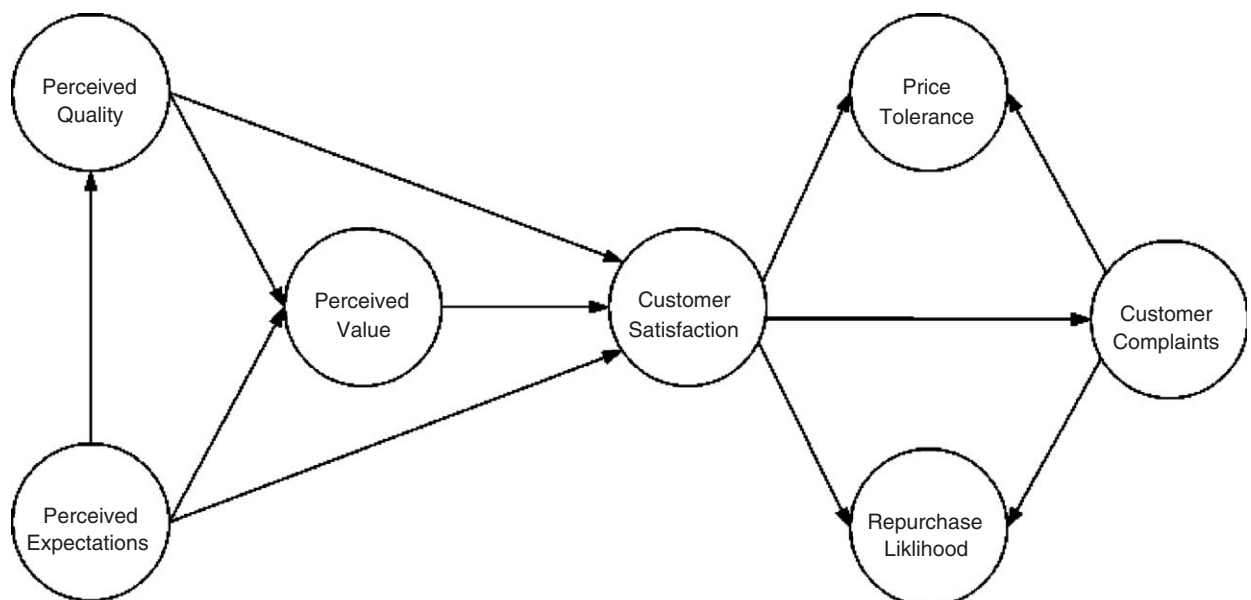

Fig. 1. The adapted American customer satisfaction model (based on the study by Fornell et al., 1996).

judgment of the state of fulfillment (Oliver, 1997). Loyalty is the ultimate construct in this model consisting of two independent latent variables: repurchase likelihood (RL) and price tolerance (PT) toward the service provider's price and toward competitors' pricing. The rationale for splitting the loyalty construct is presented later. In a more general manner, Reichheld (2003) defined loyalty as the willingness to make a personal sacrifice in order to strengthen a relationship. The ACSM's loyalty operationalization is within the range of this general definition since it captures financial and quality sacrifices users make when remaining with a specific service provider. The model also includes a construct measuring CC to a service provider. This construct is negatively associated with the degrees of satisfaction and loyalty.

The ACSM and its adaptations have been utilized in many studies in various industries. For example, ACSM variations were used to examine banking services (Mukherjee, Nath, & Pal, 2003), conferences (Gorst, Wallace, & Kanji, 1999), transportation and communications sectors (Grigoroudis & Siskos, 2004), e-mail systems (Dow, Serenko, Turel, & Wong, 2006) and retailing industries (Arnett, Laverie, & Meiers, 2003). As of March 2006, the Thomson Corporation's ISI Web of Science® Social Sciences Citation Index (SSCI)® listed 138 journal citations of the article that introduced the ACSM. Such studies demonstrate the viability of this model to investigate behaviors and perceptions of mobile service users.

In addition to the measurement of standardized values, the model demonstrates high predictive capabilities. Several researchers have identified a strong positive association between the ACSI and the following period's corporate earnings. Other scholars have shown that firms with high ACSI produce significantly higher value for their shareholders than those with a low one.[2] As such, in addition to its academic application to explain consumer behavior, the model may potentially provide insights for industry practitioners and regulators. ACSI indices are provided quarterly for various industry sectors in North America. Mobile services sector indices, however, are not generally reported (as of January 2004), and, therefore, cannot be benchmarked against other industries.

2.2. Customer loyalty and retention

A review of consumer behavior marketing literature reveals that customer relationships with a manufacturer or service provider are a composite concept consisting of at least two independent areas—loyalty and retention. In the mobile services context, loyalty is defined as a favorable attitude toward a specific service provider that leads to a combination of repurchase likelihood of additional services from the same provider and tolerance to price increases (Fornell et al., 1996). Customer retention is depicted as actual maintenance of relationships with a specific provider. Typically, wireless subscribers retention is measured through churn rates.

Preceding loyalty and retention studies demonstrated a link between these constructs and companies' profitability (Dawkins & Reichheld, 1990) and provided information on the association between some of the constructs: profitability, loyalty, retention, customization, quality and satisfaction (Price, Arnould, & Tierney, 1995; Rust, Zahorik, & Keiningham, 1995).

Both general and industry-specific loyalty investigations usually suggest that retention and loyalty are achieved through the enhancement of service quality and satisfaction. This viewpoint, nevertheless, is not fully valid in the context of mobile services due to the typical contractual nature of customer–operator relationships. Wireless operators may "lock-in" subscribers for long periods of time. Therefore, it can be assumed that, even though subscribers may be dissatisfied and disloyal to their current service provider, they will still use its services and maintain a relatively high retention rate.

In addition, previous research demonstrates that customer retention has a limited capability in enabling growth, but rather is more likely to drive sustainability over the long run. This is mainly due to the notion that retention reflects the rate at which "the bucket is emptying" rather than filling. As such, it is more appropriate to explore loyalty than to investigate retention as the ultimate construct. It is also believed that loyalty will become a key determinant of a mobile operator's success, especially in saturated wireless markets. Thus, mobile service providers should strive for loyal customers rather than just retain them. Loyal customers create a viral effect and praise a company to their friends, families and colleagues (Reichheld, 2003). Consequently, wireless operators may potentially utilize loyalty to create a network of unpaid sales persons.

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[2]For more information about the ACSM and its predictive capabilities, visit the ACSI website at http://www.theacsi.org.

A closer analysis demonstrates that the original ACSM examines the association between satisfaction and loyalty where customer loyalty is employed as a uniform construct. However, the effects of switching barriers on loyalty (Kim et al., 2004) distinguishes between the two components of this construct: RL and PT. The RL is the probability of choosing the same service provider when a person acquires a new mobile phone service. It should not be affected by switching barriers since repurchase refers to a hypothetical case where no barriers exist (i.e., when acquiring a new phone or service, individuals may freely choose any service provider they want since they are not tied by previous contractual obligations). In contrast, PT is the probability of staying with the current provider if it increases its prices, or if competitors decrease their prices. It is measured with respect to the actual situation where switching barriers exist (i.e., due to prior contractual obligations). Therefore, it is suggested that, in the case of mobile services, loyalty consists of two distinct components: RL and PT.

2.3. Research questions

To explore the aforementioned arguments, this study adapts the ACSM to address two important research questions. The first question pertains to nomological validity and the application of the modified ACSM to test user satisfaction and perceptions of mobile services:

(1) Does the adapted ACSM provide an accurate description of user behaviour with respect to mobile services? Consistent with previous studies that employed this model, a number of hypotheses are suggested:

H1. There is a positive association between PE and PQ of mobile services.

H2. There is a positive association between PE and PV of mobile services.

H3. There is a positive association between PE and customer satisfaction with mobile services.

H4. There is a positive association between PQ and PV of mobile services.

H5. There is a positive association between PQ and customer satisfaction with mobile services.

H6. There is a positive association between PV and customer satisfaction with mobile services.

H7. There is a positive association between customer satisfaction and RL from a particular provider of mobile services.

H8. There is a positive association between customer satisfaction and PT with respect to a particular provider of mobile services.

H9. There is a negative association between customer satisfaction and CC.

H10. There is a negative association between CC and RL from a particular provider of mobile services.

H11. There is a negative association between CC and PT with respect to a particular provider of mobile services.

The second research question relates to the computation of the ACSI based on this model. The calculation of this index will allow the comparison of a user's satisfaction with mobile services to the extent of people's satisfaction with services in other sectors. Furthermore, it can provide the basis for future comparative and longitudinal studies employed by academics and policy makers:

(2) What is the ACSI of mobile services in Canada, and how does it compare to other industries?

3. Methodology

Answering the suggested research questions and testing the hypotheses was accomplished through a survey of 210 mobile phone users. The questionnaire employed in this study is presented in Appendix A. The following sub-sections report on the selection of subjects and present the rationale for the creation of the instrument.

3.1. Subjects

Respondents to the self-administered survey comprised two groups. The first group included 148 individuals who where randomly chosen undergraduate and graduate students as well as staff and faculty members of two Canadian universities. The second group comprised 62 indiscriminately selected mobile phone users who were personally known to the researchers, and who resided in Canada. In order to control for country-specific effects, residents of only one country (Canada) were surveyed.

On the one hand, this data collection approach corresponds to a convenience rather than a probabilistic sampling method (Kitchenham & Pfleeger, 2002). On the other, it was believed that surveying this sample population would yield statistical results generalizable to the entire, young adult user population for the following reasons. First, all respondents had used mobile phones for at least 4 months. This experience is sufficient to establish reliable perceptions and opinions regarding the service. Second, as indicated in Section 4 of this paper, this sample is an actual representation of the entire young adult Canadian user population based on the comparison of several demographic and use dimensions. While there are no available demographic data with regard to the average age of cell-phone users in Canada, it is believed that the sample used in this study is somewhat young in comparison to the general population of mobile service users (most respondents were under 24 years with an average age of 23.8 years). Thus, based on this sample, it is reasonable to assume generalizability to young adults. Further empirical examination is required to obtain results generalizable to the entire population.

3.2. Measures

The Likert scales for measuring all constructs were adapted from Fornell et al. (1996). In measures of customer satisfaction, skewed frequency distributions represent a serious threat to the validity of the statistical results (Anderson & Fornell, 2000).

In order to avoid that problem, a ten-point Likert-type scale was utilized since it enables respondents to make better discriminations (Andrews, 1984). The use of a fairly high number of scale categories as well as multiple questions per constructs was expected to yield valid data. In addition to questions pertaining to the ACSM, several responses pertaining to demographic information, current service providers and types of contractual obligation (i.e., pre-paid vs. post-paid) were solicited.

In order to improve the validity of the research instrument, a group consisting of industry practitioners, academics and mobile phone users was consulted. As a result of their feedback, a few scales were slightly modified and several questions were adjusted. Overall, it was believed that the use of this research instrument facilitated the collection of reliable and valid data that may help answer the proposed research questions and related hypotheses.

4. Data analysis and results

4.1. Descriptive statistics

The study was conducted in the first quarter of 2004. It involved 210 current mobile phone service users residing in Canada. Six questionnaires were returned incomplete, and they were excluded from data analysis. Overall, 204 valid responses were obtained. One hundred and sixty-two respondents used post-paid mobile services, 37 used pre-paid, and five did not report their contractual relationship. The application of the χ^2 goodness-of-fit test (Snedecor & Cochran, 1989) to examine the respondents' distribution (81% post-paid and 19% pre-paid) in comparison to the general population's distribution (77% and 23%, respectively) (CWTA, 2004) reveals that the obtained sample represents the population. There were 109 female and 94 male participants. Table 1 outlines the study's descriptive statistics.

The analysis demonstrates that most respondents used cellular phones mainly for personal communications (93%), but some used them for work as well (30%).[3] 81% of the respondents paid their own phone bills. In

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[3]The sum is more than 100% since some individuals used mobile phones for both personal communication and work.

Table 1
Demographics

	Under 20	20–24	25–34	Over 34
Male	2	50	32	9
Female	9	68	28	1
Total[a]	11	118	60	10

[a]The total sum is 199 since five respondents did not report their age for personal reasons.

Table 2
Respondents' experience with current service provider and current handset

	Under 6 months ago (%)	7–12 months ago (%)	13–24 months ago (%)	25–36 months ago (%)	Over 36 months ago (%)
When did you purchase/receive this phone?	24	36	27	8	5
When did you connect to your current service provider?	21	25	23	15	16

other cases, phone bills were paid by employers, parents, etc. The majority of respondents had only one mobile phone (96%) but some used two or three handsets simultaneously (4%). Nokia was the dominant handset brand among the respondents (29%), followed by Motorola (21%). The rest used various other handset brands (e.g., Samsung, Audiovox, LG). Thirty-three percent had a color screen phone, and 9% had an integrated digital camera.

Respondents reported various levels of experiences with mobile services and the phone functionalities. Seventy-two percent reported using one or more mobile phones before acquiring their present one. Table 2 offers descriptive statistics on current service providers and handsets experience.

Table 3 reports on users' experience with value-added services (VAS).

Further analysis demonstrates that an average respondent talked for 28 min per day over the phone, sent and received one or two text messages (SMS) per day, and spent Canadian $53 per month.[4] Thus, the monthly average revenue per user (ARPU) of the obtained data sample is almost identical to the average ARPU in the Canadian population (Canadian $54 in 2002, according to CWTA (2004)). This further confirms the validity of obtained data set.

Table 4 outlines the distribution of respondents in terms of wireless service providers, compared to the distribution of subscribers in Canada. Although there are some differences in numbers, it was believed that the obtained sample fully represents the general young population's distribution and the results are generalizable to the entire young adult Canadian mobile phone user population.

4.2. Measurement model

Total set loadings of all items were estimated by using partial least squares (PLS) (Chin, 1998, 2001). In general, the employment of structural equation modeling techniques is common in mobile telecommunications research (for example, see Gerpott et al., 2001; Kim et al., 2004). PLS was chosen for this project because it fits both exploratory and confirmatory research, places less restriction on the data distribution, and requires smaller sample sizes (Gefen, Straub, & Boudreau, 2000). In addition, since the prior ACSM-based studies

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[4]This part of descriptive statistics comes from Part A of the questionnaire (mobile phone usage), where users were asked about their monthly expenses, SMS usage, phone usage, etc., and these self-reported numbers were averaged.

Table 3
Experience with value-added services

Feature	Respondents who use this feature (%)[a]
Voicemail	67
Text messaging	60
Roaming	37
Play games on handset	30
Download ringtones and icons	18
Voice-activated dialing	16
Wireless Internet access	14
SMS-based information services	8
Picture messaging (MMS)	6
Download games	4

[a]The total is more than 100% since many individuals used two or more services.

Table 4
Service providers' distribution

Wireless operator	Sample (%)	Population (%)[a]
Rogers AT&T wireless	43.6	28.22
Telus	24.3	25.50
Bell mobility	21.8	37.01
Microcell (Fido)	10.4	9.27

[a]Based on the subscriber data report from the Canadian Wireless Telecommunications Association (2004).

utilized PLS, the usage of this technique allows comparison of the results obtained in the present investigation with those of previous projects.

Table 5 presents the measurement model. The results demonstrate that the loadings of all items exceeded the required threshold of 0.7, and, therefore, explain over 50% of the variance in an observed item. The item-to-total correlations of all indicators were greater than 0.35. As such, no items were removed from the measurement model.

In order to test for discriminant validity, two steps were taken. First, a matrix of loadings and cross-loadings was constructed (see Table 6). By using this matrix, the loadings of an item with its associated factor (or construct) to its cross-loadings were compared. Second, a comparison of the average variance extracted (AVE) from each of the constructs with its shared variances with other constructs is conducted (Fornell & Larcker, 1981). Table 7 outlines the inter-construct correlations (below the diagonal) and the square roots of the AVE (in the diagonal). A visual inspection of the table demonstrates that the AVE for all constructs is higher than their shared variances.

Table 6 reveals that all items had somewhat higher loadings with their corresponding factors in comparison to their cross-loadings. Nevertheless, cross-loading in some cases (e.g., between PQ items and PV items) is fairly high. A similar pattern of high inter-construct correlations is observed in Table 7.

One may argue that these observations indicate that the discriminant validity is somewhat compromised. It is believed, however, that the validity of the model is not threatened for three reasons. First, the loadings of items on the constructs to which they belong are higher than their cross-loadings.

Second, the highly correlated constructs represent independent and dependent variables that are expected to be correlated. As stated by Straub, Boudreau, and Gefen (2004, p. 25), 'loadings across what are traditionally known as independent and dependent variables are not relevant to the issue of construct validity and such tests may/should be avoided in PCA [principle component analysis].'

Third, other studies that utilized or adapted the ACSM also report high correlations between its constructs. For example, O'Loughlin and Coenders (2004) show a very high correlation between quality and satisfaction since the path coefficient between them is 0.95. Other studies directly report high correlations. For instance, a

Table 5
Estimated loadings for the total set of measurement items

Item	Mean	Std. dev.	Loading	Error	Item-total correlations
PQ1	6.419	1.737	0.910	0.172	0.789
PQ2	6.773	1.774	0.910	0.172	0.787
PQ3	6.665	1.773	0.898	0.193	0.783
PE1	7.507	1.753	0.791	0.375	0.633
PE2	7.606	1.672	0.904	0.183	0.727
PE3	7.636	1.719	0.925	0.144	0.790
PV1	6.100	2.117	0.948	0.102	0.791
PV2	5.900	2.106	0.942	0.113	0.791
ACSI1	6.389	1.980	0.904	0.183	0.753
ACSI2	5.493	1.609	0.863	0.256	0.701
ACSI3	5.818	1.943	0.870	0.243	0.723
CC	0.440	0.517	1.000	0.000	1.000
RL	6.500	2.641	1.000	0.000	1.000
PT1	5.124	1.830	0.746	0.444	0.538
PT2	3.901	1.849	0.941	0.114	0.538

Table 6
Matrix of loadings and cross-loadings

	PQ	PE	PV	ACSI	CC	RL	PT
PQ1	**0.910**	0.271	0.678	0.744	−0.157	0.479	0.195
PQ2	**0.910**	0.351	0.653	0.719	−0.119	0.367	0.134
PQ3	**0.898**	0.325	0.610	0.639	−0.130	0.409	0.134
PE1	0.315	**0.791**	0.179	0.191	0.197	0.177	−0.065
PE2	0.377	**0.904**	0.273	0.281	0.161	0.195	−0.105
PE3	0.393	**0.925**	0.290	0.282	0.186	0.256	−0.155
PV1	0.716	0.240	**0.948**	0.786	−0.237	0.440	0.181
PV2	0.639	0.206	**0.942**	0.774	−0.217	0.415	0.186
ACSI1	0.787	0.301	0.811	**0.904**	−0.131	0.502	0.238
ACSI2	0.620	0.114	0.664	**0.863**	−0.243	0.402	0.298
ACSI3	0.624	0.208	0.683	**0.870**	−0.142	0.435	0.246
CC	−0.233	0.184	−0.330	−0.262	**1.000**	−0.055	−0.072
RL	0.460	0.150	0.472	0.519	−0.065	**1.000**	0.146
PT1	0.117	−0.078	0.100	0.198	0.008	0.138	**0.746**
PT2	0.116	−0.141	0.130	0.189	−0.071	0.140	**0.941**

Table 7
Correlation matrix and discriminant validity assessment[a]

	PQ	PE	PV	ACSI	PT
PQ	**0.906**				
PE	0.469	**0.868**			
PV	0.715	0.313	**0.945**		
ACSI	0.775	0.318	0.822	**0.874**	
PT	0.129	−0.135	0.126	0.237	**0.859**

[a]Fornell and Larcker (1981) measure of discriminant validity which is the square root of the average variance extracted compared to the construct correlations. The values are greater than those in corresponding rows and columns as per Fornell and Larcker.

Table 8
Construct statistics

	PQ	PE	PV	ACSI	PT
Arithmetic mean	6.619	7.583	5.998	5.900	4.512
Cronbach's α	0.891	0.847	0.883	0.850	0.711
Internal consistency	0.932	0.907	0.943	0.911	0.836
Convergent validity	0.821	0.766	0.883	0.763	0.738

correlation of 0.79 between PV and satisfaction is reported by Lai (2004); and a correlation of 0.77 between quality and satisfaction is observed by Babakus, Bienstock, and Scotter (2004). Overall, it was found that the mean correlation among factors in a customer satisfaction model is 0.74, ranging from 0.67 to 0.83 depending on the strength of the statistical relationship (Choi, Cho, Lee, Lee, & Kim, 2004).

Overall, it is concluded that even though some of the inter-construct correlations of the reported model are fairly high, they are still within the norm (the highest inter-construct correlation in the model under investigation is 0.822). As such, it is reasonable to have some confidence in the discriminant validity of the model's constructs.

Table 8 presents construct statistics. First, tests for reliability of the measurement items related to five constructs were conducted by estimating Cronbach's α. Based on the results, it was concluded that all scales behaved consistently. Second, internal consistency and convergent validity measures were calculated based on the guidelines by Fornell and Larcker (1981). The analysis demonstrated high internal consistency and convergent validity since the scores exceeded the 0.7 and 0.5 thresholds, respectively (Fornell & Larcker, 1981).

Based on the obtained measurement model, two key observations were made. First, the cross-loadings of items pertaining to two presumably independent constructs: RL and PT were low (RL–PT1 = 0.138 and RL–PT2 = 0.140). This observation confirms that mobile phone users perceive RL and PT to be entirely independent factors.

Second, the loading of the PT1 indicator (0.75) was substantially lower than the loading to the PT2 item (0.94). Recall that the corresponding questions pertained to the probability of switching to a competitor given that the competitor reduces prices (PT1) or staying with the same service provider given that the service provider increases its prices (PT2). The difference in the loadings suggests that even a slight increase in the current fees accounts for more variability in loyalty than a similar price reduction by a competitor. For example, a 5% increase in current charges will have a greater negative impact on customer retention than a 5% decrease in fees by competitors. In addition, the mean of PT1 (5.1) was higher than that of PT2 (3.9). A paired t-test of the means of these items confirmed a significant difference ($p < 0.000$, $t = 9.961$). This indicates that an average cell-phone user may consider changing a current provider if it raises prices by 14%, whereas she or he may tolerate any competitive price reductions up to 20% (see the questionnaire for more detail).

4.3. Structural model

Bootstrapping[5] was employed to derive t-statistics to assess the significance level of the model's coefficients and to test the hypotheses. Two hundred sub-samples were generated, which is twice as high as the default resampling option of PLS-Graph 03.00. As suggested by Chin (2001, p. 14), "resamples of 200 tend to provide reasonable standard error estimates." A category of contractual obligations (prepaid vs. post-paid) and type of a phone screen (color vs. non-color) were used as control variables.

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[5]Bootstrapping is an inferential technique that allows generating t-values to assess the significance of a model's standardized path coefficients, (Chin, 2001). Bootstrapping is a re-sampling procedure that assesses the significance of PLS parameter estimates (i.e., path coefficients). Bootstrapping re-samples with replacement from the original sample set until it reaches the specified number of cases.

$R^2 = 0.231$

Perceived
Quality

$R^2 = 0.096$

Price
Tolerance

H5

0.723 ***

0.398 ***

H4

$R^2 = 0.522$

0.488 ***

H1

Perceived
Value

0.555 ***

$R^2 = 0.751$

Customer
Satisfcation

0.243 **

H8

0.039

H11

Customer
Complaints

-0.257 ***

H9

$R^2 = 0.079$

-0.016

H2

-0.042

H3

0.598 ***

H7

0.048

H10

Perceived
Expectations

Repurchase
Liklihood

$R^2 = 0.348$
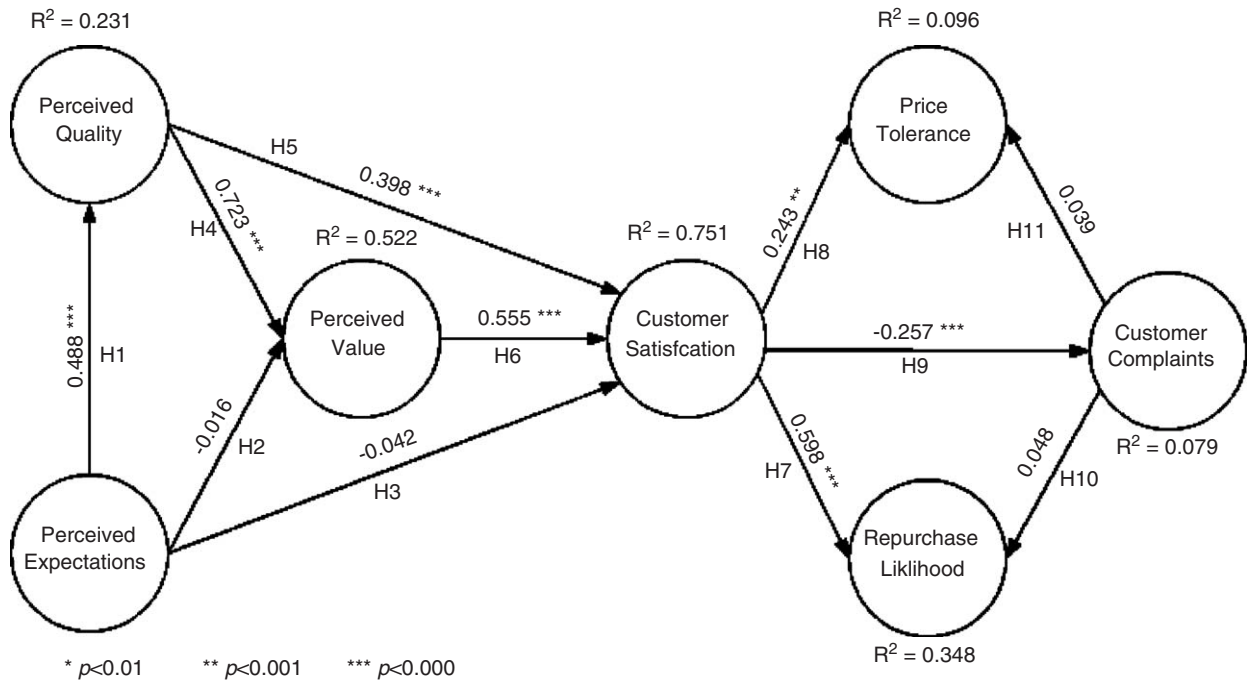
* *p*<0.01   ** *p*<0.001   *** *p*<0.000

Fig. 2. The structural model.

Fig. 2 presents the structural model. As such, seven hypotheses were supported (H1, H4, H5, H6, H7, H8, and H9) and four hypotheses were rejected (H2, H3, H10, and H11). The β coefficients for the rejected hypotheses were close to a zero and all *t*-values were below one. In order to further confirm the insignificance of the rejected hypotheses, the linkages corresponding to those hypotheses were dropped, and the PLS model was re-estimated. The analysis revealed that the β coefficients and *t*-values of the remaining model were still strong and significant, and that none of the R^2 values changed. This demonstrates the statistical validity of the remaining linkages.

Several issues can be highlighted from the structural model. First, the rejection of H2 and H3 indicates that consumer expectations have no direct effect on both perceived value and customer satisfaction with mobile services. Rather, perceptions of value for money and quality mediate the effect of perceived expectations on satisfaction. It should be noted that this finding is congruent with previous satisfaction studies. For example, Gorst et al. (1999) report on the insignificant effect of expectations on customer satisfaction for first time conference attendees.

The interpretation of such findings could be that expectations themselves are meaningless, without contrasting them with the experienced quality and the monetary value of the mobile service. Thus, wireless operators in Canada need to form reasonable customer expectations that are aligned with the actual quality and the price paid for the service in order to foster satisfaction. This notion may be especially important with regards to innovative services. For example, in terms of newly launched Third-Generation Services, wireless service providers may be better reporting coverage problems and actual bit rates, etc., rather than over exaggerating. Another example would be that with respect to packet-based billing, wireless service providers may want to develop reasonable aggregated price estimations per service incident. In this case, subscribers will be able to reasonably a priori approximate the cost of using a service, and develop expectations that are aligned with the actual quality and value of the service.

Second, the rejection of H10 and H11 indicates that the number of formal and informal CC regarding a wireless service provider have no direct effect on RL and PT. This may be partially attributed to the demographics of the subjects used in this study. In particular, age was shown to play a major role in determining technology perceptions (Lightner, 2003). Thus, it is reasonable to believe that young adults are

more familiar with cellular technologies, have a higher tendency to complain and are more demanding than older users. As such, the complaining behavior of young adults may be explained by other factors, not examined by the suggested model. Such factors may be less instrumental, and include self-efficacy with mobile technology (i.e., knowing what to ask for) (Boyle & Ruppel, 2004; Gebauer, Shaw, & Zhao, 2002), "trendy" demanding behavior, or a general tendency to complain. Therefore, the reported complaints may be partially derived from non-instrumental motives and thus exhibit a weak effect on PT and RL.

The implication for service providers that stems from this finding is not that complaints are unimportant. Rather, it is believed that the number of complaints may have a low effect in the retention battle, but it may have a strong impact on other user behaviors, for example, word of mouth. These behaviors were not examined in this study. In addition, it is possible that the way the complaints were treated is more important than the number of complaints in predicting PT and RL. Thus, if a subscriber complained many times, and in all cases complaints were handled in a satisfactory manner, his/her RL and PT may still be very high. Overall, it is hypothesized that service providers cannot fully control complaints behavior because it is affected by various external, uncontrollable factors. Nevertheless, they should strive to minimize complaints since dealing with them affects the operating costs. In addition, it is recommended that service providers adequately and professionally address complaints whenever these arise.

4.4. The Canadian ACSI of mobile services

An index score was calculated for the satisfaction construct (ACSI) in Canada, based on the formula suggested by Anderson and Fornell (2000):

$$\text{ACSI} = \frac{\sum_{i=1}^{3} w_i \bar{x}_i - \sum_{i=1}^{3} w_i}{9 \sum_{i=1}^{3} w_i} \times 100,$$

where w_i is the weight of the ith item obtained from the outer model generated by PLS and $\bar{x}_i$ is the average of the ith item that loads on the ACSI construct. This index represents the ACSI score for the Canadian mobile services. Surprisingly, this score (54.67) was relatively low compared to the scores reflecting customer satisfaction with products and services in other industries in the USA in Q4, 2003. In addition, the ACSI organization has started reporting the ACSI score for wireless services in the USA after the completion of this research project. The ACSI score in Canada obtained within the present study is significantly lower than the USA score reported by the ASCI organization for Q1, 2004.

Table 9 outlines the comparison of the ACSI with wireless service in Canada with the ACSI of other sectors as well as the ACSI of the wireless sector in the USA.

One of the potential explanations for the low-satisfaction level in Canada is the use of fairly young subjects in this study. The average respondent age in the USA sample was 44 (data was kindly provided by the ACSI organization); whereas the average age in the sample obtained though primary data collection in Canada was 24.8.

Table 9
ACSI for select industry sectors[a]

Sector	ACSI
E-commerce	80.8
Retail	75
Finance/insurance	74.7
Fixed-wire telephone services	72
Scheduled airlines	67
Mobile services (USA)	**65**
Publishing/newspapers	64
Cable & satellite TV	61
Mobile services (Canada)	**54.67**

[a]Data obtained from www.theacsi.org

Age is believed to be an important factor in determining satisfaction levels. In particular, this view was empirically supported by Palvia and Palvia (1999), who showed that age is a salient predictor of satisfaction with information technology. In addition, industry experts believe that an age effect exists. For example, the managing director of the ACSI at the National Quality Research Center of the University of Michigan Business School argues that "ten years of ACSI data have consistently demonstrated that younger age cohorts are significantly less satisfied than older age cohorts across the aggregate of all products and services in the consumer economy" (VanAmburg, 2004). Such statements provide some confidence in the age effect.

To overcome this issue, a normally distributed sub-sample of 186 USA responses with the mean of 24.75 was created that was comparable to the ones collected by the authors. This data set was obtained by the authors by prior agreement with the ACSI organization at the National Quality Research Center of the University of Michigan Business School. The USA ACSI for young adult users was calculated based on this sub-sample, and it was shown to be 56.0. This score is slightly higher than the one obtained in Canada for a similar population, and may be considered comparable. Therefore, it is concluded that the results of this study are reasonable, and that young adults across North America (Canada and the USA) have similar levels of satisfaction with mobile services.

5. Conclusions and directions for future research

The study's intention was to apply an adaptation of the ACSM to mobile services and to calculate the ACSI for Canadian wireless carriers and compare it with indices of other industries. This measure of satisfaction is suggested to be an important performance indicator that may be used by regulators and wireless carriers. Regarding the first research question, the study demonstrates that the adaptation of the ACSM adequately describes the service perceptions and customer behaviors of mobile phone users. Particularly, it suggests that the degrees of PQ and PV are the key factors affecting a person's satisfaction with mobile services. Satisfactory, in turn, influences the extent of loyalty. As such, highly satisfied customers tend to demonstrate a high likelihood of repurchase and higher tolerance to price increases by their providers or price decreases by competitors. A negative link between satisfaction and CC shows that the more satisfied a customer is, the less he or she is prone to complain. Nevertheless, satisfaction only partially explains complaints behavior, and other factors may be taken into account to better explain CC.

Furthermore, it was found that due to the moderating role of switching barriers, loyalty, in the context of mobile services, is not a unified construct but rather one with at least two distinct dimensions: RL and PT. This finding calls for further examination of the loyalty concept in the wireless services sector.

In addition, a non-significant direct effect of customer exceptions on satisfaction indicates that in the wireless-services context, expectations are relevant only when contrasted with the experienced service quality and with the PV for money. This finding suggests that wireless operators need to avoid hype and align expectations with the service delivered.

With regard to the second research question, it was initially found that the respondents to the survey reported a surprisingly low degree of satisfaction with mobile services, which is even lower than those of cable companies and satellite TV providers in the USA. However, a closer examination of the results reveals that an age effect may have driven the satisfaction score down. As such, it is concluded that the satisfaction score of young adults with mobile services in Canada is comparable to the score of the same population in the USA. This suggests that both Canadian and American mobile operators need to further improve their offering for young adults through a better understanding of their subscriber needs.

This is especially important due to the fact that the aforementioned cohort of users includes many technology-savvy innovators and early adopters, who may become the future users of novel VAS. To stay competitive and increase revenues beyond voice communications, service providers turn to VAS (Barabee, 2003). Despite the importance of these services for service providers' prospects, most of these services have not prevailed. By 2003, VAS accounted for only 1.9% and 11.9% of the total ARPU in North America and worldwide, respectively (The Yankee Group, 2004). Thus, improving service satisfaction among young adult subscribers may drive future adoption of third generation as well as other advanced types of VAS.

Despite its potential contribution, this study had two key limitations. First, a convenience data sample was used. Although it was concluded that this data collection procedure produced reliable and valid results, the

employment of random samples is necessary to judge upon the generalizability of findings of any empirical investigation. Second, cell-phone users residing in only one Canadian province were surveyed. On the one hand, this allowed researchers to control for location-specific effects. On the other, similar data samples should be obtained in other geographical areas that may reveal differences in customer satisfaction based on users' geographical locations.

With respect to future projects, a longitudinal study is necessary to monitor the evolution of customer behavior over time. In addition, similar studies should be conducted in other countries, and cross-national comparison should be performed. Such studies can potentially explain cross-national differences in the adoption and use of mobile service around the globe, and provide some guidance for wireless carriers who operate globally, in more than a single country.

To the knowledge of the authors, this was the first documented attempt to apply the adapted ACSM to investigate user perceptions and behavior toward mobile services in Canada. Overall, it is believed that this study provides insights for service providers, policy makers and users and forms the foundation for the further explorations in the field of mobile commerce.

Appendix A

Questionnaire

Part A. Mobile Phone Usage.
Please check the box or circle the number that best matches your mobile phone (cell-phone) usage.

Are you using more than one mobile phone?
☐ Yes   If yes, how many mobile phones are you currently using? _____
☐ No

Please answer the questions below with respect to your current mobile phone, or the mobile phone you are most frequently using, or the phone you were using.
What is the phone's brand? _____ Model (if known) _____
Does it have a color screen?   ☐ Yes   ☐ No
Does it have a digital camera?   ☐ Yes   ☐ No

Who is your current service provider?
☐ Rogers   ☐ Telus   ☐ Fido   ☐ Bell   ☐ Other (specify) _____

When did you purchase/receive this phone?
_____ months ago
When did you connect to your current service provider?
_____ months ago
Is this your first mobile phone?   ☐ Yes   ☐ No
Do you personally pay your mobile service bills?
☐ Yes
☐ No   If no, please specify who pays your bills:_____
What do you primarily use your mobile phone for? (check all applicable categories)
☐ work   ☐ personal   ☐ emergencies   ☐ other (explain) _____
Please specify all mobile services you use (check all applicable categories)
☐   voice calls
☐   download games
☐   play games
☐   text messaging (SMS, MMS)
☐   picture messaging (picture exchange)
☐   voicemail
☐   download ringtones and icons
☐   voice activated dialing
☐   wireless Internet access

☐   roaming (using your mobile phone in a foreign country)
☐   information services (e.g., news, stock quotes, weather, etc.)
The average number of calls you make per day (i.e., when you call someone first)
_____ calls
The average number of calls you receive per day (i.e., when someone calls you first)
_____ calls
The average number of text messages (SMS, MMS) you send per day (if any)
_____ messages
The average number of text messages (SMS, MMS) you receive per day (if any)
_____ messages
How much time do you spend talking over your mobile phone per day?
_____ minutes
What are your average monthly expenses? (i.e., your average monthly mobile phone bill)
$ _____

Part B. Pre-purchasing expectations.

Please answer the questions below based on your general experience with the mobile phone and service **you are currently using**. If you are using more than one phone, consider the **most frequently utilized** one.

Definitions: You use a **pre-paid** service if you purchase calling cards for your mobile phone.

You use a **monthly billing** service if you receive a monthly bill from your provider and you pay it within a certain period of time by check, money transfer, credit card, pre-authorized payment from your banking account, at a bank in person, etc.

What category (or type) of program are you using?

☐ **Pre-paid** (i.e., you purchase calling cards for your mobile phone)

☐ **Monthly billing** (i.e., contract-based, you receive a monthly bill from your provider and you pay it within a certain period of time by check, money transfer, credit card, pre-authorized payment from your banking account, at a bank in person, etc.)

Please answer the three questions below with respect to your **expectations** of the quality of services of this provider (i.e., before you became a customer of this provider):

PE1. What were your overall expectations of the quality of mobile services?

very low							very high		
1	2	3	4	5	6	7	8	9	10

PE2. What were your expectations of the extent to which these mobile services would meet your personal requirements?

very low							very high		
1	2	3	4	5	6	7	8	9	10

PE3. What were your expectations of the reliability of these mobile services?

very low							very high		
1	2	3	4	5	6	7	8	9	10

Part C. Actual experience.

Please answer all questions below with respect to your **actual experience** with mobile services of this provider:

PQ1. What is your overall evaluation of the quality of mobile services?

very low							very high		
1	2	3	4	5	6	7	8	9	10

PQ2. What is your evaluation of the extent to which these mobile services meet your personal requirements?

very low							very high		
1	2	3	4	5	6	7	8	9	10

PQ3. What is your evaluation of the extent to which these mobile services are reliable?

very low   very high

1   2   3   4   5   6   7   8   9   10

PV1. Please rate the quality of mobile services given the prices you pay

very low   very high

1   2   3   4   5   6   7   8   9   10

PV2. Please rate the prices of mobile services given the quality you receive

unfair   fair

1   2   3   4   5   6   7   8   9   10

ACSI 1. Overall, how satisfied are you with mobile services? (all things considered)

very dissatisfied   very satisfied

1   2   3   4   5   6   7   8   9   10

ACSI 2. Considering your expectations, to what extent have these mobile services fallen short or exceeded your expectations?

fell very short   exceeded by far

1   2   3   4   5   6   7   8   9   10

ACSI 3. How close are the services offered by this provider to your ideal mobile services?

very far from ideal   very close to ideal

1   2   3   4   5   6   7   8   9   10

RL. If you required a new mobile phone, how likely is it that you would choose your current provider for mobile services?

very unlikely   very likely

1   2   3   4   5   6   7   8   9   10

PT1. If a competitive provider offers you the same range and quality of services as you currently receive, by how much should their prices be lower than those you are currently paying for you to change your current provider?

1%   5%   10%   15%   20%   25%   30%   40%   50%   over 50%

PT2. If your current service provider increases prices given the same range and quality of services, how much would they have to increase their prices for you to consider switching to a competitor?

1%   5%   10%   15%   20%   25%   30%   40%   50%   over 50%

CC1. Have you ever complained (either formally or informally) about mobile services you receive?

☐   Yes
☐   No

Part D. Demographics.

Your age: _____ years   Your gender: ☐   ☐

                                                   male   female

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