Original Article

Potential moderators of the link between rate plan suitability and customer tenure: A case in the Canadian mobile telecommunications industry

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ABSTRACT In the competitive wireless telecommunications market, customer retention has become a priority to many carriers, as they face high customer acquisition cost and high churn rate. Prior literature has found that wireless customers often subscribe to inappropriate rate plans, and thus overpay for their services. A new database marketing strategy called 'Rate Plan Optimization' has emerged, but literature in this area is still limited. This paper aims to strengthen our understanding of this strategy by analyzing the potential moderating effects of customer's frequency of handset change, frequency of rate plan change, customer age and contract status on the linkage between rate plan suitability and customer tenure. The data set covers 1249 wireless users in Canada. The hypotheses are tested by factorial Analysis of Variance (ANOVA). This paper argues that except customer's age, all other factors being analyzed have positive moderating effects on the linkage.

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INTRODUCTION

Wireless rate plans are often perceived as confusing and difficult to compare.¹ Prior research has demonstrated that many customers are overpaying for their wireless services because they have selected the wrong rate plans. In the wireless

telecommunications market, approximately 56 per cent of Canadians and 40 per cent of Koreans are subscribing to non-optimal rate plans. As a result, rate plan optimization, the act of matching these customers to use optimal rate plans, has been suggested as a viable customer

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retention strategy.^{2,3} Academic literature in this area is still limited, though researchers have explored a wide range of churn determinants and customer retention strategies for the wireless industry in the last decade.^{4–11} In light of the rapidly changing market environment, marketers in the wireless telecommunications industry are looking for new ways to better retain their valued customers. The goal of this paper is to strengthen our understanding of the use of rate plan optimization as a feasible customer retention strategy, through analysis of some potential moderating factors that may influence the strength of the relationship between rate plan suitability and customer tenure. These factors include frequency of handset change, frequency of rate plan change, customer age and contract status.

LITERATURE REVIEW

Prompted by high customer costs and high churn rate,¹² there has been a growing amount of literature on customer retention strategies for the wireless industry.

Improvements in voice call quality, wireless coverage, customer complaint process and the development of value-added services are suggested in order to enhance wireless customer satisfaction levels.⁸

According to Baron and Kenny,¹³ researchers are often interested in the moderating effects of certain variables because their variations can influence the direction or strength between an independent and a dependent variable. Previous studies in the wireless telecommunication industry have identified many factors that act as moderators in the customer satisfaction-loyalty-retention linkage, including handset brand, customer's income level, service pricing, brand image of competitors and various switching barriers.^{9,11}

Although previous research has contributed to our knowledge in the field of customer loyalty and retention in the

wireless market, the discussion on rate plan optimization is limited. Wong² argues that helping customers to save money, by matching them to the optimal rate plans, is a feasible strategy to reduce customer churn rate. Previously, Joo *et al*³ have suggested that rate plan optimization is beneficial to wireless carriers from a long-term financial perspective. In their research of the Korean wireless market, Joo *et al*³ have identified variables such as customer age, contract duration and frequency of handset change for analysis. This provides a direction for our research.

HYPOTHESES

This research study considers the following factors and examines their potential moderating effects on the linkage between rate plan suitability and customer tenure.

- Frequency of handset change.
- Frequency of rate plan change.
- Customer age.
- Contract status.

Although there are other demographic factors such as gender, income level and ethnic background that may potentially influence their retention intentions, this study has chosen not to include them for analysis. This is because such data could not be easily obtained in Canada because of privacy and regulatory restrictions, and the Canadian wireless carrier that sponsors this research is unable to provide such information for the purpose of this research.¹⁴

A high-level conceptual framework is shown in Figure 1.

Wireless carriers launch new mobile handsets on a regular basis to attract customers. The latest models often bring customers with tangible benefits such as longer battery life, faster download speeds and a more fashionable design. Getting an insight into the importance of mobile handset change can help wireless carriers to

Figure 1: The moderating effect.

better develop business rules and customer retention programs. This leads to the development of our first hypothesis:

Hypothesis 1: Frequency of handset change has moderating effect on the linkage between rate plan suitability and customer tenure.

In the Canadian wireless telecommunications industry, wireless service can be priced in many different ways. Customers can find up to 45 different kinds of post-paid wireless rate plans with a particular wireless carrier, not to mention the various special plans that are not published but are available on request by customers.^{15,16} The monthly payment can vary depending on customer's actual usage of the wireless service. Usually a rate plan includes a fixed amount of free (in-bucket) minutes for voice calling, and extra usage is charged at a premium rate. In this research, rate plan suitability is determined through a series of steps. Initially, the optimal range of minute usage is calculated for each plan based on its specification such as included buckets of minutes and overage charges. A customer is said to have the optimal rate plan (coded as '0.00') when his or her monthly usage falls within the subscribed plan's optimal range of minutes, resulting in the lowest monthly payment as compared to all available plans. On the other hand, non-optimal rate plan customers are those who are using rate plans that are too small or large; they are coded as '1.00' in Statistical Package for Social Science (SPSS).

Unless a customer can accurately predict his or her usage pattern, selecting an inappropriate rate plan can lead to overpayment in service fees. Previous literature has given us some insights into telecommunications customers' ability in rate plan selection. It has been suggested that customers cannot accurately predict their own usage requirements, and thus they often make the wrong rate plan selection.^{3,17-19}

Reasons for making a wrong rate plan selection are customers' lack of understanding of their usage requirements, persistent misperception of their actual usage or preference for high-usage rate plans to ease up their billing concerns.^{18,20,21} It is not surprising to learn that only 56 per cent of American wireless customers report using all of their in-bucket minutes on a monthly basis.²²

Some customers may switch their rate plans during their tenure with the wireless carrier because they have new usage requirements or want to take advantage of the newly launched rate plans that are more attractive. By gaining an insight into their frequency of rate plan change, wireless carriers can better identify those customers who are more sensitive to rate plan suitability, and can then carry out customer retention activities accordingly. As such, the second hypothesis is developed:

Hypothesis 2: Frequency of rate plan change has moderating effect on the linkage between rate plan suitability and customer tenure.

Demographic factors may also influence the relationship between rate plan suitability and customer tenure. Would teenagers care more about rate plan optimization because they are more price sensitive than the elders? If the answer is 'Yes,' to what extent is the difference? Gaining an understanding into this area can help wireless carriers to better target the

appropriate customer segments for rate plan optimization. Hypothesis three is developed to address this question:

Hypothesis 3: Customer age has moderating effect on the linkage between rate plan suitability and customer tenure.

Another moderating factor that is considered in this research is the type of service contract that customers have signed with the wireless carrier. In general, customers can be segmented into three categories: (i) customers with no contract, (ii) customers who have expired contracts and (iii) customers who are currently on contracts. A contract acts as a switching barrier because early termination fees have to be paid if a customer chooses to break the term of a long-term contract. From the customer's perspective, a contract-free service is good because there is no long-term financial commitment. However, customers are often presented with handset subsidies or other attractive incentives to sign a long-term contract with the wireless carriers. To what extent is contract useful in customer retention? This leads to the development of the fourth hypothesis:

Hypothesis 4: Contract status has moderating effect on the linkage between rate plan suitability and customer tenure.

With this hypothesis, wireless carriers can understand the values of contract, in terms of its effect on customer tenure.

DATA DESCRIPTION

This research follows the strategy of Joo *et al.*³ to use secondary data for analysis. The data set, which includes records from 1249 post-paid wireless customers, is provided by a national wireless carrier in Canada. All of these residential customers were new to the wireless carrier; they activated their wireless services in the month of May 2002 and subscribed to similar national long-distance

wireless rate plans, which makes direct comparison feasible. The study period spans 44 months from May 2002 to December 2005. In North America, customers on average, stay approximately 29 months with the wireless carriers,²³ so a study-period of 44 months, should be sufficient to provide a relatively 'complete' picture of customer tenure. The whole population of the targeted customer segment (that is, 1249 customers) is used in this research. Customers' calling and billing records are extracted from the wireless carriers' data warehouse for analysis.

DATA ANALYSIS PROCEDURES

A major component of our quantitative data analysis involves testing of the proposed hypotheses using the SPSS for Windows software.

Hypotheses 1–4 investigate the moderating effects of handset changing frequency, rate plan changing frequency, customer age and contract status on the linkage between rate plan suitability and customer tenure. A two-way independent Analysis of Variance (ANOVA) is used to examine each of these hypotheses.

DATA ANALYSIS AND RESULTS

The moderating effect of handset changing frequency

The first hypothesis (Hypothesis 1) explores the moderating role of handset changing frequency. The descriptive statistics are presented in Table 1. Customers are categorized into two groups in the research: those who are using optimal rate plans are coded as '0.00' and those with non-optimal ones are coded as '1.00'. The mean and standard deviation values are shown in months.

The results of the factorial ANOVA are shown in Table 2. It can be observed that *F*-ratio for rate plan suitability is highly significant, $F(1, 1241) = 41.84$, $P < 0.001$, meaning that it has significant main effect

Table 1: Descriptive statistics: Handset changing frequency

<i>Rate_plan_suitability</i>	<i>Freq_of_changing_ handset_code_2</i>	<i>Mean</i>	<i>S.D.</i>	<i>N</i>
0.00	0.00	34.3908	10.83439	174
	1.00	36.7273	10.17331	297
	2.00	41.0000	5.25521	163
	3.00	41.1316	4.66251	38
	Total	37.4077	9.50114	672
1.00	0.00	24.0748	14.95980	147
	1.00	28.5709	14.04572	275
	2.00	38.8017	7.82884	116
	3.00	40.8462	5.12752	39
	Total	30.3120	14.06939	577
Total	0.00	29.6667	13.85881	321
	1.00	32.8059	12.84349	572
	2.00	40.0860	6.52883	279
	3.00	40.9870	4.87338	77
	Total	34.1297	12.34588	1249

Table 2: Main ANOVA table: Handset changing frequency

<i>Tests of between-subjects effects^a</i>					
<i>Dependent variable: Customer_tenure</i>					
<i>Source</i>	<i>Type III sum of squares</i>	<i>Df</i>	<i>Mean square</i>	<i>F</i>	<i>Sig</i>
Corrected model	39223.251 ^b	7	5603.322	46.052	0.000
Intercept	945160.958	1	945160.958	7767.962	0.000
Rate_plan_suitability	5090.733	1	5090.733	41.839	0.000
Freq_of_changing_ handset_code_2	21466.291	3	7155.430	58.808	0.000
Rate_plan_suitability × Freq_of_changing_ handset_code_2	3495.331	3	1165.110	9.576	0.000
Error	150997.737	1241	121.674	—	—
Total	1645102.000	1249	—	—	—
Corrected total	190220.988	1248	—	—	—

^aRate_plan_code_2=2.00

^bR squared=0.206 (adjusted R squared=0.202)

on customer tenure, when excluding any effect of handset changing frequency. Similarly, the *F*-ratio for handset changing frequency is also highly significant, $F(3, 1241) = 58.81$, $P < 0.001$, showing that it has significant main effect on customer tenure, when ignoring whether or not customers are using optimal rate plans.

The interaction between the effect of rate plan suitability and of handset changing frequency is observed to be significant as well, $F(3, 1241) = 9.576$, $P < 0.001$, suggesting that in the discussion of customer tenure, both factors (rate plan

suitability and frequency of handset change) should be considered together. To understand the interaction, a graph is plotted in Figure 2.

It can be observed that customers with optimal rate plans stay longer than non-optimal rate plan customers, except when they have changed their handsets three times or more. It is found that optimal rate plan customers who have changed their handsets three times or more stayed on average of 41.13 months (S.D. = 4.66 months), as compared to 40.85 months (S.D. = 5.13 months) in the non-optimal rate plan customer group. This difference is

Legend	
Rate Plan Suitability:	
0.00	Customers with optimal rate plans
1.00	Customers with non-optimal rate plans
Frequency of Changing Handsets	
0.00	no change
1.00	1 time
2.00	2 times
3.00	3 times or more

Figure 2: Graph showing customer tenure: Handset changing frequency.

very small when considering the standard deviation.

This test reveals that handset changing frequency is a factor directly affecting customer tenure, and its influence on customer tenure is produced through an interaction with rate plan suitability.

The moderating effect of rate plan changing frequency

The objective of our second hypothesis (Hypothesis 2) is to test the moderating effect of rate plan changing frequency on the linkage between rate plan suitability and customer tenure. The descriptive statistics and ANOVA results are shown in Tables 3 and 4, respectively.

Table 4 shows that the F -ratio for both rate plan suitability [$F(1, 1241) = 89.15$, $P < 0.001$] and rate plan changing frequency [$F(3, 1241) = 41.26$, $P < 0.001$] is highly

significant. Furthermore, significant interaction is found between these two independent variables [$F(3, 1241) = 16.61$, $P < 0.001$], suggesting that the effect of rate plan changing frequency on customer tenure is different for optimal rate plan customers than it is for non-optimal rate plan customers. A graph is plotted in Figure 3 to provide more information about this interaction.

Figure 3 shows interaction, as the lines are not in parallel shape, suggesting that the difference in customer tenure between optimal rate plan customers and non-optimal rate plan customers is not the same across different frequency of rate plan change. The results from factorial ANOVA supported the rejection of the null hypothesis, giving acceptance of the alternative hypothesis that states that the frequency of rate plan change has moderating role in the linkage between rate plan suitability and customer tenure.

The moderating effect of customer age

In the third hypothesis (Hypothesis 3), the moderating effect of customer age is examined, and its descriptive statistics are presented in Table 5.

From the main ANOVA table (see Table 6), the interaction effect between rate plan suitability and customer age is found to be insignificant [$F(4, 1239) = 1.57$, $P > 0.05$], although each of the independent variables demonstrates significant main effect on customer tenure [$F(1, 1239) = 40.62$, $P < 0.001$, and $F(4, 1239) = 13.86$, $P < 0.001$].

The lack of interaction effect is visually presented in Figure 4, where the two lines are virtually parallel to each other in the first four age groups. Customers who selected not to disclose their age information to the wireless carrier are categorized and coded as '6.00.' This last group shows significantly lower customer tenure than others. The anomaly can be explained by its small sample size; it has

Table 3: Descriptive statistics: Rate plan changing frequency

<i>Rate_plan_suitability</i>	<i>Freq_of_changing_plans_code_2</i>	<i>Mean</i>	<i>S.D.</i>	<i>N</i>
0.00	0.00	36.1012	11.20152	257
	1.00	37.4598	9.19730	224
	2.00	38.4375	7.41753	128
	3.00	40.4603	4.81538	63
	Total	37.4077	9.50114	672
1.00	0.00	22.1310	15.56503	168
	1.00	31.3810	13.68035	189
	2.00	33.6058	10.62763	137
	3.00	39.0000	6.80925	83
	Total	30.3120	14.06939	577
Total	0.00	30.5788	14.76287	425
	1.00	34.6780	11.84817	413
	2.00	35.9396	9.51335	265
	3.00	39.6301	6.05494	146
	Total	34.1297	12.34588	1249

Table 4: Main ANOVA table: Rate plan changing frequency

<i>Tests of between-subjects effects^a</i>					
<i>Dependent variable: Customer_tenure</i>					
<i>Source</i>	<i>Type III sum of squares</i>	<i>Df</i>	<i>Mean square</i>	<i>F</i>	<i>Sig</i>
Corrected model	36004.423 ^b	7	5143.489	41.390	0.000
Intercept	1239067.323	1	1239067.323	9970.930	0.000
Rate_plan_suitability	11078.280	1	11078.280	89.148	0.000
Freq_of_changing_plans_code_2	15381.110	3	5127.037	41.258	0.000
rate_plan_suitability × Freq_of_changing_plans_code_2	6191.525	3	2063.842	16.608	0.000
Error	154216.565	1241	124.268	—	—
Total	1645102.000	1249	—	—	—
Corrected total	190220.988	1248	—	—	—

^aRate_plan_code_2=2.00

^bR squared=0.189 (adjusted R squared=0.185)

only five optimal rate plan customers and 21 non-optimal ones in this group (see Table 5).

The results from factorial ANOVA and graph reject the third hypothesis (Hypothesis 3), suggesting that customer age has no moderating effect on the relationship between rate plan suitability and customer tenure.

The moderating effect of contract status

The last hypothesis (Hypothesis 4) is developed to check the moderating effect of contract status on rate plan suitability –

customer tenure linkage. Table 7 presents the descriptive statistics.

From Table 8, it is observed that *F*-ratio for both rate plan suitability and customer tenure is highly significant, with $F(1, 1243) = 147.40$, $P < 0.001$ and $F(2, 1243) = 305.18$, $P < 0.001$, respectively. The interaction between the effect of rate plan suitability and customer contract status is shown as highly significant, $F(2, 1243) = 35.88$, $P < 0.001$. This finding is confirmed visually in Figure 5, where the lines are not in parallel shape.

The line graphs clearly demonstrate that customers who are using optimal rate plans

Legend	
Rate Plan Suitability:	
0.00	Customers with optimal rate plans
1.00	Customers with non-optimal rate plans
Frequency of Changing Rate plans	
0.00	no change
1.00	1 time
2.00	2 times
3.00	3 times or more

Figure 3: Graph showing customer tenure: Rate plan changing frequency.

Legend	
Rate Plan Suitability:	
0.00	Customers with optimal rate plans
1.00	Customers with non-optimal rate plans
Customer Age	
1. 00	0-17
2. 00	18-24
3. 00	25-39
4. 00	40-59
5. 00	60-110
6. 00	Not disclosed

Figure 4: Graph showing customer tenure: Customer age.

Table 5: Descriptive statistics: Customer age

Rate_plan_suitability	Age_code_2	Mean	S.D.	N
0.00	2.00	35.2600	10.55174	50
	3.00	36.3919	10.14664	222
	4.00	38.2681	8.84862	317
	5.00	38.8590	7.99143	78
	6.00	26.8000	17.90810	5
	Total	37.4077	9.50114	672
1.00	2.00	28.0943	13.75928	53
	3.00	29.8941	13.85032	236
	4.00	32.5089	13.19260	224
	5.00	34.7442	12.26511	43
	6.00	8.0952	8.27590	21
	Total	30.3120	14.06939	577
Total	2.00	31.5728	12.76530	103
	3.00	33.0437	12.60953	458
	4.00	35.8835	11.21405	541
	5.00	37.3967	9.87630	121
	6.00	11.6923	12.75232	26
	Total	34.1297	12.34588	1249

have higher customer tenure than those with non-optimal ones, when they are not having any active contracts. On the other hand, customers who are currently on contract demonstrate similar tenure

(approximately 42 months) in both optimal and non-optimal rate plan customer groups. The existence of interaction supports the fourth hypothesis (Hypothesis 4), confirming that customer's contract status

Table 6: Main ANOVA table: Customer age

Tests of between-subjects effects^a
Dependent variable: Customer_tenure

Source	Type III sum of squares	Df	Mean square	F	Sig
Corrected model	29645.148 ^b	9	3293.905	25.416	0.000
Intercept	281564.491	1	281564.491	2172.546	0.000
Rate_plan_suitability	5264.919	1	5264.919	40.624	0.000
Age_code_2	7183.282	4	1795.820	13.857	0.000
Rate_plan_suitability × Age_code_2	811.527	4	202.882	1.565	0.181
Error	160575.840	1239	129.601	—	—
Total	1645102.000	1249	—	—	—
Corrected total	190220.988	1248	—	—	—

^aRate_plan_code_2=2.00

^bR squared=0.156 (adjusted R squared=0.150)

Table 7: Descriptive statistics: Contract status

Rate_plan_suitability	Contract_status_code_2	Mean	S.D.	N
0.00	0.00	30.6228	12.23472	114
	1.00	34.8315	10.11130	267
	2.00	42.4296	2.69310	291
	Total	37.4077	9.50114	672
1.00	0.00	16.9687	13.00158	96
	1.00	27.2405	13.20569	291
	2.00	41.7579	3.74933	190
	Total	30.3120	14.06939	577
Total	0.00	24.3810	14.29182	210
	1.00	30.8728	12.41068	558
	2.00	42.1642	3.16624	481
	Total	34.1297	12.34588	1249

Table 8: Main ANOVA table: Contract status

Tests of between-subjects effects^a
Dependent variable: Customer_tenure

Source	Type III sum of squares	Df	Mean square	F	Sig
Corrected model	74718.555 ^b	5	14943.711	160.819	0.000
Intercept	1071522.572	1	1071522.572	11531.381	0.000
Rate_plan_suitability	13696.594	1	13696.594	147.398	0.000
Contract_status_code_2	56716.565	2	28358.282	305.183	0.000
Rate_plan_suitability × Contract_status_code_2	6668.825	2	3334.412	35.884	0.000
Error	115502.433	1243	92.922	—	—
Total	1645102.000	1249	—	—	—
Corrected total	190220.988	1248	—	—	—

^aRate_plan_code_2=2.00

^bR squared=0.393 (adjusted R squared=0.390)

has significant moderating effect on the linkage between rate plan suitability and customer tenure. A summary of hypothesis testing results is presented in Table 9.

CONCLUSION

This research aims to improve our understanding of rate plan optimization as a customer tenure maximization strategy

Figure 5: Graph showing customer tenure: Contract status.

in the wireless telecommunications industry. Through the analysis of 1249 Canadian wireless customers using factorial ANOVA procedure, it is shown that except customer age, independent variables such as frequency of handset change, frequency of rate plan change and customer's contract status have demonstrated significant moderating effects on the linkage between rate plan suitability and customer tenure. This research confirms the findings of prior literature that 'rate plan suitability' plays a significant role in affecting customer tenure in the wireless telecommunications industry.^{2,3} Customers with optimal rate plans are found to stay significantly longer with the wireless carrier than those with non-optimal ones.

The author argues that wireless carriers should consider matching their customers to optimal rate plans for retention purpose.

In Canada, wireless carriers often set up financial and operational barriers to prevent customers from making changes to their rate plans easily. For example, there are

limitations on the number of rate plan changes that customers can make per year, while administration fees are often charged when processing these changes. Furthermore, authorized dealers are not allowed to handle any rate plan changes for customers in the stores. Based on the research results, marketers are suggested to re-evaluate these business rules, remove the barriers and provide their sales channels with incentives to help customers make changes to their rate plans.

One of the research findings is that customers who switched their handset frequently stayed longer with the wireless carrier than those who did not switch. Marketers are therefore suggested to remove handset swapping fee, and provide customers with incentives to upgrade their mobile handsets. Following this line of thought, marketers can consider launching a promotion to give out free handsets every few years to qualified customers who are currently on contract.

In this research, customers who have never had any contracts are observed to yield the lowest customer tenure. Meanwhile, customers who are always on contracts have higher customer tenure than those with expired contracts. These results clearly demonstrate the importance of having an active contract with the customers. Finally, older customers are observed to stay longer with the wireless carrier than younger ones. A managerial implication is that marketers should focus on up-selling their products and services to older customers, while spending more of their retention efforts on the younger customers.

Several limitations have been identified for this research study. Because of the unavailability of data, some demographic variables that may be of interest to marketers are not included in the study, preventing it from giving a more comprehensive analysis of the potential

Table 9: Summary of hypothesis testing results (factorial ANOVA)

Hypotheses	Factorial ANOVA	F-ratio	Sig	R ²	Rate plan segment	Result
Hypothesis 1: Frequency of handset change has moderating effect on the linkage between rate plan suitability and customer tenure	Rate plan suitability × Handset changing frequency	9.576	0.000**	0.206	Canada long distance	Accepted
Hypothesis 2: Frequency of rate plan change has moderating effect on the linkage between rate plan suitability and customer tenure	Rate plan suitability × Rate plan changing frequency	16.608	0.000**	0.189	Canada long distance	Accepted
Hypothesis 3: Customer age has moderating effect on the linkage between rate plan suitability and customer tenure	Rate plan suitability × Customer age	1.565	0.181	0.156	Canada long distance	Rejected
Hypothesis 4: Contract status has moderating effect on the linkage between rate plan suitability and customer tenure	Rate plan suitability × Contract status	35.884	0.000**	0.393	Canada long distance	Accepted

**Significant at $P < 0.001$

moderators. Moreover, this research only considers customers who are using Canada long-distance-oriented wireless rate plans. The population of this customer segment is small, and its rate plan structure is relatively simpler than regular rate plans. Hence, the applicability of research results to other wireless customer segments may be limited. Future study can consider a larger sample size and incorporate a more sophisticated model for analysis.

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