Understanding Customer Behaviours toward the Use of Electronic Banking Given Customer Characteristics and Financial Portfolios

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Abstract

The evolution of electronic banking demonstrates the need for research regarding demographics and banking preferences. In this study, financial data was collected from three Kuwaiti banks. The data included customer characteristics, product portfolios, and usage information in all electronic banking channels. This data was used to predict the use of electronic channels, treated as dependent variables in our study, based on individual customer's information that is treated as independent variables. Machine learning (ML) techniques, specifically multinomial logistic regression, were used to handle the data bearing in mind that these techniques would bring the most benefit to financial analysts and bankers. The results showed that one can determine the preferred electronic banking channel for each customer by knowing some of their characteristics and financial portfolio.

Keywords: Electronic banking, Mobile banking, Financial services, FinTech (financial technology),Multinomial logistic regression

1: Introduction

Electronic banking is an essential source of operation in the banking sector. Electronic banking enhances a bank's efficiency and profitability, which will increase the bank's revenue and decrease the cost of serving their customers. Knowing the suitable online channel for each customer, based on their characteristics and their banking portfolio, will help increase customer satisfaction. In the long run, this will result in a more sustained and productive relationship in which customers demand more banking services and products. Not only will this increase the bank's revenue, but it will also decrease advertisement costs and other expenses by allowing the banks to determine the appropriate electronic channel for their customers. This will enable banks to advertise for the use of their communication channels to the right customers: the customers interested in each particular channel. The evolution of banking data in today's financial world has allowed for a substantial amount of relevant data to be collected.

2: Materials and Methodology

Firms aiming to generate profits tend to diversify their operations to maximize their year-end positive performance. Diversified management strategies are attained by introducing online channels to maximize profitability (Gensler et al., 2007). This fact applies to several business fields. For example, Bank of America has stated that 12.6 millions of their online banking customers are 27% more profitable than its offline customers (Tedeschi, 2005). Financial institutions createnew operational channels as an additional service to maintain current clientele as well as to attract new clients (Thornton & White, 2001). Advancements in technology allow banks to offer new banking channels above the traditional banking systems (Calisir & Gumussoy, 2008). In recent years, self-serviced banking operations have replaced the face-to-face interactions (Eriksson & Nilsson, 2007). The automated teller machine (ATM) was the first self-service device that was introduced to lower the costs for banks and to meet the banking needs of customers(Calisir & Gumussoy, 2008). Following the ATM, call centre banking was introduced for branches to offer services through telecommunications devices connected to bank systems. The progression of the internet era led banks to introduce internet banking, allowing customers to manage their accounts and perform their transactions directly by remote access (Weir, Anderson, & Jack, 2006). Several scholars have mentioned the cost-effectiveness of the usage of internet financial services (Gopalakrishnan et al., 2003;Polatoglu & Ekin, 2003).

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This cost effectiveness can be attributed to lower numbers of staff required as well as lower branch operational costs (Cheng, Lam, & Yeung, 2006). Yakhlef (2001) indicated that the average transaction cost at the traditional methods cost $1.08, while the average transaction cost through internet banking was $0.13 or less. Customers have not moved to internet banking as much as banks anticipated in earlier years (Furnell, 2004).However, currentlythe internet banking reached high levels of usage and mobile banking has become more accessible. This is attributed to clientele's conservative tendencies in sharing their accounts and concern about the security of their transactions.

Mobile banking via smartphones established itself and brought further changes to the world of financial banking. Based on research by Akhter et al.(2018), there are three categories of mobile banking services: (1) static, where customers can only view account balances and other financial information; (2) interactive, where customers could contact service providers; and (3) transactional, where customers can conduct some financial transactions. It is important that these categories are identified as they play a significant role both on theory as well as in practice.

A recent document from Bank Negara Malaysia (2017) reported that 11.26 million individuals within Malaysia use mobile banking services; 25.2 million individuals are internet banking subscribers. Mobile banking services include fund transfers, utility bills payments, prepaid reload, and online shopping. Alternatively, other non-financial transactions as check balancing, accessing transaction history, and verification of transactions are offered (Rehman, Omar, Zabri, & Lohana, 2019). The paper also mentioned that the development of mobile banking is a result of the development of the telecommunications sector and data services available in each respective country. Advancements in technology have led to more banks providing new banking services while effectively reducing costs and enhancing customer satisfaction (Sadiq et al., 2003). In the most recent paper by Jebarajakirthy & Shankar (2021), results indicated that in order to increase mobile banking adoption intention, banks could focus on accessibility, operation, benefit and post-benefit convenience.

Moazenzadeh & Hamidi (2018) discuss restrictions in terms of accessibility of the use of internet banking which caused a shift toward the innovation of mobile banking. They did a study on 732 banking customers given their age, gender, and educational level. The findings demonstrated that the client age has insignificant impact on the use of any more advanced technology communication channel, so they are willing to adopt any new technology. The results also showed that the bank's clients are fortunate to pay for improved services while benefiting from its advantages. The launch of new technology does not affect their trust in using such technology.

Malaquias & Hwang (2019) studied the differences of reactions and responses to the use of mobile applications for banking services in two countries with different stage of development which are Brazil and United States. They used some variables as determinant factors of mobile banking use. The results indicate that trust and ease of use are significant elements to understand the use of mobile banking application in both countries. Results also showed that social effect has a relevant influence of mobile usage in brazil while have no influence in united states. Baabdullah et al.(2019) conducted a study to discover and recognize the factors that could affect the usage of mobile banking application in the Kingdom of Saudi Arabia. They used 10 variables related to customers satisfaction and their usage behaviour. Findings showed that performance expectancy, facilitating condition, price value, hedonic motivation, habit, system quality and service quality have significant impact on usage behaviour. Outcomes also showed that learning effort expectancy, social influence and information quality have a little effect on the usage.

Research conducted by Jünger & Mietzner (2020) supports the idea of households using digital financing services from non-banking start-ups in Germany. Survey results found that a household's level of trust and comfort is the main aspect to switch to a fintech. The paper as a reference could enhance the role of policy makers to ensure adequate consumer protection and enhance comparableness and transparency of services.

Anouze & Alamro (2020)utilized SPSS and AMOS as methods to explain the slow uptake of e-banking in Jordan. In their research, they collected 328 completed surveys distributed to individuals in Amman, Jordan that revealed several major factors causing the delay in adopting e-banking. These factors were ease of use, perceived usefulness, security, and reasonable price.

Choudrie et al. (2018) focused on investigating why older people are less likely to adopt mobile banking in the United Kingdom through a comparative analysis on Google Scholar and Scopus. The work suggested that future studies is required to provide insight into the factors leading to the adoption of smartphones for mobile banking. This and the aforementioned studies guided the research used in our study.

3: Theory and Calculation

Given that Kuwait currently operates with fifth generation (5G) data services broadband, the continuously improving service of mobile banking is becoming faster and more readily available. Therefore, it is imperative to determine the characteristics of customers using or preferring mobile banking so that banks can increase profits and advertise to the correct customers.

In this research, we collected financial data from three Kuwaiti banks. The accessibility to customer's transactions by channel, product portfolios, and customer characteristics comprise the data in this research. Hypotheses about the effect of our independent variable on the use of electronic channels were tested. The seven hypotheses of this research study are listed below.

H1	Do younger customers prefer to use mobile applications more than elderly customers?
H2	Is there a difference in preferences for using different electronic channels between male and female customers?
H 3	As the number of accounts increases (current, saving, joint, or deposit), does the probability of using mobile applications increase?
H 4	As the number of loans (consumer or instalment) per customer increases, will the probability of that customer to use call centre increase (as compared to other electronic channels)?
H 5	As the customer credit card limit or credit card outstanding balance increases, will more customers opt to use call centre?
H 6	Does the length of the customer's relationship (in years) with the bank increase the probability of using call centre and internet rather than mobile?
H 7	Will customers with higher income have a higher probability of using mobile applications?

Previous studies on this topic focused on electronic channels versus branches. In thiswork, we study the different types of electronic channels, namely internet, call centre and mobile. The literature review revealed that the number of variables in previous research studies has been limited. In this study, we introduced new variables which are (1)number of loans owned by the customer; (2) customer credit card limit; (3) customer income level; (4) customer nationality/continent.

4: Data Collection

Data collection consisted of obtaining a substantial amount of panel financial data from three Kuwaiti banks, which vary in assets size and banking types. More specifically we gathered the data from two conventional banks, medium and small in size, and one medium size Islamic bank. The data collected covered a span of ten years from 2008 to 2018. This study was conducted on retail customers; number and value of their monthly online transactions in each online channel; automated teller machine, point of sale, online banking, mobile apps, automated call centre, specifying the type of transaction done through these channels; deposits, withdrawals, purchases, payments, and transfers. The data included customer characteristics and their product portfolios, specifically:

- Customer gender
- Customer address (Governance within Kuwait)
- Customer age
- Date of the relationship with the bank
- Customer nationality
- Customer income on monthly basis
- Customer monthly transactions, including date of transaction, value of payment per transaction, transaction payment currency, type of card used, transaction type such as purchase, withdrawal, payments, deposits and transfers
- Number and balance of current account, saving account, retail deposit, and joint account
- Total amount, principle paid, interest paid, and outstanding balance of consumer loans and instalment loans
- Limit and outstanding balance of credit cards

The extensive data collection from the three banks had some limitation, that each bank launched their electronic channel in separate periods. Previously, older systems registered two or more services under the same name.

Bank terminology changes may affect data analysis. For example, prior to 2017, bank call centres registered payments and transfers under "payments." From 2017 onward, banks started registering each service separately. For better comparison between channels, some of the older incomplete data was abandoned to maintain consistency. It was decided to solely use the electronic channels that are offering the same services in order to yield better comparisons. These channels are (1) call centre, (2) internet, and (3) mobile.

These platforms provide payments and transfer services while the other channels provide different types of services like deposits and withdrawals. In Table 1, the data sample for each bank is shown.

Table 1

Bank Data Sample

	Bank 1	Bank 2	Bank 3
Total customers under observation	295,801 customers	95,429 customers	392,995 customers
Time period	11 years	11 years	9 years
Number of transactions	Callcentre: 209,454	Callcentre:144,579	Call centre: 34,118
	Internet: 385,887	Internet: 278,010	Internet:1,244,746
	Mobile: 341,601	Mobile: 9,384	Mobile:3,821,546
Final sample size (given all parameters used for this bank)	7,083 customers	3,014 customers	17,743 customers
Final observations size (given all parameters used for this bank)	108,071 observations	54,494 observations	363,457 observations
Banks type	Conventional	Conventional	Islamic

In this research, we analysed the number of transactions rather than the value of transactions. This is due to the assumption that people older in age generate more wealth and eventually conducts transactions of higher value; this assumption would negatively influence the results of the analysis of using electronic channels. Visualization of the data showing the relation between the dependent and independent variables was applied. Next, an elimination of some variables with low correlation amongst the use of online channels occurred. The variables displayed in Table 2 remained.

Table 2

Individual Bank Parameters

Bank 1	Bank 2	Bank 3	Dependent variables
Age	Age	Age	
Gender	Gender	Gender	
Number of current accounts	Number of current accounts	Number of current accounts	
Number of deposits accounts	Number of deposits accounts	Number of deposits accounts	
			Internet
Number of joint accounts	Number of joint accounts	N/A	Call Centre
Number of saving accounts	Number of saving accounts	Number of saving accounts	Mobile
Continent	Nationality	N/A	
Number of consumer loans	Number of consumer loans	Number of consumer loans	
Income level	Income level	Income level	
Number of instalment loans	Number of instalment loans	Number of instalment loans	
Credit card limit	Credit card limit	Credit card limit	
Credit card outstanding balance	Credit card outstanding balance	Credit card outstanding balance	
N/A	Relationship duration	Relationship duration	

5: Data Analysis

Financial analysts and bankers will not benefit from the large bulk of available data without the use of machine learning techniques to clean, process, and generate predictive analysis. The evolution in technology combined with the rapid growth of banking data led to this study's usage of machine learning techniques to analyse the data.A supervised machine learning algorithm was used to solve a classification problem by applying a multinomial logistic regression model.

When there are more than two possible outcomes, nominal responses, multinomial logistic regression can be used to calculate the probabilities of various possible outcomes, dependent variables. Multinomial logistic regression (MLR) is a classification model based on binary logistic regression model to solve a multiclass problem. It predicts the probabilities of multiple possible outcomes of a categorical variable by using a set of independent variables (McCullagh & Nelder FRS, 1990). Multinomial logistic regression is used when research has more than one categorical dependent variable and it has more than one outcome as an alternative for only one outcome in logistic regression (Greene, 2012). In this research, the dependent variables are the electronic channels.

We focused in this study on three electronic channels as a dependent variable; in multinomial logistic regression you have to choose one dependent variable as a reference category. In this study, "mobile" is the reference category. The probability of using any of the other online channels is compared to the probability of using "mobile". Rather than running individual regressions and then interpreting and comparing the outcomes. The MATLAB software environment and language were used(The MathWorks Inc., 2020). This type of regression evaluated parameters simultaneously, resulting in efficiency.

Various parameter estimation methods exist based on the goals of MLR analysis. The broad linear modelling technique of MLR can be used to model unordered categorical response variables. To better interpret the method, MLR is an extension of logistic regression that allows each category of an unordered response variable to be compared to a reference category providing several logit regressions models. This method outputs several logistic regression models that make specific comparisons of the response categories. Assuming there are *j*-categories of the response variable, then, the model comprises of *j-1* logit equations which fit at the same time (Okasha & Shehada, 2016).

MLR classifies d-dimensional real-valued input vectors $x \in R^d$ into one of the *k* outcomes $c \in \{0, \ldots, k\text{-}1\}$ using *k-1* parameter vectors $\beta_0, \ldots, \beta_{k-2} \in R^d$,(Carpenter, 2008). Allow the response variable $Y \in \{1, \ldots, k\}$ have *k* possible values/categories. A form of the MLR is given by

$$p(Y = r|x) = \frac{\exp(xT\beta r)}{\sum_{s=1}^{k} \exp(xT\beta s)} = \frac{\exp(\eta r)}{\sum_{s=1}^{k} \exp(\eta s)}$$

Where $\beta^T_k = (\beta_{r0}, \ldots, \beta_{rp})$.

Here we have to choose a reference category, when category *k* is chosen, one sets $\beta^T_k = (0, \ldots, 0)$ producing $\eta_k = 0$. We can select any other category as a reference, mobile in this research. Fitting a model using a reference category *k*, the corresponding equation is

$$p(Y = r|x) = \frac{\exp(xT\beta r)}{1 + \sum_{s=1}^{q} \exp(xT\beta s)} for r = 1, \ldots, q$$

We focused on the coefficients and *p*-values to see the contribution of each variable under study on the probability of using each electronic banking channel. The coefficients show the statistical relationship between the variables under test and the dependent variables. *P*-value is the preselected level of significance. We consider any variable with a *p*-value less than 0.05 as significant and bearing an important effect on the dependents variables in this study(Gibbons & Pratt, 1975).

6: Results

Tables 3 and 4 display the results from the multinomial logistic regression. The results show that as customers get older in age, they tend to prefer using call centres as their primary method of communication.

Table 3

Regression Results

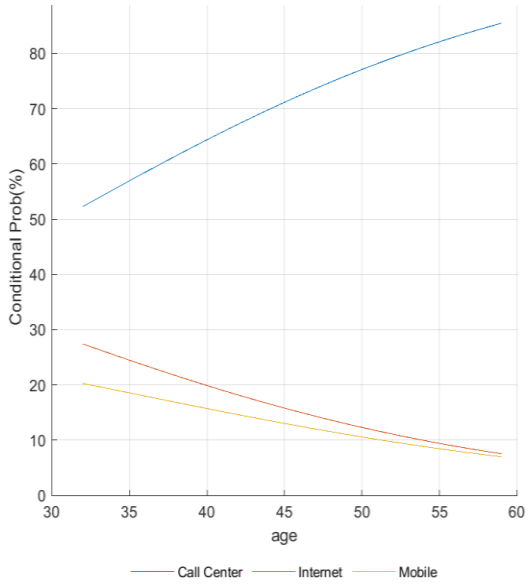
coefficients-relative log odds	Bank 1		Bank 2		Bank 3	
	Internet/Mobile	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**
Intercept	-0.154171672	-0.723088341	-3.010906034	-0.393307854	-2.255349725	-7.016488775
x1-age	0.025034614	0.033433131	0.016009357	0.024803694	0.01089603	0.039518591
x2-gender	-0.156809204	-0.457237825	-0.49638637	-0.106324566	0.363922005	-0.915312678
x3-CA Count	-0.971463653	-1.118902718	-0.128641352	-1.061087092	-0.13176231	-0.258304101
x4-Da Count	0.623254636	0.505641805	-0.856803672	-2.38349319	0.039513988	0.055580182
x5-JA Count	0.206464741	0.374372125	-1.152210986	0.905098325	N/A	N/A
x6-SA Count	-0.359381309	-0.38882337	-1.889637859	-2.151301572	-0.247601998	-0.276202036
x7-Continent numb B1/nationality B2	0.023452706	0.151459558	-0.00398063	-0.010131903	N/A	N/A
x8-CL Count	0.119434419	0.186730994	-0.001004094	-2.552146672	-0.037899031	0.21180431
x9-Income	4.38E-05	3.58E-05	-4.15E-06	-1.20E-03	-1.12E-05	-8.52E-05
x10-Ins.L Count	-0.195564333	0.023383757	0.50618582	-0.371076034	-0.042372238	0.375486991
x11-Credit card lim.	0.000155815	-6.84E-05	0.000439622	2.14E-04	-2.76E-05	-2.34E-05
x12-Credit card out.	-0.000118131	1.81E-05	-0.000557669	-4.45E-04	-1.09E-05	-1.51E-04
X13-Relationship duration in Y			0.043505708	0.264955981	0.057321532	0.244229363
coefficients-relative risk exp(coefficients)						
	Internet/Mobile	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**
Intercept	0.857124864	0.485251318	0.049247039	0.674820969	0.104836873	0.000896969
x1-age	1.025350612	1.033998299	1.016138193	1.025113865	1.010955608	1.04030984
x2-gender	0.854867148	0.633029772	0.608726402	0.899132773	1.438961978	0.400391413
x3-CA Count	0.378528598	0.326638012	0.879289264	0.346079386	0.876549317	0.772360321
x4-Da Count	1.864988032	1.658049324	0.424516811	0.092227845	1.04030505	1.057153778
x5-JA Count	1.229324388	1.454078148	0.315937463	2.472174988	N/A	N/A
x6-SA Count	0.698108106	0.677853989	0.151126528	0.116332644	0.78067059	0.758659639
x7-Continent numb B1/nationality B2	1.023729883	1.163531246	0.996027282	0.989919252	N/A	N/A
x8-CL Count	1.126859341	1.205303008	0.998996409	0.07791423	0.96281015	1.235906007
x9-Income	1.000043844	1.000035767	0.999995846	0.998797832	0.999988755	0.999914849
x10-Ins.L Count	0.822370436	1.0236593	1.658951572	0.689991477	0.958512919	1.455700156
x11-Credit card lim.	1.000155827	0.999931619	1.000439718	1.000214358	0.999972397	0.999976574
x12-Credit card out.	0.999881876	1.000018109	0.999442486	0.999554699	0.999989054	0.999849252
X13-Relationship duration in Y			1.044465956	1.303373601	1.058996257	1.27663711

Table 4
Regression Results

p-value	Bank 1		Bank 2		Bank 3	
	Internet/Mobile	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**	**Internet/Mobile**	**Call centre/Mobile**
Intercept	2.27E-05	1.22E-85	2.20E-74	4.89E-03	0	0
x1-age	2.84E-291	0	5.52E-07	3.26E-24	3.41509180109000e-312	0.00E+00
x2-gender	2.00E-26	2.64E-209	2.92E-20	1.29E-02	0	0
x3-CA Count	0	0	0.003367069	4.09E-167	6.27E-105	1.42E-31
x4-Da Count	1.63E-265	1.21E-142	1.93E-02	9.67E-14	2.84E-35	2.82E-07
x5-JA Count	0.72240804	0.519496747	8.42E-20	6.99E-45		
x6-SA Count	0	0	4.42E-50	1.66E-84	0	1.86E-218
x7-Continent B1/nationality B2	0.00880377	4.81E-73	2.40E-06	8.72E-45		
x8-CL Count	1.46E-81	8.83E-197	9.80E-01	0.00E+00	3.29E-19	2.29E-42
x9-Income	3.16E-110	9.32E-62	7.58E-01	0.00E+00	6.64E-27	1.17E-92
x10-Ins.L Count	0	3.34E-11	9.89E-81	7.01E-34	5.24E-55	0.00E+00
x11-Credit card lim.	0	1.27E-56	8.52E-31	5.27E-10	3.10E-130	1.19E-07
x12-Credit card out.	2.00E-152	0.000173234	3.04E-92	4.09E-80	2.31E-05	4.09E-48
X13-Relationship duration in Y			1.85E-10	0	0	0.00E+00

Figure 1 explicitly shows that the second most favoured method of communication is the internet, while mobile usage is their least favourable out of the three platforms. Results also indicate that the longer a customer's relationship with the bank is, the higher their probability of using call centre and internet than mobile is.

Figure 1
Probabilities of Electronic Banking Usage Considering Customer Age



It was also found that a higher probability of males compared to females exists in terms of usage of mobile, rather than internet and call centres, given that the other variables remain the same. In Bank 3, the probability increased by 1.43 times with males compared to females using the internet over mobile and call centres, given everything else remains the same.

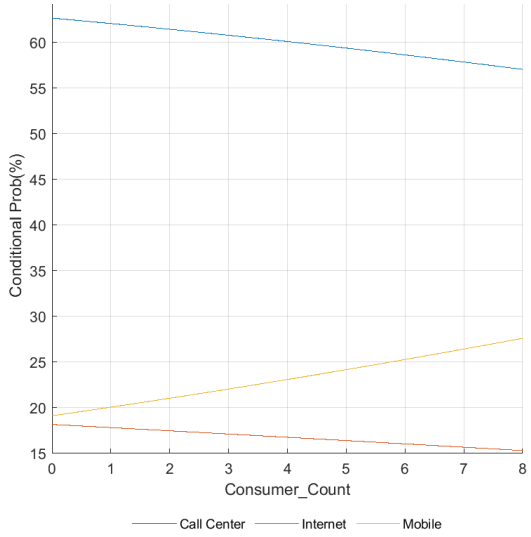
Regarding the four types of banking accounts -current, saving, deposit, and joint - the findings show that as the number of accounts increased, the probability of customers using mobile banking followed by the internet banking also increased. A noticeable decrease in call centre usage was observed as well. Data indicates customers with more than one deposit account use the internet and call centre, followed closely by mobile. The same data shows a

noticeable decreasing trend in call centre usage and an increasing trend in internet and mobile usage. It should also be noted that the greater the number of joint accounts owned by a customer, the higher the probability of that customer using a call centre than other channels. Again, this result is aligned with the decreasing trend in call centre and increasing trend in mobile. Bank 1 showed insignificant relation of this variable given the high p-value.

The analysis also included the number of loans, consumer or instalment, held by each customer and whether this influenced the use of electronic channels of banking. We found that in Bank 1 and Bank 3, the greater the number of consumer loans per customer, the more that each individual customer tend to use call centre when compared to two other electronic channels. However, it also showed a shift from call centre to mobile in recent years. Bank 2 results display that the greater the number of consumer loans per customer, the greater the usage of mobile followed by call centre. Figure 2 results in Bank 2 also showed that there is insignificant impact of this variable on the customer decision of whether to use internet or mobile banking.

Figure 2

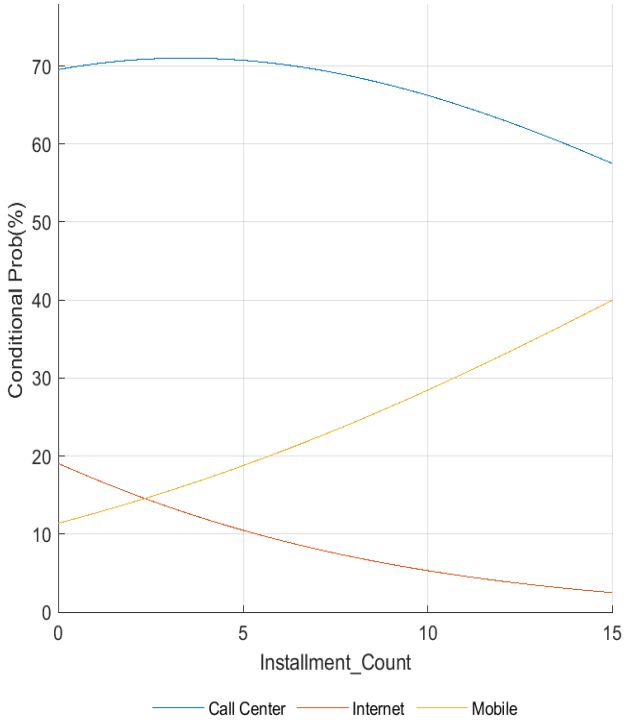
Probabilities of Electronic Banking Usage Considering the Number of Consumer Loans Owned by Customer



Regarding the instalment loans, Bank 1 and Bank 3 showed that the greater the number of instalment loans per customer, the more that customer tends to use call centre when compared to the other electronic channels. Data also showed a shift from call centre to mobile in recent years. Bank 2 results in Figure 3 state that the higher the number of instalment loans per customer, the higher the use of internet then mobile followed by call centre.

Figure 3

Probabilities of Electronic Banking Usage Considering the Number of Instalment Loans Owned by Customers



Results show a weak correlation between customer income level and their use of electronic banking. The high *p*-value in the results denotes that income level cannot determine customer preferences between internet and mobile. Two variables were also tested: credit card limit and credit card outstanding balance.

In all three banks, there is a very small coefficient for those variables which indicates the weak correlation of this variables with the preference of usage of electronic banking channels. Another variable, continent in Bank 1 and nationality in Bank 2, had no significant effect on customers behaviour in using the electronic channels. From each of the major four continents in our sample (Asia, Europe, Australia, and Africa), we chose a customer sharing similar characteristics and product portfolios and studied the probability of their usage of different type of channels. All four chosen customers shared similar tendencies of choosing electronic channels for usageas shown in Table 5.

Table 5

The Probability of Electronic Channels Usage Based on Four Major Continents

	Africa	Asia	Australia	Europe
Prob. Call Centre	25%	28%	31%	34%
Prob. Internet	34%	33%	31%	30%
Prob. Mobile	41%	40%	38%	36%

*Note.*In this example, we picked customers with 35 years of age having one current account with an income of at least 500 Kuwaiti Dinars and no other credit facilities with the bank.

7: Discussion

The knowledge about the relationship between variables is important and highlights benefits based on banking industry in Kuwait. While some of the results may have been intuitive, some others undoubtedly will influence the decision making due to better understanding of customer needs and actions. The results show that there is a big shift toward using the mobile application in recent years given the advancement in technology and ease of use. Conversely, our research showed that people having credit facilities like loans or credit cards prefer the direct

contact with the staff through call centree-platforms. These particular customers feel more comfortable to discuss the status of their credit facilities by directly contacting banks staff.

Having this information will alter the way the banks create their investment decisions. Instead of banks focusing on the most advanced technologies, like mobile application, they need to focus on understanding the different types of customers and their product portfolios to determine the right channel. This will help to generate profits more efficiently given that the majority of bank's assets consist of loans.

It has been noticed that holders of time deposits, funds held in the account for specific agreed period to generate interest income, are less interested in using mobile applications. Downloading mobile apps is an indication of frequent use of banking services like what results showed with people holding current and saving accounts, while time deposit customers are not interested in using frequent available banking services. In this case, banks need to make sure to market for other type of products suitable for deposits holders.

It has become evident that the level of a customer's income has insignificant impact on their preference in using different electronic banking channels. However, the development of such channels cost the banks equally for all types of customers, despite that, the economic benefits generated from customers vary depending on their income contribution. As a result, if banks considered having customized services (such as special transfer rates and special currency conversion rates) for high income customers in both their electronic platforms and branches, this would lower the concentration on branch services and promote for banks electronic channels.

8: Conclusion

The goal of this research study was to calculate the comparison probability usage of each banking channel for every client based on their information via parameters. The literature review revealed issues that were not addressed before; these are discussed in the findings section. Now, using the multinomial logistic regression, a prediction formula was created so that each bank can predict which banking channel will be used most effectively by each customer.

This prediction formula has potential to help banks allocate the correct marketing tools to the appropriate audience. One of the main potential impacts of this research is to create a better understanding of customer needs by offering quality products rather than quantity. By accurately offering the most suitable products and services, customer engagement will be more productive and trust between banks and customers will increase. In summary, the identified prediction model will allow banks to reduce unnecessary marketing and capital expenditure, reduce the number of employees and ultimately increase their profit.

Most recent works, in their data collection, they rely on questionnaires on limited group of respondents while we used real statistical numerical data on larger population. They focused on customer characteristics like age, gender, level of education as well as their behavioural factors with willingness in taking risk and paying price of the advanced technology. In our study we include the three mentioned characteristics along with nationality and we also consider their financial product portfolio which was not addressed. The research also used statistical modelling to solve financial problem and its quite comparative to our MATLAB usage. Additionally, the study was conducted in an area of study similar to Kuwait and provided beneficial information for managers, how e-banking predictors can send meaningful and timely information to customers. We also proposed a special priced' services, similar to what is given in the branches for exclusive customers e. g. high incomed, for the electronic banking channels. This is an item that was mentioned as one of the factors causing the delay of e-banking in Jordan. This work is affiliated with the central bank of Kuwait. In future research, a thorough study from banking databases and exposures to households through a real, long term data sets, we can better identify the strategies adopted by banks to better serve the population. Moreover, having a sound profit make banks relay on their own funds and minimizes the expected future support from central banks. From real time data and historical evidenced of usage, our findings explain that there are other factors could influence the use of mobile banking for older people, like type of accounts, number and type of loans, and not only the facilitations of smartphones.

In summary, mobile banking technology has a lot of benefits for clients and banks. We collected real time data of e-banking channel usage and identified the factors influence its usage. To affectively adopt this platform, we need to know and study all the variables that could affect customer behaviour and their satisfaction level and eventually their loyalty to the bank.

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