

A comparison between the brand awareness and logistic prediction models for predicting election results

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Abstract

Candidates involved in the elections normally formulate their own strategies through the method of opinion polls, and consequently it is extremely important if a prediction model can effectively compute and provide their supporting rate. A suitable election prediction model should be available and implemented in full practice to satisfy the critical necessity for obtaining a result with accuracy, stability, and simplicity. By using the opinion polls gathered from the elections held in Tainan City, Taiwan, with the assistance of the brand awareness prediction and logistic prediction models frequently adopted in elections, this study tests out the validity of these aforementioned two prediction methods, in terms of the three practical necessities referenced above. The results of this research may imply that the forecasted outcomes obtained from both aforementioned models are very promising in terms of the accuracy and stability. However, the brand awareness prediction model will be better if the simplicity of the calculation process is the key objective.

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Keywords: *Voter's request indicator, Evoked set, Brand awareness, Logistic prediction model, Flow-in and out.*

1. Introduction

In the election, candidates are expected to keep pace with changing public opinions to end up with the final success. They have a need to get access to the true data from surveys and polls to develop their corresponding policies and/or strategies accordingly. In the case in Taiwan, the situation is even more challenging simply because the foundation of democratic election has not endured as long as these Western countries. The election situation could be changed overnight due to some unexpected incidents. Even well-recognized western polling organizations have experienced a great difficulty in Taiwan in fully comprehending and grasping the true information in general and in some of the most recent elections in particular. Most polling organizations in Taiwan employ the direct inquiry method to determine the rating of the specific candidates by asking such question as "Whom would you vote for, if tomorrow were Election Day?" However, in practice, nearly 30 percent of voters who are questioned are unwilling to reflect their true opinion about the specific candidate they favor even one day before an election. Additionally, undecided voters will usually determine the major force to ultimate results of the election.

Relative to western countries, the history of political election in Asian nations is much shorter, the voting experiences are relatively immature, and the voter's behaviors are quite flexible and unpredictable. Consequently, it becomes such a critical issue to clarify a model of voting

behaviors in Asian countries. Nevertheless, some nations in Asia have accumulated decent data and records of elections, one of which is Taiwan (Republic of China, R.O.C.), which is also one of the earlier demographic countries in Asia. In fact, she held her first popular election in 1947, including local and national elections for representative and head of local governments. The head of state, the president, is elected by a popular vote since 1996. Over 95% of the population in Taiwan is Han Chinese, of which are descendants of early Han Chinese immigrants who arrived at Taiwan dated back to the 17th century. While Taiwan has been under the ruling of Japan for 50 years. After the World War II, Taiwan was resettled with assistance from the U.S. and European nations. The cultures in Taiwan are thus a hybrid from various sources, incorporating elements of traditional Chinese culture and Confucianism beliefs, some Japanese culture, and increasingly Western values. For this reason, the election experience of Taiwan can be a representative case and referable for/by other nations, particularly those emerging democracies in Asia.

From above discussion, it is the authors' attempts to develop a method that can effectively and efficiently determine the ratings from both decided and undecided groups to reduce nonresponse bias and hence allow the resulting election predictions to satisfy the needed requirements of accuracy, stability, and simplicity. It is no doubt that this objective has become an important issue for the researchers and practitioners in this subject area to address.

This study contributes to provide a new insight into the prediction issues for the election campaign. This research firstly conducts a thorough literature review for the relationship between elections and marketing and then looks back related prediction models of election campaigns. The authors then discusses the details of the two major prediction models of this study - brand awareness model and logistic model, including the dominant theory, assessment of the rating, a case study for each model, and a comparison and contrasting between two different models. At the end, this study concludes the paper based on the findings of the studies and provides some feasible suggestions and meaningful directions for the future electoral and academic efforts.

2. The relationship between marketing and election

The study of Kotler [22] suggested that candidates' election promotion processes are very similar to the ones for the promotion of merchandise. The opinion poll and situation analysis are very similar to the marketing

surveys to promote relative products. Creating the image for a candidate is much the same as packaging a product, and hence, election rallies are nothing different to the product promotions. In other words, voters like consumers, use their ballots (currency) to choose their ideal candidate (product). Further, the study by Newman [34] conducted an in-depth research about the year 2000 US presidential election, and it argued that when the voters elected the president, his/her personality and the position were taken into account initially, which is much like the aforementioned product image.

In addition, O'Cass [36] investigated voter's behavior occurred in the elections by using a theory of consumer behavior, and uncovered the various voters' attributes when they cast their ballots. Candidates must know how to formulate their campaign policy and how to boost voter's confidence and level of satisfaction to accomplish a success. Lees-Marshment [27] even proved that the political marketing approach has been introduced into most political operations worldwide. Political parties often spot and locate their targeted voters by means of a marketing analysis and nominate these candidates who meet the market trends to respond to voters' demands. Leppaniemi et al. [29], further asserted that the planning process and the intended targets of both commercial marketing and political promotions are similar.

3. Prediction model of election

Prediction-related studies about elections are abounding in this subject area. In fact, various theories and models have been employed to forecast whether a candidate will be elected [6], [7]. Consequently, the share of the votes for candidates can thus be forecasted in a reasonable manner. Most of these models are based mainly on statistical, mathematical, and economic analysis methods, including the rank ordered logit model, the multinomial logit model, cluster analysis, the autoregressive model, the bivariate selection bias model, the time-series approach analysis, and the econometric models, among others [5], [13], [35], [42], [44].

The previous statistic-based prediction models provided the solid effects on the explanation of voting behaviors [6], [12]. This study, however, attempts to explore more about election campaign based on a marketing perspective. The past literature has clarified the election issues by employing marketing perspectives, including such strategic issues as electoral advertising, promotion strategy, campaign messages, and competitive analysis of the campaign. Lee and Wen [25] built an election

prediction model based on the associated marketing theory. This model consists of two major dimensions, in which the first one created a “voter request indicator” based on the “product attributes” in the area of marketing management by which the most accurate popularity ratings of the candidates were determined by using a “product’s core demand” and an “evoked set” concepts of the purchase decision processes. In the second dimension, consumer “flow-in and out” phenomenon formed in the purchase decision stage was used to devise the corresponding formulas, with which the ratio of voters’ preferred candidates and the ratings of candidates shown in voters’ direct expression were adjusted, modified, and predicted accordingly. By doing so, the predicted vote of candidates was finally worked out. In addition, Lee, Wen, and Chen [26] developed a “brand awareness election prediction model” based on the “brand awareness” concept of marketing management.

In addition, due to the development trend of new technology, it also has an impact on polls. For example, due to the popularity of mobile phones, the utilization rate of traditional phones has been decreasing year by year. Therefore, a hybrid survey of traditional telephones and mobile phones is used for election forecasting try to make up for the lack of purely using traditional telephones [9], [10], [17]. In addition, due to the popularity of the internet, the use of online real-time surveys has become a trend. The zero-day election prediction through the online public opinion prediction market forms an alternative comparison with traditional public opinion surveys, which can be used for reference [41].

From above discussion, this study attempts to clarify the election campaign based on a marketing perspective by employing logistic models as a technique for predicting voter’s decisions. This study not only compares the following two models [28], namely brand awareness method and logistic method, but also examine these models by conducting an empirical study with the practical surveys obtained from the past Taiwan’s elections.

4. The “brand awareness” election prediction model

4.1. The theoretical foundation of the model

4.1.1. Purchase decision

Kotler[23] presented the five stages mode of decision making in the purchase process. Customers may not look at every aforementioned set in making their purchase decisions. In other words, they will not take all the brands and products into consideration due to limited time, energy, and/or

knowledge. They normally consider only a portion of all possibilities and then proceed directly to the consideration set. Within the brand consideration set, some brands are evoked from memory, which may be referred to as the “evoked set”. Brands having a high market share and a high level of consumer’s attention are more easily evoked by the consumers [37].

Teng [40] studied the possibility to be included in a consideration set by considering the factor of price discounts. The results of this study indicated that brands with a price discount can be expected to be included in the consideration set; meanwhile, customer’s awareness, attitude, and purchase intention toward these brands will tend to be increased significantly. Candidates, likewise, can raise their awareness by using the election promotional policies and therefore can bring themselves to be included into both the voters’ “evoked set” and “consideration set.” This study attempts to employ the concept of “evoked set” in the election prediction model and to explore how it works subsequently.

4.1.2. The flow-in and out of customers

In the evaluation stage of customer decision-making, purchase intention and priority for the products or brands in the chosen set are roughly clear[28]. However, even when certain products or brands draw a strong consumers’ interest, buyers may still be affected by the following two factors before making their final purchase decisions that tend to result in customer flow-in and out. McCarthy et al. [32] studied the consumers’ personal attitudes and also the influence that other persons had created on their purchase intention. The results showed that, in addition to their own attitudes, another person’s opinion might also affect the consumer’s purchase intention. Moreover, consumer’s purchase behavior may also be changed due to the various situational factors. Hand et al. [15] studied these factors that may affect the desire of users who purchased the products through an on-line shopping platform. The results of this study indicated that situational factors did affect consumers’ use of an on-line shopping platform. In addition, Zhuang et al. [45] took shopping malls as an example and studied the situational factors which might have onto consumer’s purchase decisions. The obtained finding showed that most situational factors will significantly affect consumer’s purchase decisions.

Similarly, these two factors may also affect voting behavior in elections. Relatives’ or friends’ opinions; unexpected major incidents such as scandals, bribery, and/or strategic vote allocation by political parties; may all contribute to the considerable changes in/to election results. As per previous discussion, the “flow-in and out” factor occurred when voters are casting their votes is therefore very important to be considered

4.1.3. Brand awareness

Brand awareness means the accumulated number of brand-related experiences resided in consumer's memory about a specific brand. The accumulated numbers may include the sightings in advertisements, encounters while shopping, mentions/hints made by someone else, and/or the consumer's own experiences with buying or using the brand, through these the brand awareness is raised/strengthened in the consumer's mind. If the brand awareness is high, it is more easily for this brand to become the "evoked set" and thus to be subsequently enlisted as the "consideration set" at the time when consumers are making their purchase decisions and placing their orders. Studies pointed out that customers tend to praise products with high brand awareness, and hence, well-known brands effectively reduce the consumers' sense of risk and in turn, increase their positive feedbacks [1], [4], [16], [19], [30], [31], [38], [39]. Hence, brand awareness may have an enormous influence onto customer's purchase options. An excellent brand awareness may not only be a useful reference for making the purchase decisions, but also affect how the market changes.

Does high brand awareness imply a high purchase intention? Consumers may have a very high level of brand awareness for a number of poor-quality products. Likewise, voters may have a very high awareness of some candidates in the elections with a negative impression associated. Only brands with a high consumer awareness and favorable impressions can really earn the reliability, consumer's loyalty, and thus create a positive purchase intention [3], [16], [18], [30], [43]. In the case of elections, candidates who evoke the positive impressions and high levels of awareness among the voters are the ones option voters will eventually choose.

The development of brand awareness may be composed of the following aspects. Namely, they are: brand knowledge, brand recall, top-of-mind awareness, brand advantage, brand perception, and brand assertion and it may include the specific viewpoint of a certain brand.

Brand knowledge is important for a new brand or a niche brand, but in the case of a well-known brand, brand recall and top-of-mind awareness are sensitive and meaningful in particular [2], [20]. Take an election case, candidates are repeatedly broadcasted via the media and political propaganda. As a result, candidates may have already created a positive impression and high awareness among the voters, so they can easily "evoke" their names from their memory. For these aforementioned

reasons, this study employs the brand recall and top-of-mind awareness as the main features of voter intention inquiry.

Laurent et al. [24] suggested that the assessment of brand awareness of a known product category can be divided into the following three types: spontaneous awareness, top-of-mind awareness aided awareness and it may imply that the brands can be immediately identified by the consumers when they are briefed with multiple brands in a survey. The study of Kim, Kim, and An [21] suggested that top-of-mind awareness assessment is more effective than aided awareness. In an election survey, it's better not to mention or imply the candidates' names or relative ranking in order to avoid the suspicion and any misunderstanding to provide the guidance or involve with cheating. Following the discussion presented in this part, the unaided awareness assessment technique developed by Laurent et al. [24] is used in this study to conduct a voting intention survey.

4.2. Assessment of candidate's original approval rating

4.2.1. Design of the "candidates' awareness survey"

This study is conducted using a telephone interview method. The design principles of this questionnaire may include the following items and they are, (1) the indirect inquiry approach is used to allow the interviewee to reply immediately with natural answers and (2) the number of entries in the questionnaire are kept to a minimum at all possibility.

4.2.2. Procedure of the "candidate awareness survey"

This study employs the perspective and includes the elements of brand awareness and adopts the technique of awareness assessment developed by Laurent et al. [24] to conduct a candidate awareness survey. The procedure may include the following two steps:

- (1) Identifying the first recalled brand in the consumer's memory and it implies the first remembered brand. In other words, the interviewees are asked directly about the name of the first candidate recalled from their memory in the election survey and
- (2) Recording the percentage for each candidate.

However, it is noted in this study that the awareness ratio obtained by using the brand recall and top-of-mind awareness techniques may not guarantee an actual approval rate. This fact means that the outcomes obtained from the above methods could include either or both of the

following two items, (1) the actual approval rate of voters' support for certain candidates; (2) an overestimation or underestimation of the approval rate. As previously discussed in Kotler's study [23], there are two more factors, between the initial purchase intention and final purchase selection, which may affect consumer's purchase behavior and cause the customer's flow-in and out phenomenon. In terms of elections, this study showed that the candidate awareness ratio obtained from these aforementioned techniques is rarely identical to the voter's actual approval rate. Accordingly, this study employs the vote flow-in and out concept and the formula of the "voter's request indicator election prediction model" developed by Lee and Wen [25] based on a "product attribute" concept to investigate voter's flow-in and out. Through the rational analysis, the vote flow is determined, and subsequently the actual evaluated approval rate is ultimately determined by the cross tabulation.

4.3. *Development of the vote flow-in and out formula*

In an election, it may not be a surprise that the most well-known candidates in voters' minds are not elected and this is because the dynamic of the serious competition is not easily understood. Further, in the case of a single-member election, the only candidate will be elected despite the influence of all others affecting the election. This study posits that every candidate has his or her own committed votes, both from the existing and potential groups. However, the committed votes may vary depending on other internal and external situational changes which may cause the originally committed votes to flow/transfer to other candidates, and vice versa. In fact, this situation is typical to result in the flow-in and out phenomenon. Accordingly, the first step in assessing the favoring rate of each candidate is to obtain his/her tendency toward strength, as shown in formula (I):

$$C_i = B_i / A_i, \quad (I)$$

Where C_i stands for the tendency strength of a candidate's vote; B_i stands for the number (from direct inquiry) of explicit supporters of a certain candidate; A_i stands for the results obtained from the brand recall and top-of-mind awareness techniques (indirect inquiry), which is the difference between the number who favor most a candidate and the number of undecided voters. The degree C_i will show the influence on a candidate's vote due to the internal or external situational changes. When

C_i is greater than 1, it means that the candidate's momentum is increasing; and on the contrary, less than 1 may indicate that the situation is worsening.

However, the results obtained by brand recall and top-of-mind awareness techniques can only be used to reveal the situation with a requested answer from each voter excluding those who refuse to answer. Consequently it is apparent that the obtained results do not represent the overall voters' rate for every candidate. Therefore, when the tendency strength is identified, the ratio obtained by brand recall and top-of-mind awareness techniques has to be revised accordingly. As a result, the calculation is shown as formula (II):

$$D_i = M_i \times C_i, \quad (\text{II})$$

Where M_i stands for the rate toward a certain candidate obtained by indirect inquiry, while the number of voters who consider a certain candidate to be the best one is the summation of the following three items: (1) the number of explicit supporters; (2) the number of voters flowing from other candidates, and (3) the number of "undecided voters." The result for M_i multiplied by C_i is the ballot rate obtained through model adjustment and modification, and it is shown as D_i .

These aforementioned formulas (I) and (II) are developed to resolve the allocation of the ratio of unresponsive voters. In other words, when every single D_i is obtained, the sum will not equal 100% since the number of unresponsive voters is not included in the indirect inquiry. In order to calculate the reasonable distribution of unresponsive votes in the direct inquiry according to the indirect inquiry technique, a weighting process may be required to help the ratio sum to be equal to 100%. Consequently, a percentage weighting redistribution correction may deem to be necessary in the final stage. By doing so, the results will accurately stand for the estimated approval ratio for every candidate from all eligible voters. The calculation is shown as formula (III):

$$N_i = D_i / \sum_{i=1}^n D_i \quad (\text{III})$$

4.4. A case

This study features a telephone survey. A candidate rate survey was conducted to check the validity of a brand recall and top-of-mind awareness techniques in predicting candidates' approval rate by referencing the case of Taiwan's 13th term presidential election held on

January 14, 2012. This survey was carried out using a telephone inquiry, and the survey subjects were the eligible voters in Tainan City, Taiwan. A stratified random sampling method was employed based on the legislative segmentation of administrative districts. The survey was conducted four times in the period ranging from September 19, 2011 to January 13, 2012. Examples drawn from the fourth survey are cited in this study to illustrate the model's operational process. In addition, the survey flow-in and out situation is shown in Table 1 and the calculation process and results for the forecasted, approval rating of the candidates before Election Day are included in Table 2.

Taking Ma Ying-jeou and Wu Den-yih (i.e., Ma & Wu) as an example (Table 1), in the brand recall and top-of-mind awareness techniques survey, 407 people considered Ma & Wu to be the best candidates, out of which 62 people remained unresponsive with regard to whom they approved for. Accordingly, all the remaining 345 (A_i) people were assumed to approve Ma & Wu. However, 49 of these originally committed votes for Ma & Wu flowed to Tsai & Su, and 1 of these flowed to Soong & Lin, respectively. In addition, 60 ($= 24+8+28$) votes flowed in from these originally committed votes for Hsieh & Su or some other unknown sources. Therefore, 355 (B_i) explicitly approved Ma & Wu as was reflected in their answers to the final question "Whom will you vote for, if tomorrow were Election Day?"

According to Table 2, the tendency strength value (C_i) for Ma & Wu calculated by using formula (I) was found to be 1.029, for Tsai & Su was 1.274, and for Soong & Lin was 0.364. This indicated that the momentum for Ma & Wu and Tsai & Su was still rising on the eve of before election. On the contrary, the momentum of Soong & Lin was falling. The D_i value for Ma & Wu was then calculated using formula (II), and before this can be done, M_i values had to be calculated first. The M_i value for Ma & Wu was 32.12 ($407/1267$), for Tsai & Su was 35.44 ($449/1267$), and for Soong & Lin was 0.364 ($80/1267$). Finally, the final ballot forecasted rates before the election obtained using formula (III) was Ma & Wu, 41.06 %; Tsai & Su for 56.08 %, and Soong & Lin was 2.86 %.

5. The logistic prediction model theory

5.1. *Framework of the theory*

Logistic regression model analysis has been used in numerous fields. For example, in medicine area, a patient's morbidity is forecasted according to his/her basic information using this method. Buchsbaum et al. [8] employed a logistic regression model to survey the possible relation

existed among these attributes including demographic variables, medical risk elements and urinary incontinence morbidity. In the field of marketing, it is possible to use the customer data attributes to do market segmentation, and then, a multinomial logistic regression can be used to help understand and predict customer's brand selection behavior [14]. There are also some applications of logistic models in the education discipline, in which the study of Diamond, Regan, and Bandyk [11] used logistic regression to analyze the relation existed among family background, home activities and parents' willingness to send children to kindergartens. In terms of the subject area of election, segmentation features can be used to predict electors' voting tendencies. McDermot [33] employed logistic regression to analyze candidate's gender-dependent approval rating and the finding indicated that female candidates are more favored by the liberal voters. On the contrary, conservative voters do not favor them. Nevertheless, the key point of prediction using logistic prediction models depends fully on whether or not the researchers choose the adequate "predictor variables." The major features employed in these aforementioned models are included in this questionnaire. Either continuous variables or class variables, such as age, occupation, registered address, and education; may be handled as the model attributes.

5.2. *A case*

The data used in this method were identical to those used in the above-mentioned brand recall and top-of-mind awareness methods (i.e. the example cited in the last of four surveys conducted between January 12, 2012 and January 13, 2012). For the data used in the model construction, there were 1,267 effective samples included originally in this survey and this sample is composed of only explicit supporters (877 in total), from one of the three sets of candidates - Ma & Wu, or Tsai & Su, or Soong & Lin. In terms of the explanatory variables, five demographic variables included in the survey were gender, age, registered address, political party, and candidate preference. They were used in conducting a chi-square test with respect to approval rating to assess if demographic variables affect voter's approval tendencies toward any set of candidates. The results indicated that only the two demographic variables, namely political party and age, generated less than 0.05 P values in the chi-square test with respect to approval rating. Therefore, it is adequate to justify that the respondents favored the candidates depending on their political party and age. However, gender, registered address, and preference for candidates were the three variables whose P values were greater than 0.05 in the chi-square test, which means these variables were not sufficient to be used to verify

that the voters who were surveyed would not change their approval tendency based on gender, registered address, and preference toward a specific candidate set.

Therefore, this study used the two demographic variables (political party and age) as segmentation variables to categorize the voters who were surveyed into small groups. This practice indicates that the calculation of the explicit voters in each segment is too complicated to be discussed and included. The estimate and related test for each variable are shown in Table 3 by taking advantage of the data analyzed by the logistic regression model.

The model indicates that for the respondents whose political party is Koumintang (KMT, also known as Chinese Nationalist Party), the number voting for Ma & Wu was 1.938 times that of those who are opposed to them. For the respondents whose political party is Democratic Progressive Party (DPP), the number of voting for Tsai & Su was 3.372 times that of those not favoring them. For respondents whose political party is either DPP or PFP (People First Party), these variables may have a negative influence onto the votes for Ma & Wu. Following the same logic, the KMT and PFP political parties may thus have a negative influence on the votes for Tsai & Su.

By comparing the predicted probability values obtained from the model in each segment with the ballot rate obtained using the multinomial logistic prediction model in each segment and by allocating the irresponsive respondents proportionally to the ballot rate, the ballot rates of 40.27 % for Ma & Wu, 56.72 % for Tsai & Su, and 3.01 % for Soong & Lin were obtained by using the proportional vote allocation method, as shown in Table 4.

5.3. *The analysis and comparison of "brand awareness" and "logistic" prediction models*

A "brand awareness election prediction model" and a "logistic prediction model" were employed in this part to analyze the data drawn from the following elections including the KMT Chairman election on July 16, 2005; the legislator election on January 12, 2008; the presidential election on March 22, 2008; the metropolitan elections on November 27, 2010, and the presidential election on January 14, 2012. The predicted ballot rates for each candidate obtained by the employing two different methods are shown in Table 5, in which the ballot rates are compared with actual votes item by item in order to observe the accuracy, stability, and simplicity of these two methods for a comparative analysis and illustration purpose.

5.4. *The comparison regarding accuracy and stability*

As per Table 5, the predicted data obtained by the “brand awareness election prediction model” and the “logistic prediction model” matched roughly with the actual election results. Thus, it is obvious that both methods are regarded as highly accurate.

Regarding the stability, the error rates were found to be 1.20% and 1.58% when the 2005 KMT Chairman election was used; 0.50% and 0.53% for the 2008 legislator election; 0.35% and 0.15% for the 2008 presidential election; 1.24% and 1.64% for the 2010 metropolitan elections, and 1.26% and 0.31% for the 2012 presidential election, respectively. These results may indicate that the stability in the outcomes is reliable by utilizing both the “brand awareness” election predication model and the “logistic prediction model.”

5.5. *The comparison of the calculation of the models*

Further, “the attitudes of others” and “unexpected situational factors” turned out to be two major factors in the “brand awareness election prediction model” which need to be taken into account between the voting intention and voting selection stages, since they can affect voters’ behavior and cause the ballots to flow in and out. The operational process of the model is to obtain the ratio of explicit voters by utilizing the indirect inquiry method into “brand awareness” and also through the direct inquiries technique such as asking the question -- “whom would you vote for, if tomorrow were Election Day?” The results are disclosed in Table 1. Formulas (I), (II), (III) are therefore used for performing the cross tabulation, and every candidate’s forecasted ballot rate is identified very quickly, as shown in Table 2.

On the other hand, the “logistic prediction model” may be the best prediction model based on the various variables included. It is also possible to use this model to determine the probability that respondents, in each group, might vote for a certain candidate according to the groups segmented in terms of the various options provided in the explanatory variables. Finally, the segmented voters are added up by using the probability and proportional vote allocation method, and the overall ballot rate can then be estimated. As noted, this aforementioned process is complicated, time-consuming, and may be cumbersome.

From the above discussion, the operational process for the “brand awareness” election prediction model is much simpler and faster than that of the “logistic prediction model” in general.

5.6 *The comparison of the prediction capabilities of the models*

The two prediction methods are further tested using Mean Square Error which is provided below.

$$MSE = \sqrt{\sum_{i=1}^n (\hat{y}_i - y_i)^2 / n}, \quad (IV)$$

where $\hat{y}_i$ is the prediction values at the i time slot, and y_i is the actual votes in the election results.

It is shown in Table 6 that the predictive capabilities of both the “brand awareness election prediction model” and the “logistic prediction model” are acceptable.

6. Conclusions and suggestions

The main purpose of this study is to compare the “brand awareness election prediction model” and the “logistic prediction model” by analyzing the data collected from various elections that have occurred in Taiwan.

In conclusion, the brand awareness election prediction model is proposed based on marketing theory. Brand recall and top-of-mind awareness techniques are used as the elements for this model in inquiring about voter’s voting intention with an attempt to obtain the approval ratio of the “preferred candidates,” and employing a further integration of the votes flow-in and out formula to obtain the estimated support for the candidates before the election. This study also tests such models and their techniques using electoral surveys conducted in Taiwan. The results indicated these aforementioned techniques to be accurate and practical and it further proved that it is feasible to apply “brand awareness” marketing ideas to conduct the resulting election prediction. In the future, this model can be used for the application of commodity and personage marketing.

The major purpose of an election prediction model is to determine whether the forecasted values for each candidate obtained before the election match with the actual election results. In this regard, when the prediction models remain to be accurate and successful with regard to the application to various elections; the development process, theory, and techniques of the models are proven to be effective. This study employs the “brand awareness election prediction model” and the “logistic prediction model” in a variety of elections, and then compares them with

regard to the attributes of accuracy and stability. The results indicated that each candidate's forecasted ballot rate obtained from the two prediction models before the election were highly matched with the actual outcomes of the election. The stable error rates also imply that both prediction models were extremely successful. However, the major distinction is that the operational procedure for the "logistic prediction model" calculation is more complicated than that of the "brand awareness election prediction model."

Moreover, one major problem of the past methods for election predictions is the unanswered responses, which make the total response of all the observations less than 100% and thus decreases the prediction validity. The models of this study resolve this aforementioned problem of unanswered responses by transferring them as the specific ratios so that the models can be complete and by doing so, it may raise the validity for the estimates.

The major limitation of this study goes to the localization of data source of the empirical study; and in other words, the empirical test was conducted by employing data only in Taiwan. As per previous discussion, the political mechanism and election affairs of Taiwan have been deeply influenced by those advanced nations such as U.S., European nations, and Japan. The prediction variables used in the models, which are examined and investigated by using empirical surveys in Taiwan, are thus highly generic and may be identical to the voters' ideology and behaviors of other countries. As a result, the models can be applicable to explaining the election campaigns of the other nations with some reasonable modification.

There are thus two potential directions/implications for conducting the future studies. The first one is to make a further replication by testing out the current models with more elections campaigns, including the past historical evidences and those of the future, as well as those of national and local elections. The second implication is to make a re-examination for and apply the current models to other countries, so that a comparative study can be done using the evidences based in Taiwan to examine the compatibility and feasibility of the models. Finally, the models developed in this study could be applicable to the emergent voting techniques such as electronic election systems and online social networking, to provide new applications on the prediction of voter's behaviors via the just-in-time and huge amount of data sources.

Table 1

**The details of vote flow-in and out for candidates in 2012 presidential election
(Tainan City, Taiwan).**

Direct inquiry Brand awareness survey technique	Explicitly approve of Ma & Wu		Explicitly approve of Tsai & Su		Explicitly approve of Soong & Lin		Undecided		Total	
Consider Ma & Wu To be the best candidates	295	(72.5)	49	(12.0)	1	(0.2)	62	(15.2)	407	(100)
Consider Tsai & Su To be the best candidates	24	(5.3)	365	(81.3)	2	(0.4)	58	(12.9)	449	(100)
Consider Soong & Lin To be the best candidates	8	(10.0)	37	(46.3)	21	(26.3)	14	(17.5)	80	(100)
Not knowing	28	(8.5)	47	(14.2)	0	(0)	256	(77.3)	331	(100)
Total	355	(28.0)	498	(39.3)	24	(1.9)	390	(30.8)	1267	(100)

Source of data: Results of internal telephone survey, between January 12 and January 13, 2012.

Table 2

**The forecasted calculation of rate of ballot of the candidates in 2012
presidential election (Tainan City, Taiwan).**

Items Candidates	Mi	Ai	Bi	Ci	Di	Ni	Actual votes (2012/1/14)
Ma & Wu	32.12	345	355	1.029	33.05	41.06	39.80
Tsai & Su	35.44	391	498	1.274	45.15	56.08	57.72
Soong & Lin	6.31	66	24	0.364	2.30	2.86	2.48
Undecided	26.13						

Source of data: Results of internal telephone survey, between January 12 and January 13, 2012.

Table 3
Multinomial logistic prediction model and its tests.

Approval rating	Model parameters	B	Standard error	Wald	Degree of freedom	Level of significance	Exp(B)
Ma & Wu	Intercept	15.715	1.184	176.218	1	.000	
	[Political Party: KMT*]	.661	.532	1.547	1	.214	1.938
	[Political Party: DPP*]	-.832	.646	1.661	1	.198	.435
	[Political Party: DFP*]	-.985	.897	1.205	1	.272	.373
	[Political Party: refused to answer]	0			0		
	[Age: 20-29 years]	-14.026	1.369	104.911	1	.000	8.103E-07
	[Age: 30-39 years]	-13.442	1.289	108.724	1	.000	1.453E-06
	[Age: 40-49 years]	-13.661	1.204	128.690	1	.000	1.167E-06
	[Age: 50-59 years]	-12.944	1.224	111.749	1	.000	2.391E-06
	[Age: Over 60 years]	-12.928	1.074	144.783	1	.000	2.429E-06
	[Age: refused to answer]	0			0		
Tsai & Su	Intercept	15.707	.520	912.861	1	.000	
	[Political Party: KMT*]	-.516	.534	.934	1	.334	.597
	[Political Party: DPP*]	1.215	.618	3.866	1	.049	3.372
	[Political Party: DFP*]	-.744	.865	.739	1	.390	.475
	[Political Party: refused to answer]	0			0		
	[Age: 20-29 years]	-12.588	.835	227.467	1	.000	3.412E-06
	[Age: 30-39 years]	-12.612	.721	306.406	1	.000	3.332E-06
	[Age: 40-49 years]	-13.426	.560	574.206	1	.000	1.476E-06
	[Age: 50-59 years]	-12.767	.602	449.496	1	.000	2.854E-06
	[Age: Over 60 years]	-12.850	.000		1		2.627E-06
	[Age: refused to answer]	0			0		

Note: *KMT: Kuomintang; DPP: Democratic Progressive Party; PFP: People First Party.

Table 4
The list of proportionally allocated rate of ballot by multinomial logistic prediction model.

Candidates	Proportionally allocated rate of ballot				
	Explicit	Irresponsive	Votes	Rate of ballot	Actual rate of ballot
Ma & Wu	355	153.920	509	40.27%	39.80%
Tsai & Su	498	219.434	717	56.72%	57.72%
Soong & Lin	24	13.731	38	3.01%	2.48%
Total	877	387.085	1264	100.00%	100.00%

Table 5
The comparison of results obtained from the two methods and actual election.

Items Elections	Date of survey and sample number (N)	Brand awareness election prediction method (%)	Logistic proportional ballot allocation method (%)	Election results (%)
2005/7/16 KMT chairman election	(2005) 7/07-7/09 N=877	Ma Ying-jeou 71.90 Wang Jin-pyng 28.10	Ma Ying-jeou 71.43 Wang Jin-pyng 28.57	Ma Ying-jeou 77.00
	(2005) 7/11-7/14 N=985	Ma Ying-jeou 75.80 Wang Jin-pyng 24.20	Ma Ying-jeou 75.42 Wang Jin-pyng 24.58	Wang Jin-pyng 23.00
2008/1/12 Legislator election	(2007) 12/03-12/04 N=1054	Lai Ching-te 54.30 Kao Su-po 45.70	Lai Ching-te 55.84 Kao Su-po 44.16	Lai Ching-te 51.64 Kao Su-po 48.36
	(2007) 12/27-12/28 N=1060	Lai Ching-te 50.09 Kao Su-po 49.91	Lai Ching-te 49.20 Kao Su-po 50.80	
	(2008) 1/10-01/11 N=1038	Lai Ching-te 52.14 Kao Su-po 47.68	Lai Ching-te 52.17 Kao Su-po 47.83	

Contd...

2008/3/22 Presidential election	(2008) 2/20- 2/21 N=860	Hsieh Chang- ting 48.71 Ma Ying-jeou 51.29	Hsieh Chang- ting 49.27 Ma Ying-jeou 50.73	Hsieh Chang- ting 49.29 Ma Ying-jeou 50.71
	(2008) 2/27- 2/28 N=929	Hsieh Chang- ting 49.07 Ma Ying-jeou 50.93	Hsieh Chang- ting 49.54 Ma Ying-jeou 50.46	
	(2008) 3/04- 3/05 N=1067	Hsieh Chang- ting 47.52 Ma Ying-jeou 52.48	Hsieh Chang- ting 47.68 Ma Ying-jeou 52.32	
	(2008) 3/12- 3/13 N=1103	Hsieh Chang- ting 49.64 Ma Ying-jeou 50.36	Hsieh Chang- ting 49.84 Ma Ying-jeou 50.16	
	(2008) 3/18- 3/19 N=1127	Hsieh Chang- ting 48.94 Ma Ying-jeou 51.06	Hsieh Chang- ting 49.44 Ma Ying-jeou 50.56	
2010/11/27 Metropolitan elections	(2010) 11/24- 11/25 N=1118	Lai Ching-te 61.65 Kuo Tien-tsai 38.35	Lai Ching-te 58.77 Kuo Tien-tsai 41.23	Lai Ching-te 60.41 Kuo Tien-tsai 39.59
2012/1/14 Presidential election	(2011) 09/19- 09/29 N=5422	Ma Ying-jeou 37.64 Tsai Ing-wen 51.24 Soong Chu-Yu 11.12	Ma Ying-jeou 36.11 Tsai Ing-wen 52.74 Soong Chu-Yu 11.15	Ma Ying-jeou 39.80 Tsai Ing-wen 57.72 Soong Chu- Yu 2.48
	(2011) 12/05- 12/15 N=5469	Ma Ying-jeou 36.69 Tsai Ing-wen 51.62 Soong Chu-Yu 8.69	Ma Ying-jeou 38.73 Tsai Ing-wen 53.45 Soong Chu-Yu 7.83	

Contd...

	(2011) 12/19-12/21 N=1403	Ma Ying-jeou	Ma Ying-jeou
		40.99	39.49
		Tsai Ing-wen	Tsai Ing-wen
	(2012) 01/12-01/13 N=1267	50.82	52.18
		Soong Chu-Yu	Soong Chu-Yu
		8.20	8.42
		Ma Ying-jeou	Ma Ying-jeou
		41.06	40.11
		Tsai Ing-wen	Tsai Ing-wen
		56.08	56.97
		Soong Chu-Yu	Soong Chu-Yu
		2.86	2.92

Source of data: Results of internal telephone survey from three individual elections in Tainan.

Table 6
The MSE comparison of the two election prediction methods.

2005 KMT chairman		2008 Legislator		2008 Presidential election		2011 Metropolitan elections		2012 Presidential election	
A*	B*	A	B	A	B	A	B	A	B
3.70	4.09	3.11	2.82	.87	.78	1.24	1.64	5.70	4.31

Note: A = Brand awareness; B = Logistic prediction model.

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