THE ANALYTIC HIERARCHY PROCESS: APPLICATION TO THE ELECTION OF THE CHIEF MINISTER OF PERAK, MALAYSIA 2013

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ABSTRACT

For the last two-three decades in an attempt to predict most likely outcomes of public elections different methods and techniques have been developed and employed by social scientists to produce empirical evidence of a predictive power. This study is focusing on application of analytic hierarchy process (AHP) as a tool to forecast most likely winning candidate in the forthcoming election of the Chief Minister of Perak, Malaysia, in the year 2012. Two candidates, Dato Seri Diraja Dr. Zambry Abd Kadir Zambry and Dato Seri Ir' Mohammad Nizar Jamaluddin, were compared vis-à-vis using AHP technique against seven sub criteria, such as charisma, humility, integrity, party, nation-building, people engagement, leadership and experience. AHP questionnaires were distributed in Ipon, state of Perak, Malaysia. There were 30 respondents selected randomly. According to the overall results, Dr. Zambry is projected to be the favored candidate for the post of Chief Minister of Perak in the forthcoming election with 59.57 per cent of winning votes over his counterparty Nizar. However, differences existed in voting between the three races representing population of Malaysians. Although Malays and Indians have shown the unanimous support to Dr. Zambry with the voting scores of 66.98 per cent and 69.55 per cent respectively, Chinese have given their preference to Nizar (60.12 per cent over Zambry).

Keywords: Analytic Hierarchy Process, predicting elections outcomes, Malaysia.

1. Introduction

Last two decades witnessed increased interest in predicting the outcomes of public elections not only by politicians but also social scientists. The latter group have developed numerous methods of predicting election outcomes and produced empirical evidence for their validity. These methods vary from the utilization of ordinary public opinion polls (Sigelman, 1979; Cohen, 1998; Wolfers & Leigh, 2002), prediction markets (Forsythe, Murray, Krishnamurthy, & Ross, 1995) and more complicated econometric and index models (Wescott & Goldberg, 1984; Armstrong & Graefe, 2011) to quite innovative methods such as unreflective judgments by respondents about images and videos of political candidates (Ballew & Todorov, 2007; Benjamin & Shapiro, 2009; Antonakis & Dalgas, 2009; Armstrong, Green, Jones, & Wright, 2010; Mattes, Spezio, Kim, Todorov, Adolphs & Alvarez, 2010) or content analysis of the online

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social networks such as Tweeter or Facebook (Tumasjan, Sprenger, Sandner & Welpe, 2010; Metaxas, Mustafaraj & Gayo-Avello, 2011). All of the above techniques have produced mixed empirical evidence of their validity.

Furthermore, the above methods emphasize either emotional or rational part of the mind as human use it in the process of decision making. However, there is a method which was intrinsically designed to combine rational and emotional side of our reasoning – Analytic Hierarchy Process (AHP) (Saaty, 1980). Nevertheless, in the literature this method was scarcely employed to the problem of predicting the political elections outcomes (Saaty, 2004; Zammori, 2010). The objective of this study is to demonstrate application of AHP method to the problem of determining the most likely winning candidate in the forthcoming General Election 13 (GE 13) in the state of Perak, Malaysia.

2. Literature review

Few works are particularly relevant to the interest of this study (Saaty, 2004; Zammori, 2010) as these authors demonstrated the application of AHP to the problem of predicting political elections.

Rozann Saaty (2007) stated that political elections can be easily formulated as hierarchy with the popular current issues as criteria and sub-criteria and the candidates as alternatives. According to her, AHP method has been successfully applied for the predictions of presidential elections outcomes over the period of twenty five years and criteria was found to be varying widely from election to election. As author further explains, "one has to be able to read and sense the political times to know what criteria the voters are focusing on in the election".

The author of the AHP method, Thomas Saaty demonstrated application of hierarchy to political candidacy (Saaty and Bennett, 1977). The hierarchy applied by these authors had eight criteria: charisma, glamour, experience, economic policy, ability in interrelationship, personal integrity, past performance and honesty. In the matter of determining the relevant decision criteria, authors were guided by the popularity of contemporary issues among general public. For instance, people who might be affected by Watergate scandals, which were a contemporary issue at that time, might be especially sensitive to the criteria of political leaders being honest and exhibiting high integrity standards.

In a more recent scholarly work another author (Zammori, 2010) illustrated application of AHP technique to the problem of identifying most likely nominee for the Democratic Party in United States presidential elections 2008 by assessing two potential candidates: Senator H. Clinton and Senator B. Obama against the popular current issues. The analytical hierarchy of the problem included five criteria: economic (with seven sub criteria: economy, social security, budget deficit, war in Iraq, energy, immigration and taxes), social (five sub criteria: healthcare, immigration, abortion, environment and social security), political (four sub criteria: war in Iraq, foreign policy, immigration and security), personal (six sub criteria: likeability, appearance, campaign budget, trustworthiness, experience and leadership) and media. Apparently this author was also guided by the popularity of contemporary issues while choosing the appropriate criteria and sub criteria as some of the criteria employed are generic and universal across the time, such as person's likeability or appearance, while some are tailored to reflect the critical issues of contemporary times, such as, for instance, healthcare or war in Iraq.

Logically we should expect the criteria vary not only across the time but also from country to country. For Malaysian context none of similar studies exist in the literature. Therefore in the process of identifying criteria the authors of this work were driven by aforementioned advice by Rozann Saaty "to sense the political times". To sense what criteria might be considered as critical by the general public in Malaysia in the light of forthcoming GE13, the authors analyzed relevant articles in the popular local printed media

such as The Star and The New Straits Times. The criteria and sub criteria that emerged from this analysis as being relevant to the present Malaysian context are presented and explained in the Table 1.

Table 1. Political issues functioning as criteria for the choice of the Chief Minister of Perak.

Criteria	Sub-criteria	Explanation
Personality	Charisma	Compelling attractiveness or charm that can inspire people.
	Humility	Modest and respectful, egolessness.
	Integrity	High quality of moral standards, trustworthiness. Shows consistency among principles, values and behaviours.
Politics	Party	The party to which candidate belongs to.
	Nation building	Ability to protect unity and sovereignty of the nation from foreign influences.
	People engagement	Willingness to listen to the people, understand their problems, being sensitive to their needs and act on those needs.
Aptitude	Leadership	Ability to provide leadership during normalcy and crisis time towards greater stability and prosperity of the state.
	Experience	Skill, knowledge, abilities in providing good governance.

3. Method

The decision hierarchy formed from the criteria and sub criteria identified and discussed in the previous section is shown in the Figure 1. The goal of the decision making process presented by the AHP hierarchy is electing Chief Minister of Perak among two alternatives: Dato Seri Diraja Dr. Zambry Abd Kadir Zambry (A1) and Dato Seri Ir' Mohammad Nizar Jamaluddin (A2).

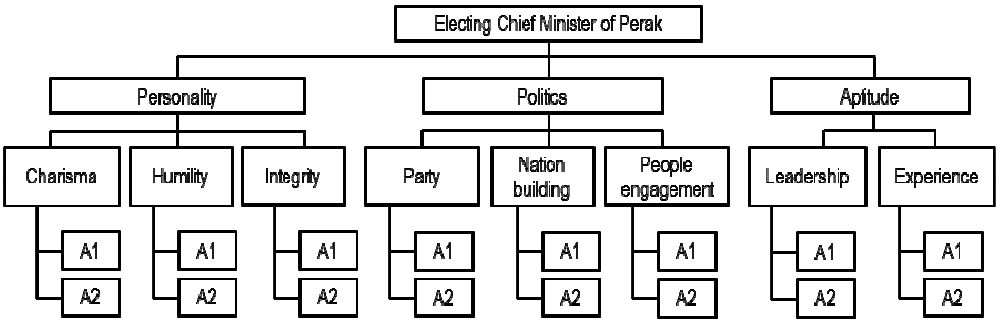


Figure 1. Decision hierarchy for electing Chief Minister of Perak.

On the basis of the above hierarchy we formed an AHP questionnaire comprising of demographic information items and pairwise comparison questions for the top criteria, sub criteria and the alternatives. Respondents were evaluating the intensities of criteria, sub criteria and alternatives on the basis of standard Saaty's (1/9, 9) ratio scale.

Instead of asking the respondents to fill in intensities into blank comparison matrixes, pairwise comparison items were given to respondents in the form of questions. In every question respondents were asked to, first, identify which one of two elements of the AHP hierarchy being compared is more important and how much more important according to the ration scale.

The population under study is Perak electorate. Therefore, a random sample of thirty people was selected comprised of Malays, Chinese and Indians with respective percentage representations of these three races closely approximating those of the entire state of Perak. All thirty questionnaires were collected and useable for analysis.

4. Data analysis and results

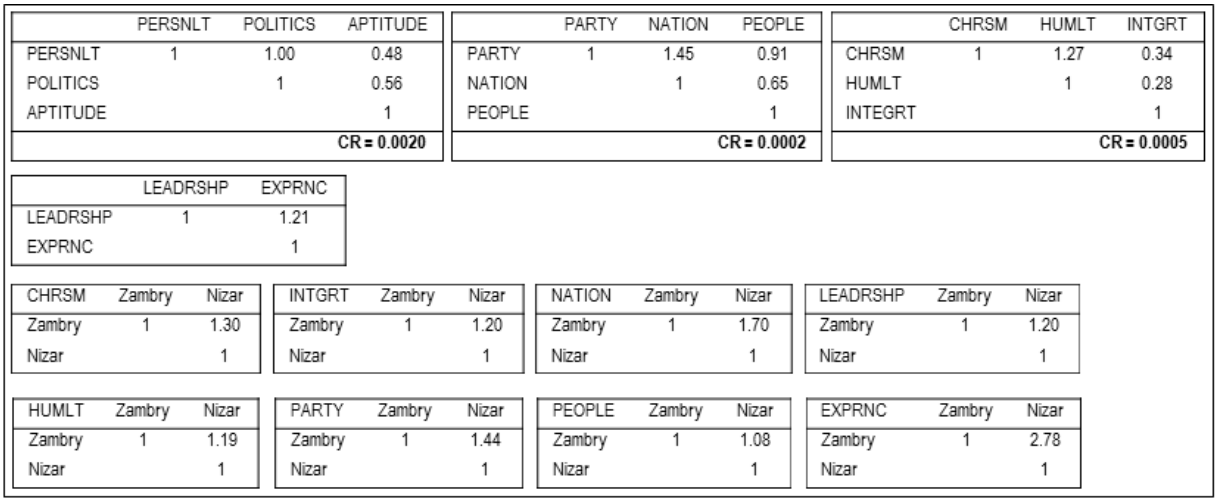
The profiles of thirty respondents are provided in Table 2.

Table 2. Respondents' profile.

Demographic variable	Frequency	Per cent
Gender		
Males	12	40.00
Females	18	60.00
Race		
Malays	18	60.00
Chinese	9	30.00
Indians	3	10.00
Age group		
below 25	4	13.33
25-30	9	30.00
31-35	5	16.67
36-40	6	20.00
41-50	5	16.67
above 50	1	3.33
Highest level of education		
O'Level	2	6.67
A'Level	4	13.33
Bachelors	21	70.00
Masters	3	10.00
Marital status		
Single	11	36.67
Married	19	63.33
Type of employment		
Public	10	33.33
Private	16	53.33
Self-employed	3	10.00
Other	1	3.33

Individual judgments by these thirty respondents were aggregated by using their geometric mean. This method of aggregating individual judgments is only appropriate method to preserve reciprocal property of judgments and thus assure the accuracy of an overall result, as suggested by Acźel and Saaty (1983).

Figure 2 displays all twelve pairwise comparison matrices that were obtained by using the geometric means. Three out of twelve pairwise comparison matrices which contain more three elements to be compared have the consistency ratios 0.002, 0.0005 and 0.0002. The rest of pairwise comparison matrices contain only two elements to be compared and therefore cannot be inconsistent and their consistency ratios are equal to 0.00.



	PERSNLT	POLITICS	APTITUDE
PERSNLT	1	1.00	0.48
POLITICS		1	0.56
APTITUDE			1
			CR = 0.0020

	PARTY	NATION	PEOPLE
PARTY	1	1.45	0.91
NATION		1	0.65
PEOPLE			1
			CR = 0.0002

	CHRSM	HUMLT	INTGRT
CHRSM	1	1.27	0.34
HUMLT		1	0.28
INTEGRT			1
			CR = 0.0005

	LEADRSHP	EXPRNC
LEADRSHP	1	1.21
EXPRNC		1

CHRSM	Zambry	Nizar
Zambry	1	1.30
Nizar		1

INTGRT	Zambry	Nizar
Zambry	1	1.20
Nizar		1

NATION	Zambry	Nizar
Zambry	1	1.70
Nizar		1

LEADRSHP	Zambry	Nizar
Zambry	1	1.20
Nizar		1

HUMLT	Zambry	Nizar
Zambry	1	1.19
Nizar		1

PARTY	Zambry	Nizar
Zambry	1	1.44
Nizar		1

PEOPLE	Zambry	Nizar
Zambry	1	1.08
Nizar		1

EXPRNC	Zambry	Nizar
Zambry	1	2.78
Nizar		1

Figure 2. Pairwise comparison matrices comprising the geometric means of individual judgments.

The priorities and corresponding ranks of the criteria for the election of Chief Minister of Perak calculate on the basis of obtained aggregated pairwise comparison matrices are provided in Table 3. Overall the respondents placed prior importance on candidates' aptitude by weighting it at 48.96 per cent while Personality and Politics received very close weights of 24.89 and 26.15 per cent respectively. Three top most important sub criteria in the matter of electing Chief Minister of Perak are Leadership, Experience and Integrity with respective global weights of 26.83, 22.13 and 15.32 per cent.

Table 3. Criteria and sub criteria for the election of Chief Minister of Perak, their priorities and ranks.

Criteria and sub criteria	Weight	Rank
Personality	0.2489	
Charisma	(0.2489 × 0.2133) = 0.0531	7
Humility	(0.2489 × 0.1713) = 0.0426	8
Integrity	(0.2489 × 0.6154) = 0.1532	3
Politics	0.2615	
Party	(0.2615 × 0.3595) = 0.0940	5
Nation building	(0.2615 × 0.2508) = 0.0656	6
People engagement	(0.2615 × 0.3897) = 0.1019	4
Aptitude	0.4896	
Leadership	(0.4896 × 0.5480) = 0.2683	1
Experience	(0.4896 × 0.4520) = 0.2213	2

We also observed that distribution of priorities and ranks varied among different races as shown in Table 4. Again within every race group the top priority was unanimously given to the Leadership, Experience and Integrity sub criteria.

Table 4. Priorities and corresponding ranks of sub criteria according to race.

Sub criteria	Malay		Chinese		Indian	
	Weight	Rank	Weight	Rank	Weight	Rank
Charisma	0.0345	8	0.0884	4	0.1020	4
Humility	0.0429	7	0.0322	8	0.0643	6
Integrity	0.1250	4	0.2024	2	0.1471	3
Party	0.1594	3	0.0408	7	0.0260	8
Nation building	0.0791	6	0.0415	6	0.0454	7
People engagement	0.1034	5	0.0877	5	0.0792	5
Leadership	0.2246	2	0.3522	1	0.2194	2
Experience	0.2311	1	0.1549	3	0.3165	1

To statistically evaluate similarities and differences in rankings between various races we compared ranks by three races pairwise using Spearman correlation analysis. The results of the statistical test are presented in Table 5. The orders of priorities by Malays and Chinese statistically significantly differ. The same conclusion applies to Malays and Indians. However, the ranks of sub criteria provided by Indians and Chinese are statistically not significantly different at 1 per cent level of confidence.

Table 5. Rank correlation coefficients of sub criteria for various races.

Malay	Chinese	Malay	Indian	Indian	Chinese
0.500		0.476		0.857**	
(0.207)		(0.233)		(0.007)	

** Correlation is significant at the 0.01 level (2-tailed)

The priorities against each of the sub criteria and overall scores of both candidates are presented in Table 6. Zambry is found to score higher on all the sub criteria. Top three sub criteria on which Zambry scored the highest versus his counterparty are Experience, Nation-building and Party. The overall score for Zambry versus Nizar stands at 59.57 versus 40.43 per cent.

Table 6. Candidates' overall scores and their priorities against sub criteria.

Sub criteria		Candidates	
		Zambry	Nizar
Charisma	(0.0531)	(0.0531 × 0.5645) = 0.0300	(0.0531 × 0.4355) = 0.0231
Humility	(0.0426)	(0.0426 × 0.5431) = 0.0232	(0.0426 × 0.4569) = 0.0195
Integrity	(0.1532)	(0.1532 × 0.5458) = 0.0836	(0.1532 × 0.4542) = 0.0696
Party	(0.0940)	(0.0940 × 0.5905) = 0.0555	(0.0940 × 0.4095) = 0.0385
Nation building	(0.0656)	(0.0656 × 0.6294) = 0.0413	(0.0656 × 0.3706) = 0.0243
People engagement	(0.1019)	(0.1019 × 0.5188) = 0.0529	(0.1019 × 0.4812) = 0.0490
Leadership	(0.2683)	(0.2683 × 0.5463) = 0.1466	(0.2683 × 0.4537) = 0.1217
Experience	(0.2213)	(0.2213 × 0.7354) = 0.1627	(0.2213 × 0.2646) = 0.0585
		0.5957	0.4043

However, the results among different races varied again as it is shown in Table 7. There are certain similarities between priorities given by Malays and Indians. However, Chinese weighted candidates against the decision sub criteria quite differently. Malay and Indian groups of respondents near unanimously gave highest weights to Zambry versus Nizar on three highest ranked sub criteria by all groups – Leadership, Experience and Integrity. Interestingly, on the very same sub criteria, except

Leadership, Chinese respondents ranked Nizar as highest versus Zambry. As a result Zambry led the election race for Malay and Indian groups of respondents with the respective wining scores of 66.98 and 69.55 per cent while losing to Nizar in Chinese group with the score of 39.88 per cent.

Table 7. Candidates' overall scores and their priorities against sub criteria according to race.

Sub criteria	Malay		Chinese		Indian	
	Zambry	Nizar	Zambry	Nizar	Zambry	Nizar
Charisma	0.0214	0.0131	0.0369	0.0515	0.0670	0.0350
Humility	0.0258	0.0170	0.0126	0.0195	0.0406	0.0237
Integrity	0.0808	0.0442	0.0623	0.1401	0.0966	0.0505
Party	0.1073	0.0521	0.0160	0.0249	0.0171	0.0089
Nation building	0.0555	0.0236	0.0181	0.0234	0.0326	0.0128
People engagement	0.0599	0.0435	0.0312	0.0565	0.0512	0.0280
Leadership	0.1406	0.0840	0.1239	0.2283	0.1419	0.0775
Experience	0.1784	0.0527	0.0978	0.0572	0.2486	0.0679
	0.6698	0.3302	0.3988	0.6012	0.6955	0.3045

Nevertheless, according to the overall scores across all the races, in the forthcoming election for the post of Chief Minister of Perak Zambry would be expected to become the winning candidate.

5. Discussion and conclusion

This study intended to demonstrate application of AHP method to the problem of predicting the election outcomes on the example of election for the post of Chief Minister of Perak. Two candidates, Dato Seri Diraja Dr. Zambry Abd Kadir Zambry and Dato Seri Ir' Mohammad Nizar Jamaluddin, were compared vis-a-vis against seven sub criteria, such as charisma, humility, integrity, party, nation-building, people engagement, leadership and experience.

According to the overall results, Dr. Zambry is projected to be the favoured candidate for the post of Chief Minister of Perak in the forthcoming election. Overall Zambry stands to win 59.57 per cent over his counterparty Nizar. However, differences exist in voting between the three races. The Although Malays and Indians have shown the unanimous support to Dr. Zambry with the voting scores of 66.98 per cent and 69.55 per cent respectively, Chinese have given their preference to Nizar (60.12 per cent over Zambry).

Overall Dr. Zambry has scored higher than his counterparty on all the sub-criteria employed in this study. The highest difference in his favour exists for such criteria as experience (73.54 per cent over Nizar), nation-building (62.94 per cent over Nizar) and party (59.05 per cent over Nizar).
By ranking sub-criteria respondents in general gave the prior importance to such characteristics of a candidate as leadership, experience and integrity with the respective global scores 26.83, 22.13, and 15.32 per cent. Coincidentally those were exactly the criteria on which Zambry scored significantly higher than his opponent.

Importantly, the results of this study may serve as validation example for the AHP process once compared against the actual election outcomes, although, the limitations of the study must be taken into consideration. If sample size could be increased to two to three hundred respondents at least, this AHP process results might serve as a better representation of the population under study.

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