29th Oct 2018 **The STV system (by John Carson)**

STV (Single Transferable Voting) that's the voting system where voters number the candidates in order of preference is complicated. Few people understand how it works and many believe that all the preferences they carefully chose will influence the result of the election.

It doesn't work like that. There is no computer program evaluating the preferences. The process of candidates obtaining the necessary quota of votes to be declared elected is mechanical and every voter is treated differently. (*A flow chart showing the vote counting process is on page 36 of; Choosing Electoral Systems in Local Government in NZ, located on the stc.govt.nz website*).

In an election process in what is known as the first iteration, the 1st preference votes are counted. The result of that is used to calculate the quota of votes candidates need to be elected. When a candidate has reached the quota they are declared elected, and surplus votes over the quota are transferred as a fraction of a vote to the voters 2nd preference. When there are no more surplus votes to transfer the lowest polling candidate is excluded, and their vote is transferred to the next preference of all the voters that had that candidate as their 1st preference. If the vote cannot be transferred because the voter has no preferences left, the vote then becomes non-transferable and the voter is removed from the ballot and the quota recalculated. Candidates are given a Keep Value and that is the proportion of each vote retained by a candidate. The Keep Value is used when calculating the surplus votes.

Information from the 2016 Whanganui DHB election is used to explain the process. The candidates in the first table on page 2, were the seven leading candidates at the first iteration and were eventually declared elected. The candidates in the second table were not elected. Total votes; 20,606

Below is a sample voting paper of the 2016 Whanganui DHB election. Voter Bob's preferences could have been the same as one of the 20,606 voters. Using the information on the tables above, and actual figures from the election results, the process is explained.

Voter Bob	
Adams	5
Anderson	2
Baker-Hogan	3
Duncan	9
Ellwood	4
Firman	7
Hylton	14
McDonald	11
Main	1
Osbourne	15
Stanbrook-Mason	10
Stevens	12
Teki	13
Vinsen	8
Wills	6

Iteration 1; Voter Bob's 1st preference Main, is declared elected with 1659 surplus votes. Voter Bob's share of Mains surplus is calculated by dividing the surplus, by the number of votes, (1659 ÷ 4235 = .391). This share is then transferred to Voter Bob's 2nd preference, Anderson.
Iteration 2; Anderson was also declared elected at the first iteration and now has only 168 surplus votes. Voter Bob's share of the 168 votes is calculated. This is then transferred to his 3rd preference, Baker-Hogan.
Iteration 3; Baker-Hogan, like Main and Anderson was declared elected at the first iteration and now has 43 surplus votes. Voter Bob's share is then recalculated as explained above, and transferred to his 4th preference, Ellwood.
Iteration 4; Ellwood was excluded from the poll at the third iteration so all of the vote that Ellwood would have received is transferred to Voter Bob's 5th preference, Adams.

From iteration 2 Main had surplus votes at every iteration, which ranged in number from 2 to 249 votes. These surplus votes are transferred first to Anderson, then to Baker-Hogan, then to Elwood etc, the same process as outlined above, commencing at every iteration, for the rest of the ballot. Small fractions of Bob's vote are transferred down the chain with every candidate getting a rub off it.

Iteration 20; Adams is now declared elected with 99 surplus votes to be transferred. Voter Bob's share of Adams surplus vote is again recalculated and transferred to Voter Bob's 9th preference Duncan. (Voter Bob's 6th preference Wills, 7th preference Firman and 8th preference Vinsen had all been excluded from the poll).
Iteration 21; Duncan had been declared elected at the ninth iteration and now had 73 surplus votes to be transferred. Voter Bob's share is again recalculated and transferred to his 11th preference McDonald. (Voter Bob's 10th preference Stanbrook-Mason had been excluded at the eighth iteration).
Iteration 23: Mc Donald had been declared elected at the sixteenth iteration and now had 37 surplus votes to be transferred. Voter Bob's share is again recalculated and transferred to his 12th preference Stevens.
Iteration 24; Stevens now has 2,227.642250329 votes. The quota is 2360.288214100 and Stevens status is hopeful.
Iteration 25; The quota to be declared elected is now 2,357.048732097 votes. Stevens has only 2,244.888453256 votes not enough to be elected. Seven candidates have been declared elected and the poll is closed

Iteration Elected	**Candidate**	**1st Preference**	**Votes when Elected**	**Surplus Votes when Elected**	**Vote Value of Surplus**	
20	Adams	1591	2497	99	.039	
1	Anderson	3009	3009	433	.144	
1	Baker-Hogan	2906	2906	330	.113	
17	Duncan	1312	2425	31	.012	
25	Hylton	935	2372	16	.006	
16	McDonald	1752	2546	61	.023	
1	Main	4235	4235	1659	.391	
		15740		**2628**		

Iteration excluded	**Candidate**	**1st Preference**	**Votes Gained**	**Transferred Votes**	**Votes not Transferred**
3	Ellwood	327	77	404	
18	Firman	750	830	1580	
11	Osbourne	582	281	863	
8	Stanbrook-Mason	634	134	768	
	Stevens	833	1412		2245
13	Teki	590	464	1054	
15	Vinsen	665	564	1229	
5	Wills	485	155	640	
		4866	**3917**		

Voter Ted's preferences could have been the same as anyone of the 20,606 voters. Once again using the information on the tables above, and actual figures from the election results, the process is explained.

Voter Ted	
Adams	9
Anderson	5
Baker-Hogan	10
Duncan	7
Ellwood	3
Firman	5
Hylton	11
McDonald	14
Main	6
Osbourne	2
Stanbrook-Mason	12
Stevens	13
Teki	8
Vinsen	1
Wills	4

Iteration1; Vinsen's 1st preference votes are counted and he has 665 votes.
Iteration 15; The quota is now 2,498 votes. Vinsen has had 564 votes transferred to him making a total of 1,229, not enough to be elected and is excluded from the poll. Voter Ted's 1st preference vote to Vinsen will now be transferred to Ted's 5th preference Firman. (Voter Ted's 2nd, 3rd and 4th preferences have already been excluded).
Iteration 18: The quota is now 2,475 votes. Firman had 750 1st preference votes and had 830 votes transferred to her making a total of 1,580, not enough to be elected and is excluded from the poll. Voter Ted's one vote that had been transferred to Firman, is now transferred to Ted's 6th preference Main.
Iteration 19; Main is already elected and has a surplus of 249 votes. Voter Ted's share of Mains surplus is calculated and transferred to his 7th preference Duncan
Iteration 21; Duncan is already elected and has a surplus of 178 votes. Voter Ted's share is calculated and transferred to his 9th preference Adams. (Ted's 8th preference had been already excluded).
Iteration 22; Adams is already elected and 56 surplus votes. Voter Ted's share of Adams surplus is calculated and transferred to his 10th preference Baker-Hogan.
Iteration 23; Baker-Hogan is already elected and has 34 surplus votes to transfer. Voter Ted's share is calculated and transferred to his 11th preference Hylton.
Iteration 24; The quota is 2,360 and Hylton has 2,345 votes, 15 short.
Iteration 25; The quota is 2,357. Hylton has 2,373 votes and is the seventh candidate declared elected. The poll has concluded.

At iteration 19,20,21,22, 23 and 24 Main had surplus votes. At each of these iterations, Voter Ted's share of Mains surplus is transferred, first to Duncan, then to Adams etc, right down the chain with every candidate gaining a rub, for the rest of the election.

1,750 votes were non-transferable.

Although Hylton was elected, none of the other preferences of the 935 voters that had Hylton as their 1st preference, were used in the election, to assist candidates to reach the quota.

The 833 voters who gave Stevens their 1st preference vote failed to elect a candidate. As well as that none of their other preferences were used in the election.

The candidates that were elected were the same seven candidates that were leading the poll at the first iteration. This result has been the same for the two previous Whanganui DHB elections.

Conclusions

1; 1st preference votes are the only vote that is important. 20,606 people voted in the election. 15,740 voters picked the top seven candidates with their 1st preferences, and made the mould that determined the result of the election. 4,866 people with their 1st preferences chose the eight candidates who were

unsuccessful. The number of preferences they selected is not known, but they made no difference to the result of the poll

2; Voters are poorly rewarded for the effort they expend in choosing their preferences. They have no control of which candidate benefits from their preference. (*In the examples above the 12th and 11th preference were the ultimate beneficiary for an election for seven vacancies).*

3; As well as Stevens 833 and Hylton's 935 voters, another group of voters failed to have their preferences used. These were the voters whose 1st preference candidates were excluded, and their 2nd preference was Hylton or Stevens.

4; Apart from the voters who voted for Main, Anderson and Baker-Hogan there is little activity, and every voter is treated differently. The numbers of surplus votes transferred are small.

The stv.govt.nz website has a demonstration that reinforces these statement. It shows a hypothetical election with five candidates competing for three positions. The candidates who are leading at the first preference count are the same three who are declared elected. Substitute dots to designate voters instead of green lines on the demonstration, and the lack of vote activity especially with middle field candidates is obvious. (This demonstration will not open on tablets).

5; Because candidates are excluded from the poll before other preferences are known, a candidate that has a large number of 2nd and 3rd preferences, but a small number of 1st preference votes is unlikely to be elected.

6; The election results are complicated to understand and appear to have errors. The DHB STV Public Report is produced using Excel. From iteration nineteen, the non-transferable votes are not included in the report, because of what appears to be an error in the program.
At iteration twenty-five the quota to be elected was 2,357.048732097 votes. Hylton with 2372.753052822 votes had reached the quota and was declared elected. Seven candidates had been elected for seven vacancies. The poll was then closed.
At the close of poll Stevens had 2,244.888453256 votes. Although these votes were not transferred Stevens status is stated as excluded.
The Whanganui DHB final result - Election 2016 published 14-10-2016, states that the quota at the twenty-fifth iteration is 2,357.048828, a different figure to that in the DHB STV Public report. (A difference of .000096). Stevens status in the Final result is excluded, and his keep value is 0. Because his votes were never transferred his status should have been hopeful, and his keep value should be 1.

7; The system is complicated and few people understand how it functions. Whanganui District Council personnel were not able to explain the system at their public meeting. The public do not understand that they only have one vote.

8; For the 2016 Whanganui DC elections, 17,546 electors cast 165,743 votes to elect twelve councillors, that's 9.4 votes per elector. Every vote is counted. It is either a winner or loser. Every voter is treated the same. Compare that result with the Whanganui DHB election, with its lack of activity, and uneven treatment of voters. STV denies voters the collective wisdom of the electorate.