Exploring Methods of Maximising Tournament Participation and Ring Experience Within the New Zealand Setting

Introduction

Being that New Zealand is a small, geographically isolated country it can be hard for competitors to gain ring experience.
With a relatively small membership and strict ranges for divisions it is quite often the same few competitors facing each other time after time.

In places like Europe, with a larger population and easy travel between countries, a serious athlete could travel around competing at every available opportunity.

There also seems to be rising interest in round robin tournaments over the traditional single elimination tournament as the competitor is guaranteed more than one matchup which is more appealing than being sent home after a first round loss.

The purpose of this document is to first examine the pros and cons of several different formats and calculate the time taken to run a division, the minimum, maximum and average number of matches per competitor then compare the effect of increasing the division sizes.

The second part outlines a ladder competition designed to encourage greater participation in the tournaments we schedule throughout the year and provide opportunities for competitors to seek out challenging and varied opponents.

The overall goal is to see how we can increase the amount of competition available to our members without increasing the time to run an event to an unmanageable level or saturating the calendar with tournaments.

The main focus of this document is on sparring competitions but can just as easily be applied to patterns competition as well.
Power breaking and specialty technique competitions fall out of scope of this analysis because the competitors are not directly competing against each other but rather individual performance is measured against the group as a whole.

Comparison of Tournament Formats

There are two main styles of tournament; elimination and non-elimination.
Elimination formats being where the competitors are removed until only the winner is left and non-elimination where the winner is determined by points once the division is over.

This comparison will be for two of each style.
Elimination:

- Single
- Double

Non-Elimination:

- Round robin
- Swiss

To keep the maths simple I'll be using 4, 8 and 16 for the division sizes.
This ensures that for the elimination formats there are the same number of competitors in each round and the averages will be the same for any of the competitors.

For this comparison I will be using a typical two round sparring match with a clear winner after the two rounds.
A match will take five minutes to complete; two, two minute rounds and a one minute break between rounds.
For simplicity I'm not including time between bouts or stoppages during the match.
Five minutes would also be an acceptable estimate for patterns competition as well.

Single Elimination Tournament

The single elimination format is the most common format within Taekwon-Do.
All of our major tournaments run this way and it is common across a wide range of sports and games so it is well established and well understood with its simplicity being it's biggest advantage.

As the majority of our tournaments are run this way, there are plenty of systems in place for managing the tournament.
It is also simple enough that if you don't have access to any computerised system you can manage the tournament quite well using pen and paper.

Each round the number of competitors is reduced by half making it the fastest format to run.
The only way to be faster would be if both competitors could be eliminated at the same time, perhaps by having a point threshold that the winner has to beat to move on to the next round.

As half the competitors are eliminated each round, this system would not be well suited for a beginners tournament where the aim is to maximize their ring experience.

All competitors will be guaranteed one match but only the two who make it to the finals will reap the full benefit.

Doubling the number of competitors only increases the maximum bouts by one and has a tiny effect on the average.

No. Competitors	Time Taken (minutes)	Minimum Bouts	Maximum Bouts	Average Bouts
4	15	1	2	1.5
8	35	1	3	1.75
16	75	1	4	1.875

Round robin

The round robin system has the same advantage of being a well known system. It is becoming more popular, especially at junior tournaments, as every competitor is guaranteed N-1 matches.

The biggest disadvantage to this format is the time it takes.
Doubling the competitors increases the time by a factor of four.

No. Competitors	Time Taken (minutes)	Minimum Bouts	Maximum Bouts	Average Bouts
4	30	3	3	3
8	140	7	7	7
16	600	15	15	15

PNTA run a round robin tournament each year as a fundraiser and have made some modifications to help speed up the divisions:

- A single three minute round.
- Split large divisions into pools with the top two from each pool facing off in an elimination format with two, two-minute rounds for this elimination phase.

There are some other changes to the rules to cater for younger students but they don't affect the time taken to run the tournament.

No. Competitors	Time Taken (minutes)	Minimum Bouts	Maximum Bouts	Average Bouts
4	18	3	3	3
8 (2 pools of 4)	51	3	5	3.75
16 (2 pools of 8)	183	7	9	7.375
16 (4 pools of 4)	107	3	6	3.875

It terms of time taken, these modifications offer a significant improvement over the normal round robin format.
Splitting the divisions into pools will reduce the number of bouts in the division but will also allow you to guarantee the competitors a minimum number of bouts.

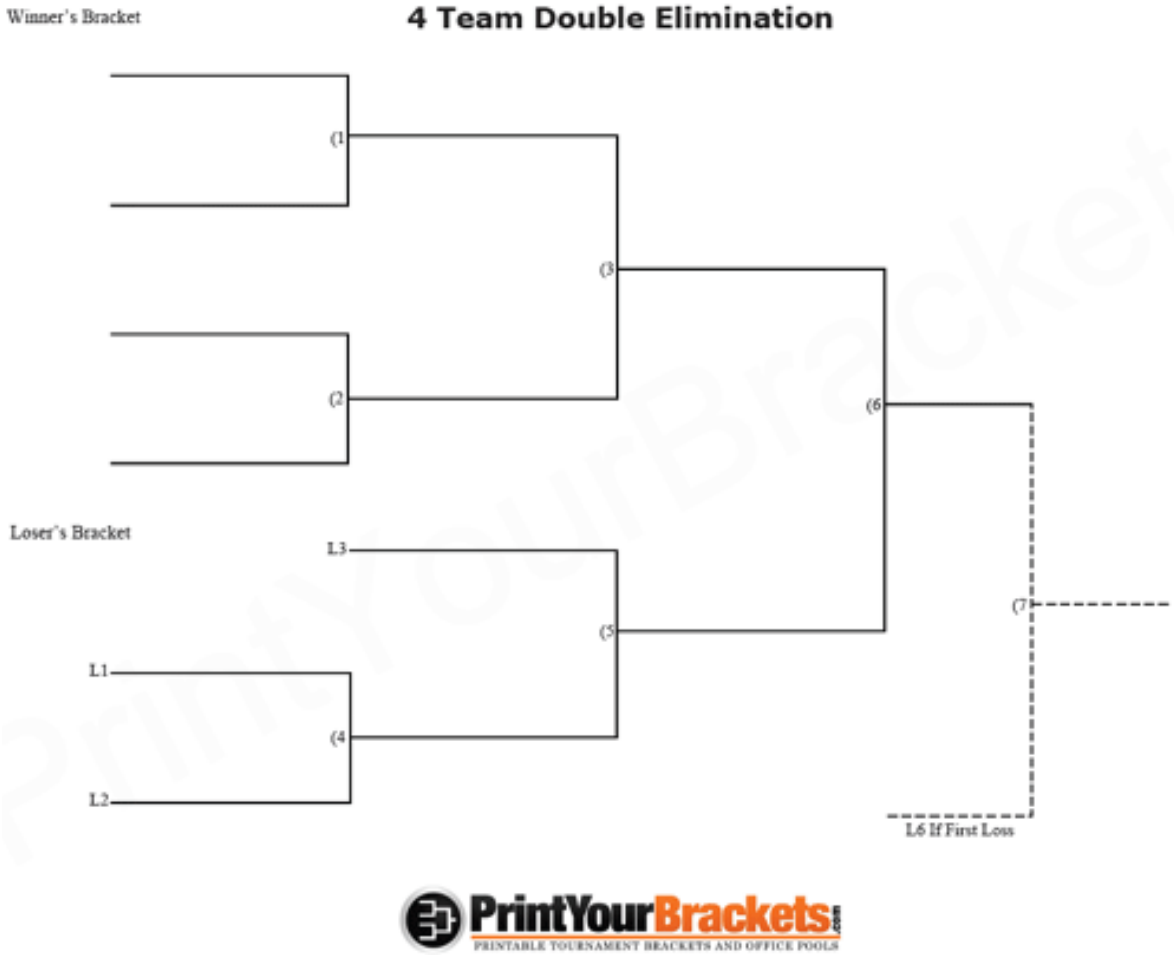
Double elimination

This system runs basically the same as a single elimination tournament except there are two brackets, a winners bracket and a losers bracket.
This system or variations of it have found common use in Judo and in a range of US college sport competitions, most notably the NCAA baseball tournament.

All competitors start off in the winners bracket and their first loss moves them into the losers bracket. A second loss removes them from the tournament.

The final match will be between the winner of the winners bracket and the winner of the losers bracket.
Third and fourth place will be the runner up of the last two losers bracket matches before the final meaning there are no ties for third place or any need for a playoff match.

A peculiarity of this system is that it is possible for the final match to be played twice.
If the winner from the winners bracket loses in the final, that is their first loss so it would be unfair for them to be eliminated.In this case, a second final is played to determine the overall winner.



Using the image above as an example, with four competitors match 1 and 2 would be played with the winners moving on to match 3 and the losers to the L1 and L2 positions for match 4.

The winner of match 4 will face the loser of match 3 with the winner of that, match 5, moving onto the finals.

At this point one competitor in match 6 is so far undefeated and the other has one loss. if the undefeated competitor loses match 6 then the only have one loss and it takes two losses to be eliminated so both competitors face each other again in match 7 to determine first and second place.

Third place will go to the loser of match 5 and fourth place to the loser of match 4.

Because we don't know if the second final will be needed until the first final has finished, this can be seen as a disadvantage when there are ticket sales or television scheduling involved.
However in a Taekwon-Do tournament this could be a minor advantage by either bringing the next match forward or allowing a quick break for the officials.

Another advantage of this system is that it mitigates the effect of two top competitors meeting in the first round without the large increase in time found in a non-elimination format.

No. Competitors	Time Taken (minutes)	Minimum Bouts	Maximum Bouts	Average Bouts
4	30 (35)	2	4 (5)	3 (3.5)
8	70 (75)	2	6 (7)	3.5 (3.75)
16	150 (155)	2	8 (9)	3.75 (3.875)

You can see from the table above the adding competitors increases the time in a linear fashion instead of exponentially like a round robin. It is however double the size of a single elimination format.

The average number of bouts takes a larger than anticipated increase. In a single elimination format the average is only slightly higher than the minimum but in a double elimination format it is a full bout higher.

In terms of running this format it is quite simple once you have the draw sheets.
The website http://www.printyourbrackets.com/double-elimination-tournament-brackets.html provides premade draws for between 3 and 64 competitors.

Modifying systems like virtual ring marshal to automatically generate draws and move competitors to the correct place when processing the results would be a significant undertaking but would be quite similar to how it currently works for single elimination tournaments. The main difference would be redirecting the participant to the correct place in the losers bracket on their first loss.

Swiss format

The Swiss format is a non-elimination system that was first used for a chess tournament in Zurich in 1895, hence the name.

There are several variations of the Swiss format, but in its simplest form it is round robin lite. Competitors are matched based on their performance to attempt to keep competitors of a similar skill level together while also ensuring no two competitors face each other more than once.

This system is best suited to situations where you have a large number of competitors, prohibitively large for a round robin but still want to run a non elimination format.

Assuming that there are no draws, a clear first place can be determined using Log_2N number of rounds, the same number needed for a single elimination format.
Second and third place may not be clear as a consequence of pairing competitors with a similar score together in each round.

Ties can be broken by comparing the cumulative score of their opponents. In some cases it may be appropriate to use the rounds to generate a ranking and have the top 4 or top 8 play off.

No. Competitors	Time Taken (minutes)	Minimum Bouts	Maximum Bouts	Average Bouts
4 (2 rounds)	20	2	2	2
8 (3 rounds)	60	3	3	3
16 (4 rounds)	160	4	4	4

The numbers above reflect using the minimum number of rounds needed to determine a clear winner but you can use any number of rounds you like.

The main issue with running this system is that you won't know the pairings for round two until after round one is complete.
You also then need to be able to communicate that back to the competitors.

The downtime can be alleviated by alternating divisions at the end of the round so there is time to process the results but getting the competitors to the right place at the right time will undoubtedly be problematic.

Ladder system

Another way to increase ring experience for competitors is to incentivise entering more tournaments.
This has been done in part with the under-18 and star series tournaments although interest in them seems to have waned over the last few years.

At the under 18s, the scoring is as follows:
5 points for a gold medal
3 points for a silver medal
1 point for a bronze medal
1 point for entering the tournament

The series placings are determined using the medal count, ranking by gold first then silver then bronze. If there is a tie on medals then the points are used including bonus points based on the size of the division a medal was won in.

1 point - 4 entrants
2 points - 5-8 entrants
3 points - 9 or more entrants

This results in the competitor who was most successful across all tournaments in the series being placed first and so on down the list.

There are a couple of quirks though.
For instance, based on the points for medals two silvers would beat a gold but this isn't the case. It is consistent with the way the rules describe the ranking but it makes the points for the medals redundant and could cause confusion if people aren't familiar with how the scoring works.

Because this system is heavily weighted towards event winners, beginning competitors may feel that there isn't a chance for them to win overall and be discouraged from entering the second tournament or at all.

In the interest of encouraging competitors to enter more tournaments and therefore gain more experience, below are the details of a ladder system designed to be run throughout the year,reward participation and diversity of opponents while fitting seamlessly into the usual schedule of tournaments as well as creating opportunities for smaller stand alone events.

Base Score

The base score for this system would be 10 points for a win, 2 points for a loss and 5 points for a draw.
This approach is designed to reward participation as well as results. Because of the cumulative nature of the scoring, a competitor with the determination to keep competing, even if they always lose, will score well compared to a competitor who has a couple of wins but doesn't compete often.
By the same token, a competitor who competes often and does relatively well will quickly earn a high score even if they aren't necessarily the one who wins the gold.

Relative Score Modifier

As the year progresses competitors will become separated on the ladder as a result of their skill and experience.

To counter the effect of a competitor coming up against a top level competitor in the first round and losing there is a modifier added based on the relative score of the two competitors.
This will provide a small boost to the lower placed competitor and an equal sized reduction to the higher placed competitor.

The formula for the modifier is Ba + ((Cb-Ca)*0.125)
Where:
Ba: Base score for Competitor A
Ca: Current score of Competitor A
Cb: Current score of Competitor B

In most cases the higher placed competitor will still receive a positive total value, even with the reduction.
However, it is possible that the gap between two competitors is great enough that the winner can receive a negative score.
The threshold depends on the base value used but for an unmodified base score of 10 the threshold is 80 points before the higher ranked competitor starts to lose points for a win.

The reason for this modifier is to encourage competitors to challenge themselves by facing people higher up on the ladder and rewarding them for it.
To balance that, people higher up on the ladder receive a reduced amount of points against people further down and even negative points to prevent them going for the “easy pickings” near the bottom of the ladder.

Repeat Matchup Modifier

Because this system allows for individual matches from outside a tournament setting to contribute to the ladder rankings there needs to be a function in place to prevent two competitors from repeatedly challenging each other in an attempt to boost their scores.

To do this, the base score is multiplied by 1/N where N is the number of times the two competitors have faced each other.

During the course of the year’s tournaments, competitors in the same weight division are likely to face each other multiple times. The probability increases the further the competitors progress. For example, the finalists from a regional tournament are more likely to meet again at national than someone who lost in preliminary rounds.

It quickly becomes less worthwhile facing the same people over and over and should encourage competitors to look for new opponents to test their skills against.

Weight Class Modifier

This is the modifier I struggled the most with. Occasionally competitors will be placed into a higher or lower division due to low numbers.
I toyed with the idea of having a modifier based on the relative difference between the competitors usual weight classes but didn't want to encourage competitors to take big risks competing way out of their weight class trying to boost their score.

There is still a benefit to stepping outside your comfort zone and competing against bigger, intimidating opponents as well as smaller, nimble opponents. The variety will help you practise your skills against different sparing styles.

Because of this I decided on a flat modifier of +0.5 for both competitors if they are competing outside their official weight class. This means there is no difference in the bonus for competitors that are 1 weight class apart or 5 so there isn't the pressure for micro weights to compete against the hyper weights and potentially put their safety at risk for the sake of a few extra points.

Both competitors receive a positive modifier as there is just as much benefit in competing higher as there is lower.

Final Formula

Putting everything together the final formula becomes:

$$Score(A) = Base(A) * \frac{1}{N} + (Current(B) - Current(A)) * 0.125 + W$$

Scheduled Tournaments and Stand Alone Events

As the majority of our major tournaments are run through virtual ring marshal it would be relatively simple to export the match results and import them into the ladder system. Even simpler if the ladder system was an extension of virtual ring marshal.

The intention for this system is that interclub matches will be valid as long as there are qualified officials controlling the match and recording the results into the database.

This will allow greater flexibility for organising competitions. Instead of having to book a venue for the weekend you could organise a small competition on a regular training night or spread across a couple of nights.

This also provides a forum for new officials to practice in a low pressure environment.

Umpiring is like any other part of Taekwon-Do, if you don't practice you don't get better at it.
While this is a low pressure environment to practice it is still important that the match ends with the correct result so having experienced umpires on hand to at least oversee the competition will be essential.

Another potentially lucrative fundraising opportunity could be to host an event night.
There have been attempts to run the finals at nationals in a similar manner, combining them with the formal dinner in the evening but at the end of a long day it didn't prove to be popular with the athletes or the diners.
However, on a smaller scale and without the long day of competition before hand it could be successful.

While this could be a great way to fundraise for your club or region it would be nice to see it used as an opportunity to fundraise for charity.
As well as helping to build a more peaceful world this would also serve to promote the sporting aspect of our art and hopefully provide a fun evening for the community.

One last possibility is the idea of touring champions.
Occasionally our top athletes have travelled around the country conducting sparing seminars. Why not couple that with the opportunity for a number of students to try practicing what they have just learnt against a top competitor and have it count towards their overall standing.

Statistics

During the course of the year the points will be calculated in one big pool irrespective of age, gender, weight division or rank.

At the end of the year the scores can be split into whatever grouping is appropriate for awarding prizes as well as by any metric or combination of metrics the users find interesting.

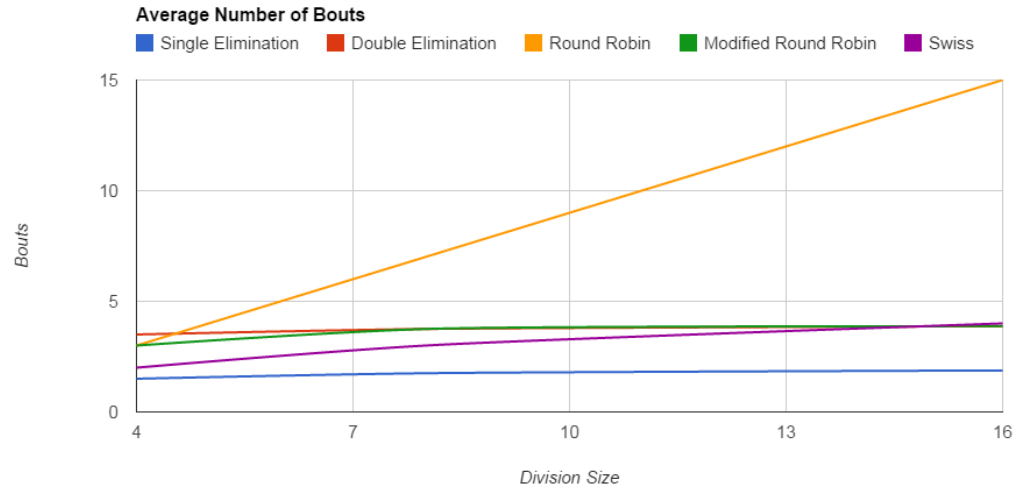
Summary and Conclusions

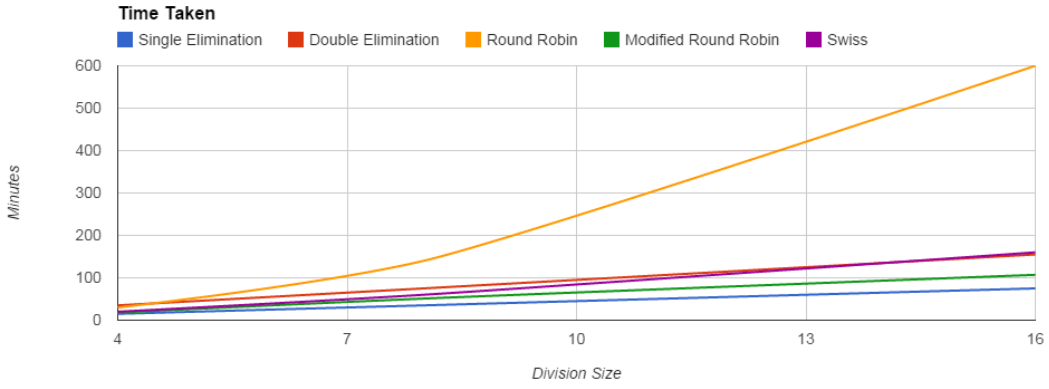
If we compare the different tournament formats we can see that single elimination is by far the fastest format but the average number of bouts barely moves at all; whereas a round robin offers the largest number of bouts on average but quickly puts the time it takes to complete a division into multiple hours, 10 hours for a 16 person division.

Double elimination follows the same curve as single elimination and although it takes twice the time it is still low enough to be a viable option to run a tournament, offers a higher average number of bouts and mitigates the effect of the top two competitors meeting in the first round.

Unfortunately the swiss format doesn't appear to be a viable option.
The benefits of this system are more apparent with larger division sizes but the larger the division the more logistical problems there are due to being unable to schedule the matches in advance.

The modified round robin format brings larger divisions back into a feasible time frame while still retaining a reasonably high average number of bouts.
It provides the same number of bouts as the double elimination format but in less time and has proved to be the most time efficient way of increasing the number of bouts per competitor. For larger divisions, making use of pools and having a play-off to find the clear winner keeps the excitement levels high for both competitors and spectators.





The idea of a ladder tournament that runs throughout the course of the year is one I believe merits further investigation.

It would provide incentive for greater participation in our existing tournaments and establishes a framework for hosting smaller ad-hoc tournaments/fundraisers/event nights.

There is also greater flexibility in how these ad-hoc tournaments can be conducted, from a full multiple division, all day tournament to a single division or open tournament or even a collection of individual matches.

By encouraging participation and using efficient tournament formats we can maximise the amount of ring experience the average student earns despite having a small group of competitors to draw from and therefore increase the standard of our competitors, which in turn will help keep up New Zealand's high standards in international tournaments.