Project 52 – Handicap

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1. Purpose

The purpose of this particular project is to create a handicap system which

- shall rank all the members within the Swedish Bridge Federation
- shall be official, fair, robust and individual
- facilitate the arrangement of fair handicap tournaments irrespective of the tournament is individual, pairs or teams

The handicap system shall record all reported top-score competitions, imp across the field competitions (IAF) and teams (with or without IAF or TAF[1]).
The handicap shall reflect the existing level of skill in such a way that no or insignificant consideration will be made in respect of old tournaments. Another purpose with the handicap system is to use the system to rank all the members of the Swedish Bridge Federation.

2. The handicap system

The handicap varies as from 0 to 52, where 0 corresponds the best players in the country and 52 is the starting point for a beginner.

A player's handicap will be adjusted when a competition is reported and the adjustment is depending on the player's performance since the last adjustment. The performance will be marked through a comparison between the achieved result and the expected result. The achieved result means the result without any handicap adjustments. The expected result is based on the handicap for the pair/team where the player participates and also the handicaps for all the other players in the field. The same procedure applies in an individual bridge tournament.

For tournaments calculated with topscore or with the IAF the following shall apply:

- the difference between the handicap for the pair and the average handicap for all other players in the field constitutes the base for the expected result.

  In respect of team tournaments, the IAF/TAF results will be used if available, otherwise each match will be handled separately. If the IAF/TAF are available the following shall apply:

- the difference between the pairs handicap and the average handicap of all pairs in the opposite direction and the sum of the handicap of the players you actually played against and the average

[1] **TAF = Topscore Across the Field is the same as IAF at the Board – a – Match team competition and is the same as the topscore calculation in a pairs tournament**

handicap of all the pairs playing in the same direction shall be the base for the expected result for each pair.

If each match is handled separately the following shall apply:

- the difference between the two pairs handicap and the sum of the two opponent pairs handicap is the base for the expected result of a pair.

If the achieved result exceeds the expected result each player in the pair shall lower the handicap proportionally to the difference between the achieved and the expected result. Accordingly, the handicap will be increased if the achieved result is poorer than the expected one.

Thus, the handicap system is therefore a game where wins and losses take out each other. The exception from this can sometimes occur, for example when a player should have a handicap exceeding 52, which will be corrected to 52.

The handicap system is designed in such a way that older performances will diminish in value when new competitions are played. The decrease of old results is therefore soft and is not based on time, but on the number of boards played.

3. Basic algorithm

3.1 General

Let $h(m)$ be the handicap for the player *m* (suitably the membership number, MID).

Give the player *m* a starting value $h_0(m)$.

The player *m* participates in turn in the competitions T_m^1, T_m^2, T_m^3 and so forth.

After each competition T_m^n a new handicap will be calculated as follows:

$$h_n(m) = h_{n-1}(m) + \Delta h_n(m) \qquad (1)$$

where $\Delta h_n(m)$ depends on the players performance in the competition T_m^n and is calculated in accordance with the following formula:

$$\Delta h_n(m) = \left[\left(1 - \frac{1}{480} \cdot \frac{N_B - 1}{N_B + S}\right)^{N_G} - 1\right] \cdot C_u \cdot C_k \cdot C_b \cdot \left[r(m) - \langle r(m) \rangle\right] \qquad (2)$$

where:

N_B is the number of boards in the competition T_m^n;

S is a distributional factor which depends on how the competition T_m^n is calculated;

C_u is a factor which concerns the "dilution" of the competion T_m^n;

C_k is a scale factor which depends on the size of the "result owner" in the competition T_m^n;
C_b is a scale factor which depends on the calculation method in the competition T_m^n;
N_G is the number of boards (which the player *m*) played in the competition T_m^n;
$r(m)$ is *m*:s achieved result in the competition T_m^n, and;
$\langle r(m) \rangle$ is *m*:s expected result from the competition T_m^n.

In respect of topscore-competitions the achieved result $r(m)$ and the expected result $\langle r(m) \rangle$ is calculated in percent over or below average. Other competitions are calculated in imps± per board.

Please observe that all variables above and those defined below is depending on the specific competition T_m^n, which is not clearly indicated with the purpose to make the formulas more clear.

The equations (1) and (2) are valid for every type of competitions. Below will those factors and variables which differ between different types of competitions be discussed in respect of:

a) calculation
- S
- C_b

b) type of tournament
- $\langle r(m) \rangle$
- C_u
- C_k

3.2 Type of calculations

For the term S and the factor C_b the following values shall be used:

Type of competition:

	S	C_b
topscore	0,6	2,0
imp	0,1	12,0

3.3 Type of competition

3.3.1 General

The handicap of a pair is calculated as the average value of the two players, i.e. the pairhandicap $h^P[k_1, k_2]$ consisting of the players k_1 and k_2 will be:

$$h^P[k_1, k_2] = \frac{1}{2}(h(k_1) + h(k_2)) \qquad (3)$$

The handicap of a team is calculated as the average value of the handicap the four players have, i.e. the team handicap will be: $h^L[k_1,k_2,k_3,k_4]$ for a team consisting of the player's k_1, k_2, k_3 and k_4 will be given of:

$$h^L[k_1,k_2,k_3,k_4]=\frac{1}{4}\left(h(k_1)+h(k_2)+h(k_3)+h(k_4)\right) \tag{4}$$

The number of players in an individual tournament is named N_S.

The number of pairs in a pair's tournament is named N_P.

3.3.1 Individual tournament

$$\langle r(m)\rangle=\frac{\overline{h}_{n-1}-h_{n-1}(m)}{C_u\cdot C_k\cdot C_b} \tag{5}$$

where:
$\overline{h}_{n-1}$ is the average handicap for all the participating players and;
$h_{n-1}(m)$ is, as defined above, *m*: s handicap.

$$C_u=\frac{N_S-1}{N_S} \tag{5'}$$

(If a tournament is calculated with a date score $C_u=1$.)

$$C_k=2 \tag{5"}$$

3.3.2 Pair competition

$$\langle r(m)\rangle=\frac{\overline{h}^P_{n-1}-h^P_{n-1}[m,p]}{C_u\cdot C_k\cdot C_b} \tag{6}$$

where:
$\overline{h}^P_{n-1}$ is the average handicap for all the participating pairs and;
p is *m*:s partner.

$$C_u=\frac{N_P-1}{N_P} \tag{6'}$$

((If a tournament is calculated with a date score the $C_u=1$.)

$$C_k=1 \tag{6"}$$

3.3.3 Team competitions

3.3.3.1 Single match or half

$$\langle r(m) \rangle = \frac{h^L_{n-1}[f_1, f_2, f_3, f_4] - h^L_{n-1}[m, p_1, p_2, p_3]}{C_k \cdot C_b} \quad (7)$$

where:
p_1, p_2 and p_3 are *m*:s team mates, and;
f_1, f_2, f_3 and f_4 are *m*:s opponents.

$$C_u = \frac{1}{2} \quad (7')$$

$$C_k = \frac{1}{2} \quad (7'')$$

3.3.3.2 Match or single half with IAF/TAF

$$\langle r(m) \rangle = \frac{h^P_{n-1}[f_1, f_2] + \bar{h}^P_{n-1} - h^P_{n-1}[m, p_1] - \vec{h}^P_{n-1}}{C_k \cdot C_b} \quad (8)$$

where:
p_1 is *m*:s partner in the match /half *e;*
f_1 and f_2 are *m*:s opponents at the table;
$\vec{h}^P_{n-1}$ the average handicap for all the pairs in the opposite direction including but not limited to *m*:s opponents at the table;
$\bar{h}^P_{n-1}$ is the average handicap for all the pairs playing in the same direction as *m*:s including the pair where *m* plays.

$$C_u = \frac{1}{2} \quad (8')$$

$$C_k = \frac{N_B - 1}{N_B} \quad (8'')$$

3.3.3.3 Duplicate teams IAF/TAF

If all the teams have played the the whole tournament with the same pairs and also subject to that no change is made between open and closed rooms, a simplified calculation can be made. Preferably, all the teams have played against each other, but if it can be assumed that a good balance exists the simplified calculation can be made.

Please note that table N_B and the number of pairs N_P refers to the the whole competition, i.e. both rooms.

$$\langle r(m) \rangle = \frac{\hat{h}^P_{n-1} - h^P_{n-1}[m, p_1] + \frac{1}{(N_B - 1)}\left(\breve{h}^p_{n-1} - h^P_{n-1}[p_2, p_3]\right)}{C_u \cdot C_b} \quad (9)$$

where:

$\hat{h}^p_{n-1}$ is the average handicap for all the pairs sitting in the same room as your pair, and

$\breve{h}^p_{n-1}$ is the average handicap for all the pairs in the other room where your team-mates play.

$$C_u = \frac{N_P - 2}{N_P} \quad (9')$$

$$C_k = \frac{(N_B - 1)^2}{(N_B - 1)^2 + 1} \quad (9'')$$

4. Certain aspects on the function of the algorithm

4.1 Impact

The impact, i.e. which effect a single tournament shall have on the handicap is interesting. Another way to see it is how fast the impact of old performances are cancelled.

In equation 2, the factor $\frac{1}{480}$, is found, which is decisive for the impact. This particular factor could be established on another level. However, It should not be changed after the start of the handicap system (see however,chapter 6.2)

To get a feeling for the impact of one separate tournament on the handicap the following example can be studied. If anyone exceeds the expected result with 10 per cent in a topscore tournament with 24 boards, this will at the next adjustment, decrease the handicap with approx. one handicap unit.

How fast the impact of old results is diminished can be shown by the following.
After 480 boards (i.e. the inversion of the impact factor) or 20 normal evening tournaments, approx. 33% of the handicap is from older results and 67% is a result from last 20 tournaments. After 1152 boards or 48 normal evening tournaments (which is a normal annual play for a club player), 7% of the handicap is from older performances and 93% of the handicap is from the last 48 tournaments.

4.2 The consideration of the number of boards

The factor $\frac{N_B - 1}{N_B + S}$ in equation 2 is a weight factor which corrects the statistical significance of the number of boards in a tournament. This factor is based on a pattern which shows how the randomized spread of results (random samples of results) varies as a function of number of boards. The term S has been established thru statistical analyzes of results from tournaments played (variance calculations from different data's). Observe that S varies depending on type of tournament.

4.3 The relations between handicap units, topscore och imp

There is also a relation factor C_r which depends on the type of tournament. In a topscore tournament factor C_r is 2, which means that a handicap unit is recalculated to 0,5 % when calculating the expected result. Another way to see it is that a player with a handicap of ten units below another player is expected to have a result 4% better, if those two are playing with partners with the same handicap as themselves.

In respect of IMP – tournaments the C_r factor is 12, i.e. 6 times more than the top score factor. To ensure this particular relation, an analyze of results from tournaments played (variance calculations) has been used.

4.4. Special handicap tournament

When reporting a special handicap tournament (see chapter 8), the results must be recalculated to the result without any handicap adjustments at all.

5. Special establishment of handicap

5.1 Placing of a player at the beginning

The start handicap will, in accordance with the discussion above, pretty soon be "forgotten", especially those who play much and often, so the handicap is not technically of any decisive importance. However, in order to be able to "sell" the system, it could be important.
The best way to place the players into the system at the beginning is to use the master points. The easiest way is to give every master class a certain starting value, but on the one hand to achieve correct placements and on the other it should psychologically be advantageous if the spread works from the start my suggestion is as follows:

$$H_0(m) = \frac{52}{1 + C \cdot MP(m)} \qquad (10)$$

where C is fixed and $MP(m)$ is m:s master points at the beginning (mutual start for all members). Approximately can C = 0,01 be suitable. Using this, the following rough starting values will be:

$MP = 0 \rightarrow H_0 = 52,0$
$MP = 10 \rightarrow H_0 = 47,3$
$MP = 30 \rightarrow H_0 = 40,0$
$MP = 50 \rightarrow H_0 = 34,7$
$MP = 100 \rightarrow H_0 = 26,0$

MP = 300 → H_0 = 13,0
MP = 1000 → H_0 = 4,7
MP = 3000 → H_0 = 1,68

The reader should estimate if this seems to be reasonable. For instance, in a starting field where all pairs except one are reasonable club players with roughly 50 master points, a pair of higher standard where both have 300 master points should reach (34,7-13,0)/ C_b = +10,8 %, which means 60,8 % to keep the handicap (C_b = 2).

After testing it is easily possible, if needed, to adjust both the size of the interval (if the handicap should, for instance, spread you over 65 units instead of 52) by changing the relationship between the result and the handicap, and the level (if, the lowest handicap after a while will be – 10 instead of 0) through adjusting the scale upwards or down.

5.2 Placing of players afterwards

Beginners will be ranked in accordance with the equation above in 5.1, which most oftenly means a handicap of 52. However, the beginner will not be part of the system until he or she will be registered for the first masterpoints or participates in a competition which is registered at the Swedish Bridge Federation.

Players, which make a comeback after an interruption of playing bridge, will regain the handicap they had when they stopped playing bridge. However, if they stopped playing before the handicap system starts, they will be ranked in accordance with the 5.1 equation. Players from abroad could be ranked after a estimated size of master points which should reflect the level of play or use the 5.1 equation or also directly be given an estimated handicap in relation to the level of play.

5.3 The ranking of foreign guest players

Sometimes foreign guest players participate in official tournaments in Sweden, for instance in OBS – tournaments or the Chairman´s Cup. Those players could be treated as follows:

1. Give all such players a temporary identification number;
2. Give those players/pairs a temporary handicap for the tournament. The handicap can be established thru one of the following methods:
   a) be based on the reported level of play
   b) be the same handicap as his partner if he is ranked in the system
   c) estimate, for every pair where one player lacks a handicap, the pairs handicap: $h_{n-1}^{P}(m_1, m_2)$ based on the performance of the pair in the particular tournament, in accordance with:

$$h_{n-1}^{P}(m_1, m_2) = \tilde{h}_{n-1}^{P} - C_k \cdot C_b \cdot C_u \left[r(m) + \frac{n_p}{(N_P - n_P)} \cdot \bar{r} \right] \qquad (11)$$

Where $\tilde{h}_{n-1}^{P}$ is the average handicap for all pairs with a handicap, n_P is the number of pairs where one player lacks a handicap, and $\bar{r}$ is the average result for those n_P pairs.

At an individual tournament or teams the corresponding estimation can be made.

5.4 The handling of players without a membership

Unfortunately unlicensed players are allowed to participate in competitions arranged by clubs belonging to the Swedish Bridge Federation. We should be able to handle the reporting of such a competition, unless the competition should be declared invalid in respect of handicap. In my opinion such a treatment would be unfair in respect of players who have paid the member fee and cannot be blamed for the participation of "free- players". Hence, I suggest the following approach:

1. when a member and a non-member play together, the whole pair shall be regarded as non-members;
2. at the calculation of the tournament those two should be assigned temporarily member numbers;
3. establish for each non-member pair an occasional handicap, as a suggestion in accordance with 5.3 above.

Please note the difference when a player (member) plays together with a foreign partner. Such a competition will influence the handicap, but if the same member plays with a non-member no change of the handicap will be made. It seems as if it does not matter, due to the fact that the change of the handicap would be close to nil or nil if the equation in 5.3 is used. However, from a psychological standpoint it could be important that such a treatment is informed of.

6. Systemadministration

6.1 Check ups

When the handicap system has been used for a while and been stabilized, say after two years, one should have a check up to determine if the system works as planned in respect of impact and a reasonable distribution of the players over the whole scale 0-52. The aim is, of course that the system should function smoothly from the beginning, but if faults are noted, there is a possibility to adjust certain factors and thus do a collective adjustment of the handicap. Obviously, such a measure is not completely successful in respect of the player's confidence in the system and should not be carried out more than once.

7. Choices

7.1 Choices in respect of different competitions

The system can easily calculate separate handicap for different competitions (for example top-score and IMP:s) instead of the general handicap demonstrated in this paper.

7.2 The importance (adjustments) of competitions

If it is requested, the system could easily be adjusted in such a way, that one board played in the final of the Swedish championships and gold competitions and so on could be treated as two boards in a more regular competition.

I cannot recommend such a method. There is no reason to give certain competitions a higher value when calculating the handicap and furthermore, it could result in partly misleading handicaps.

The only reason to upgrade big tournaments could be that those maybe are played on a higher serious level and the results should therefore be more significant. The effect of various grades of seriousness is however hard to estimate and is probably small. A disadvantage with upgrading bigger tournaments could be that the top-players, who also play more boards than the club-players, would have a bigger impact on their handicaps.

8. Usage of the handicap system

In accordance with its purpose, the handicap system use all registered top-score tournaments, IAF – tournaments and team tournaments (with or without the IAF – calculations). In the future, when all the clubs are using the computer system Magic Diamond, should all tournaments be reported, which would result in a strong and adequate handicap system.

The system makes it possible to organize handicap tournaments, including individual tournaments, where the participants are assigned a starting point which corresponds to the expected out-come in accordance with equation 5 or 6.
The results after the correction for handicap will, obviously, be used during the prize giving ceremony.

Of course, can the system be used to identify the favourites in a tournament, for example the Swedish championship, and not only the ranking order, but also the expected result with the help of the equations 5-9.

A fully accomplished and adequate handicap system is obviously just cut out for using in the ranking of all the members, which has eagerly been requested. If the system also should be used in the ranking, it could prevent anyone trying consciously to play up the handicap (which, of course, would be unethical but never the less could occur).

As a marketing measure an annual individual top 100 tournament could be organized.

9. Presentation of the handicap system

As can be seen, the detailed functions of the system is rather complicated. In order to popularize the system, a description of different levels of complication must be available. A more popular description for all would be as follows:

- A handicap system from 0 to 52, where the beginners start from 52 and only the top-players have a single handicap

- You start on a handicap based on your master points

- The change of the handicap will be based on your results in relation to your handicap. If you and your partner both have 26 as your handicaps and the rest of the field has 16, your expected result would be 46 % in a pairs tournament. On the other hand, if the rest of the field has a handicap of 46 (i.e. almost beginners) your expected out-come would be 58 %. Results better or worse than the expected will decrease/raise the handicap.

- In the same way the results in teams and IAF will affect your handicap

- Once a month the handicap change will be calculated. The change will be based on the number of boards and how good/bad you played.

- Let us presume that you and your partner play a normal pairs and your result exceeds the expected with 8 %. Such a result will decrease the handicaps with approx. 1 unit.

- Your handicap is a result of all your performances within the system, but older results decrease in value. Results, older than one year, have practically no or insignificant importance.

- The handicap system will be used to correct the skill in separate handicap tournaments. If you, in a competition with the average handicap of 26, has a handicap of 28 and your partner has 14 is the pairs handicap 21, i.e. 5 less than 26. Your pair will be charged 40 % of the difference, i.e. -2 %.