

## Wimbledon

When we are discussing variability, let's understand it by taking an example of Wimbledon, a lawn tennis tournament that comes every year in that last week of June. (Since last couple of years, start of the tournament is shifted to first Monday of July)

Wimbledon is the oldest tennis tournament in the world, and is widely regarded as the most prestigious. It has been held at the All England Club in Wimbledon, London, since 1877 and is played on outdoor grass courts.

And then something happened in 2001. Unseeded Goran Ivanišević defeated Patrick Rafter in the men's singles final of the 2001 Wimbledon Championships. He became the first wild card to win a major. Before the tournament he was ranked 125th and after the win he was 16<sup>th</sup>. But there was something else to that match. There was a mention of "**People's Monday**". In the 124 years history of Wimbledon, the men's singles championship match was played on Monday only for the 3<sup>rd</sup> time.

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I started watching Wimbledon as a kid. The way Boris Becker played really fascinated me. And as I grew up, there was Steffi Graf, Anna Kournikova and others.

Around 2008-09 I became an agile practitioner and started dealing with variability in the size of the work items and it resulting in high lead times. During my CMMI days I had learnt about Statistical process control and about variability. Since I continued watching Wimbledon (now for Roger Federer and Rafael Nadal), I realized that irrespective of circumstances, Wimbledon men's singles final always happened on 2<sup>nd</sup> Sunday of July. And believe me, my understanding of Wimbledon was restricted to 'Men's' and 'Women's' singles championship. I didn't even know how many different championships are being played during those 2 weeks. Every match was of a different duration and still they managed to have the men's single championship final on 2<sup>nd</sup> Sunday of July @ 2.00 pm.

How do they do that? I started digging deeper and this is what I found out ....

Wimbledon (Source: [www.Wimbledon.com](http://www.Wimbledon.com) )

Schedule – last Monday of June till 2<sup>nd</sup> Sunday of July (the start is changed to first Monday of July now)

Different championships that are played during those two weeks –

1. Gentlemen's singles
2. Ladies singles
3. Gentlemen's doubles
4. Ladies doubles
5. Mixed doubles
6. Boy's singles
7. Girl's singles
8. Boy's doubles
9. Girl's doubles
10. Invitation Doubles

11. Wheelchair Gentlemen's singles
12. Wheelchair Ladies' Singles
13. Wheelchair Gentlemen's Doubles
14. Wheelchair Ladies' Doubles

And this is how they are scheduled during those 2 weeks –

| Provisional Championships Schedule   |                                       |                                      |                                         |                                      |                                      |                                  |
|--------------------------------------|---------------------------------------|--------------------------------------|-----------------------------------------|--------------------------------------|--------------------------------------|----------------------------------|
| Days                                 |                                       |                                      |                                         |                                      |                                      |                                  |
| Monday                               | Tuesday                               | Wednesday                            | Thursday                                | Friday                               | Saturday                             | Sunday                           |
| 1                                    | 2                                     | 3                                    | 4                                       | 5                                    | 6                                    | MS                               |
| Gentlemen's Singles first round      |                                       | Gentlemen's Singles second round     |                                         | Gentlemen's Singles third round      | Gentlemen's Singles third round      |                                  |
| Ladies' Singles first round          |                                       | Ladies' Singles second round         |                                         | Ladies' Singles third round          | Ladies' Singles third round          |                                  |
|                                      |                                       | Gentlemen's Doubles first round      |                                         | Gentlemen's Doubles second round     | Gentlemen's Doubles second round     |                                  |
|                                      |                                       | Ladies' Doubles first round          |                                         | Ladies' Doubles second round         | Ladies' Doubles second round         |                                  |
|                                      |                                       |                                      |                                         |                                      | Mixed Doubles first round            |                                  |
|                                      |                                       |                                      |                                         |                                      | Boys' and Girls' singles first round |                                  |
| 7                                    | 8                                     | 9                                    | 10                                      | 11                                   | 12                                   | 13                               |
| Gentlemen's Singles fourth round     | Ladies' Singles quarter-finals        | Gentlemen's Singles quarter-finals   | Ladies' Singles semi-finals             | Gentlemen's Singles semi-finals      | 2pm - Ladies' Singles final          | 2pm - Gentlemen's Singles final  |
| Ladies' Singles fourth round         | Gentlemen's Doubles quarter-finals    | Ladies' Doubles semi-finals          | Gentlemen's Doubles semi-finals         | Gentlemen's Doubles semi-finals      | Gentlemen's Doubles final            | Mixed Doubles final              |
| Gentlemen's Doubles third round      | Ladies' Doubles quarter-finals        | Mixed Doubles second round           | Mixed Doubles third round               | Mixed Doubles quarter-finals         | Ladies' Doubles final                | Wheelchair Gentlemen's Singles   |
| Ladies' Doubles third round          | Mixed Doubles second round            | Boys' and Girls' Singles third round | Wheelchair Gentlemen's and              | Wheelchair Gentlemen's and           | Girls' Singles final                 | Wheelchair Ladies' Doubles final |
| Mixed Doubles first round            | Boys' and Girls' Singles second round | Boys' and Girls' Doubles second      | Boys' and Girls' Singles quarter-finals | Wheelchair Gentlemen's and           | Wheelchair Ladies' Singles final     | Boys' Singles final              |
| Boys' and Girls' Singles first round | Boys' and Girls' Doubles first round  | Invitation Doubles                   | Boys' and Girls' Doubles third round    | Boys' and Girls' Singles semi-finals | Wheelchair Gentlemen's               | Boys' Doubles final              |
|                                      |                                       |                                      | Invitation Doubles                      | Boys' and Girls' Doubles quarter-    | Mixed Doubles semi-finals            | Girls' Doubles final             |
|                                      |                                       |                                      |                                         | Invitation Doubles                   | Boys' and Girls' Doubles semi-finals | Invitation Doubles finals        |
|                                      |                                       |                                      |                                         |                                      | Invitation Doubles                   |                                  |

- # of matches played – 651 (674 for 2017 including invitation games. Invitation games are not considered for calculation here)
  - # of matches played per championship

| Draw                           | # of matched |
|--------------------------------|--------------|
| Gentlemen's singles            | 127          |
| Ladies singles                 | 127          |
| Gentlemen's doubles            | 63           |
| Ladies doubles                 | 63           |
| Mixed doubles                  | 63           |
| Boy's singles                  | 63           |
| Girl's singles                 | 63           |
| Boy's doubles                  | 31           |
| Girl's doubles                 | 31           |
| Invitation Doubles             |              |
| Wheelchair Gentlemen's singles | 7            |
| Wheelchair Ladies' Singles     | 7            |
| Wheelchair Gentlemen's Doubles | 3            |
| Wheelchair Ladies' Doubles     | 3            |

- Approximate # of matches played every day

| Days         | Matches played (#) |
|--------------|--------------------|
| Day 1        | 64                 |
| Day 2        | 64                 |
| Day 3        | 64                 |
| Day 4        | 64                 |
| Day 5        | 32                 |
| Day 6        | 80                 |
| Day 7        | 80                 |
| Day 8        | 84                 |
| Day 9        | 46                 |
| Day 10       | 31                 |
| Day 11       | 23                 |
| Day 12       | 12                 |
| Day 13       | 7                  |
| <b>Total</b> | <b>651</b>         |

- # of sets to be played (Best of ...)
  1. Gentlemen's singles – Best of 5
  2. Ladies singles – Best of 3
  3. Gentlemen's doubles – Best of 5
  4. Ladies doubles – Best of 3
  5. Mixed doubles – Best of 3
  6. Boy's singles – Best of 3
  7. Girl's singles - Best of 3
  8. Boy's doubles - Best of 3
  9. Girl's doubles - Best of 3
- # of players – 1068 players participate in the tournament (790 actual number for 2017 as many players participated in multiple championship tournaments like singles, doubles or mixed doubles)
- Total # of courts available – 19 (Roof available for 2 courts)
  - Times of Play
    - Grounds open at 10:30am.

- Play starts on Courts 2-18 scheduled for 11:30 daily
  - Start on Centre and No.1 Court scheduled for 1.00pm daily except for the Gentlemen's and Ladies' Finals at 2.00pm.
  - Close of play: Approx 9.00pm depending on weather, light and matches state.
- Attendance (2017)
  - Total attendance was 473,372 across 13 days (493,928 attended The Championships in 2016 across 14 days)
  - Capacity (grounds) - 39,000 spectators in the grounds at any one time
- Staff
  - Around 6,000 staff are taken on for Championships
  - Ball Boys and Ball Girls - Around 250 from around 750 entries come through a rigorous training routine
- Balls
  - Slazenger has been the Official Supplier of tennis balls to The Championships since 1902.
  - Yellow balls used for first time in 1986.
  - 54,250 balls used during The Championships' period.
  - Balls stored at 68 deg F.
  - New balls after first seven games (to allow for warm-up), then after every nine games.
  - Balls subject to availability after use
  - Balls sold daily to LTA-affiliated clubs and to spectators in the grounds. £2.50 per can of three. Proceeds go to the Wimbledon Foundation.
  - At start of day 48, tins are taken onto Centre and No.1 Courts and 24 on all outside courts.
- Order of play
  - Decided by Referee and published around 6.00pm daily
  - Based on the interests of
    - The Championships,
    - served by attention to the interests of players,
      - match played late during the previous day
      - multiple matches played same day
      - Temporary illness etc
    - spectators,
    - national and international TV, radio and online audiences,
    - and the press
- Prize Money
  - TOTAL GENTLEMEN'S & LADIES' SINGLES - 24,360,000 pounds
  - TOTAL GENTLEMEN'S & LADIES' DOUBLES - 3,640,000 pounds
  - TOTAL MIXED DOUBLES - 368,000 pounds
  - TOTAL PRIZE MONEY across all championships in a year - 31,600,000 pounds
- Wet Weather Procedure - The courts are covered as soon as the championship referee has made his decision. They are often covered as a precaution on the advice of the London Weather Centre.
  - Play is resumed as soon as possible after the rain delay.

- Players are officially allowed a 15-minute reprieve from the time the match is called, and their appearance on the court.
- If the rain delay is 10 minutes or less, the players are not allowed to warm-up before resuming the match.
- If the delay is 11-20 minutes, the players are allowed a three-minute warm-up period.
- If the delay is 20 minutes or more the warm-up period is extended to five minutes.
- **Longest Match**
  - 2010, Court 18, played over 3 days
  - John Isner (USA) bt Nicolas Mahut (FRA) 6-4, 3-6, 6-7 (7), 7-6 (3), 70-68
  - 11 hours 05 minutes duration. Final set lasted 491 minutes (8hrs 11mins), 1hr 38mins longer than the previous longest match in tennis history
  - 980 points played in total – Mahut won 502 and Isner 478 of them
  - Isner served the most aces in a match – 113
  - 123 balls used
- **Longest tennis match records in a grand slam - Men**
  - 11 h 05 Wimbledon 2010, 1st Round: United States John Isner def. France Nicolas Mahut, 6–4, 3–6, 6–7(7–9), 7–6(7–3), 70–68 (3 days).
  - 6 h 33 French Open 2004, 1st Round: France Fabrice Santoro def. France Arnaud Clément, 6–4, 6–3, 6–7(5–7), 3–6, 16–14 (2 days).
  - 5 h 53 Australian Open 2012, Final: Serbia Novak Djokovic def. Spain Rafael Nadal, 5–7, 6–4, 6–2, 6–7(5–7), 7–5.
  - 5 h 41 French Open 2012, 2nd Round: France Paul-Henri Mathieu def. United States John Isner 6–7(2–7), 6–4, 6–4, 3–6, 18–16.
  - 5 h 31 French Open 1998, 3rd Round: Spain Àlex Corretja def. Argentina Hernán Gumy 6–1, 5–7, 6–7(4–7), 7–5, 9–7.
  - 5 h 31 Wimbledon 2012, 3rd Round: Croatia Marin Čilić def. United States Sam Querrey 7–6(8–6), 6–4, 6–7(2–7), 6–7(3–7), 17–15.
- **Longest tennis match record in a grand slam – Ladies**
  - 4 h 44 Australian Open 2011, 4th round: Italy Francesca Schiavone def. Russia Svetlana Kuznetsova, 6–4, 1–6, 16–14.
  - 4 h 42 French Open 2010, qualifying competition: Japan Kurumi Nara def. Romania Monica Niculescu, 4–6, 7–6(7–3), 10–8.
  - 4 h 19 Australian Open 2010, 1st round: Czech Republic Barbora Záhlavová-Strýcová def. Russia Regina Kulikova, 7–6(7–5), 6–7(10–12), 6–3.
  - 4 h 07 French Open 1995, 1st round: France Virginie Buisson def. France Noëlle van Lottum, 6–7(3–7), 7–5, 6–2.
  - 3 h 55 French Open 1972, 3rd round: Australia Kerry Reid def. United States Pam Teeguarden, 9–7, 4–6, 16–14.
- Different aspects that impact the length of match

- Initial draw,
  - The seeding of the top 32 players,
  - Order of play published every day
  - # of sets to be played depending on the championship
  - Duration of set
    - The tiebreak rule (tiebreak is not applicable for the decider set)
    - Rules relating to changing ends
    - Taking rests
    - Medical time out i.e. calling for the doctor
    - Time periods between playing points
  - Ball temperature
  - Racket make and size
    - 1987 was the last year in which wooden tennis rackets were used
  - Rain delay i.e. Wet Weather
  - Retirement or Walkover
  - Wear and tear of the ground
  - Heated debates / arguments with umpire
  - Player using challenges, though the number of challenges are restricted per player
  - **Question - Can the class identify and classify the above elements of a tennis tournament which introduce random chance cause variability vs assignable cause variability?**
- Internal sources of variation are variations that are under the control of the system in operation.
    - Think of a system as a process that is defined by a set of policies that govern the system operation
      - Affected by changes made by individuals, the team or management
      - Changes to policies change the system operation
      - Changes to the process definition represents a change that affects the internal sources of variation
    - Named as “chance cause variations”. “Chance” implies that the variation is random and the randomness is direct consequence of the system design. It does not imply that randomness follows standard distribution. **Changes to the process design via changes in internal policies will affect any variation’s mean, spread and shape of distribution**
  - External sources of variation are events that happen that are outside of the control of the immediate team or management. They are randomizations that come from other teams, suppliers, customers and random “acts of God”.
    - Requires a different approach to manage – Issue and Risk Management
    - Blocker clustering
    - Named as ‘assignable cause variation’ meaning someone could easily point at the source of the problem and consistently describe it. **They can’t be controlled by local team or management but they can be predicted, and plans made and processes designed to cope with them gracefully.**

- As mentioned by David –
  - The tournament is good at regulating unnecessary variation using constraining policies. They use policy to trim and contain the tail in the distribution.
  - Tail affects the mean more than the median and the tournament schedule is affected by the mean hence, they need to manage the tail in the distribution to keep things on schedule.
- In the IT world
  - Internal sources of variability are
    - Work item size
    - Work item type mix
    - Class of service mix
    - Irregular flow
    - Rework
  - External sources of variability are
    - Requirements ambiguity
    - Expedite requests
    - Environment availability
    - Other market factors
    - Difficulty scheduling coordination activity
  - **Question - How would the team deal with them?**
- Here is some more Wimbledon data from 2017, if you want to use it in the class –
  - Gentlemen's singles championship

| Year | Particulars       | R1   | R2   | R3  | R4  | QF  | SF | F  |
|------|-------------------|------|------|-----|-----|-----|----|----|
| 2017 | Matches played    | 64   | 32   | 16  | 8   | 4   | 2  | 1  |
| 2017 | 5 set matches     | 6    | 7    | 2   | 4   | 2   | 0  | 0  |
| 2017 | 4 set matches     | 23   | 11   | 2   | 0   | 0   | 1  | 0  |
| 2017 | 3 set matches     | 28   | 13   | 11  | 4   | 1   | 1  | 1  |
| 2017 | Retirements       | 7    | 1    | 1   | 0   | 1   | 0  | 0  |
| 2017 | Walkovers         | 0    | 0    | 0   | 0   | 0   | 0  | 0  |
| 2017 | Sets played       | 222  | 119  | 53  | 32  | 15  | 7  | 3  |
| 2017 | Tie breaks played | 39   | 23   | 12  | 5   | 4   | 4  | 0  |
| 2017 | Total games       | 2145 | 1182 | 541 | 338 | 145 | 84 | 26 |

- Ladies singles championship

| Year | Particulars       | R1   | R2  | R3  | R4  | QF | SF | F  |
|------|-------------------|------|-----|-----|-----|----|----|----|
| 2017 | Matches played    | 64   | 32  | 16  | 8   | 4  | 2  | 1  |
| 2017 | 3 set matches     | 19   | 15  | 5   | 3   | 1  | 0  | 0  |
| 2017 | 2 set matches     | 44   | 16  | 11  | 5   | 3  | 2  | 1  |
| 2017 | Retirements       | 1    | 1   | 0   | 0   | 0  | 0  | 0  |
| 2017 | Walkovers         | 0    | 0   | 0   | 0   | 0  | 0  | 0  |
| 2017 | Sets played       | 147  | 79  | 37  | 19  | 9  | 4  | 2  |
| 2017 | Tie breaks played | 15   | 11  | 6   | 4   | 2  | 0  | 0  |
| 2017 | Total games       | 1385 | 762 | 357 | 191 | 94 | 32 | 18 |

- This is how Cumulative Flow Diagram will look like across 13 days –

