

Running the numbers

Start Right is a predictive algorithm developed by Marcel Altenburg, senior lecturer at Manchester Metropolitan University's Department of Crowd Science, in cooperation with the Abbott World Marathon Majors races in Chicago, Berlin and New York. He explains how it works:

In our research, we compared millions of results from races of all distances. We connected the developments on the course with the operations at the start to understand the consequences of even the slightest changes. By doing this we were able to predict the whole race flow based on the planned procedures at the start.

This is what world-leading marathons are now using to simulate their race months before they are held. It allows them to make changes, try out new approaches, adjust sections of the course or investigate the safe maximum capacity of the race.

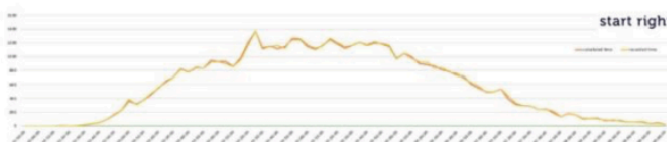
The facility to test alternatives and simulate a full race on the desktop is entirely new to the running industry. Using "Start Right" allows race organisers the freedom to define a safe benchmark for the finish, aid stations or any point along the course and then find a start procedure that makes sure none of those benchmarks are exceeded.



Experienced runners and novices alike will have noticed the pre-assigned start corrals, controlled measurements and precisely orchestrated start times of multiple waves at races they have done. The start procedure can stretch over an hour at certain races in order to massage the impact of runner flow to best effect.

For some of the larger races up to 10 million calculations need to be performed to accurately predict the position of every single runner at every point in time during the race. Once done this defines the road width required all the way along the course.

Applying the "Start Right" algorithm allows race organisers to see through this complexity with an accuracy regularly above 99.9%. Calculating runner flow over the finish line



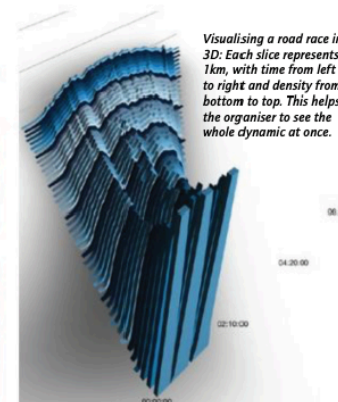
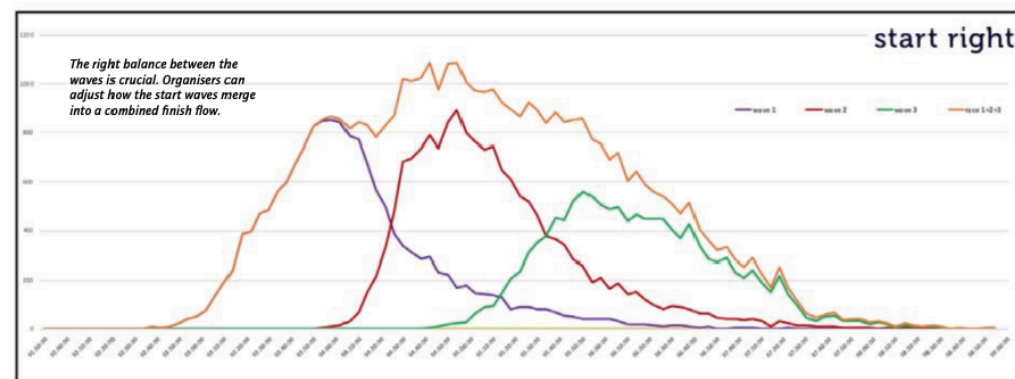
This comparison shows the accuracy to which races can be calculated. Elapsed time is shown along the bottom axis. The graph shows the number of runners crossing the finish line, per 5 minutes.

at the Bank of America Chicago Marathon 2018 predicted 853 for the peak five-minute period – which is exactly what it was.

The Advocate Health International Chicago 5km is held the day before the Chicago Marathon. Last October, in its 4th edition, 7500 runners started. This was an increase on the previous editions but, benefiting from the same kind of simulation exercises performed for its big brother event, it was relatively straightforward to define the ideal start procedure for this number of runners. The simulation is based on the logic of larger races while making adjustments for the unique profile of this race's participants.

In this way the organiser can know exactly what to expect at every point on the course: at every junction and every corner. How to prepare staff, volunteers and services. How to organise street closures, narrow sections, crossing times and cameras. And how to ensure safety, course density and a great experience for everyone in the race.

With Start Right there is nothing between start and finish of a race that can't be calculated. Growth of the race, the efficiency of resources, course merges in races with multiple distances...



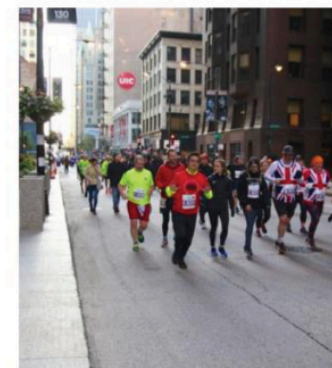
Organisers can freely design their desired finish flow: having a shorter race with a similarly high peak at the finish, or reducing peak flow over the finish line compared to previous years.

everything can be foreseen, based on the work done over the last few years. Now it is up to the race organisers to ask the right questions to make use of the research. In doing so races can be made safer, while simultaneously making them more time and cost-efficient.

The logic behind Start Right is based upon operations and results of the Abbott World Marathon Majors but the same lessons are now applied by more than 50 races on

five continents. Using the experience and data from industry leaders can have direct benefits for much smaller races and even those being held for the first time that have no previous experience to draw from.

While the organisers are taking advantage of the ability to test changes or simulate entirely new races from the comfort of the computer the algorithm learns from itself every time it is applied. If you are a regular runner you



have probably already benefited from this revelation in the running industry. You may have been "simulated" months in advance while you still were training for the event.

Based on the application of crowd science and experience from world-leading distance running events all races can be expected to benefit by making use of these highly-controlled and accurate simulations.