Innovations for the Olympic Athletes – but what about Innovation for the Crowd and Spectators?

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During and after London 2012, technologists and the public will be exposed to many examples of technological innovations in sports apparel, footwear and equipment. Significant advances have been made in advanced performance materials which will legally enhance the achievements of the medal winners. However, such developments will be kept under wraps until the Games begin. It is estimated that the global sporting goods market will reach some $303 billion by 2015 providing growth and employment – outperforming retail trends in both the US and the UK.

Prior to London 2012, Speedo (part of the Pentland Group) announced the Speed Fastskin 3 Racing System that claims to offer unrivalled benefits to swimmers. Similarly, Nike announced the Flyknit – a running shoe with an engineering knit to provide a light-weight, formfitted and virtually seamless upper shoe. They also launched Nike Pro TurboSpeed clothing and Nike Zoom Spikes – cutting edge spikes for running shoes. More examples will follow and such innovations will be seen in sports apparel in the High Street.

. . . improve the enjoyment of the assembled audience . . .

But what about innovation for the assembled audience – the crowds and spectators? How can technology improve the enjoyment of the assembled audience of sporting events?

Spectator experience is not merely an experience of receiving and consuming. It requires the active participation of the spectator in creating the atmosphere of the entire event. Sporting events provide much experience that cannot be delivered through broadcasts.

To date, most technology innovations have focused on providing a detailed view of the game/event/activity. Now things are changing.

A recent example in New York involved tagging marathon runners. Friends and family could then use a smart-phone app to track their loved one's progress, placing and time. Such interaction provides greater enjoyment, engagement and sharing of the experience.

What about innovations to help families to get to the stadium venue? A Manchester-based start-up company called Ruk-Bug Limited have developed a safe and reliable children's buggy that folds into a rucksack for ease of storage and carrying. It includes a child-changing kit.

Perhaps now is the time to get rid of queuing. Imagine a smart ticket that limits entry to the stadium to a pre-determined time slot – allowing efficient people management – again improving the overall experience and crowd safety. The US Department of Defense are developing low-cost tracking systems which will help to prevent crowd crush situations. Each year over three million people descend on Mecca for the Hajj. In future, those pilgrims could be tracked by RFID technology in their passports or wristbands. Sporting events in Europe are prime targets for protestors. Visual tracking could deter muggings and pickpockets. It would also be an invaluable help for rescuing children lost in large crowds.

Scan the ticket barcode into your smart-phone and the ticket will remind you of the time and then use GPS to take you straight to your seat. The seat

may contain a disposable or re-usable tablet – rather like opera glasses – but is likely to contain an embedded mini-speaker

from Singapore or Korea. No more booming announcements echoing around the stadium. The seat may also contain a microphone – scanning for terms of racial abuse – to direct Stewards to areas in the crowd of developing unrest.

Inventors in the US have developed directional sound which uses an ultrasonic emitter to shoot a laser-like beam of audible sound so focused that only people within a narrow path can hear it. Imagine telling the Umpire, Judge or Referee exactly what you thought of their decision directly and immediately! Or, perhaps talking about the 100 metres result in real-time with your friends who are at the opposite end of the stadium.

Bone conducting technology being developed by Kyocera uses bone in the face to transmit sound to the ear – allowing you to listen to your phone commentary in the noisiest crowd.

Imagine the future uses of augmented reality. Point your phone (or tablet) to an athlete on the track and read through the results of his past performance, personal best times and likely chances of winning. The latest smart-phones can be unlocked using facial recognition.

Chevrolet rolled out the first Super Bowl smartphone app in 2012 that allows Big Game American Football watchers to enter a contest to win everything from pizza to a new Camaro. Coca Cola set up a Facebook page and website so viewers could see its animated polar bears – one cheering for the New England Patriots and the other for the New York Giants – reacting to the game in real time.

The day's sporting programme would not be printed in hard copy – unless as a souvenir. Rather the programme timings – which may involve various sporting activities in the same stadium – would be updated in real-time allowing the spectators to move position to watch their selected events. Imagine the historical record – with millions of crowd photographs uploaded to the Internet.

No longer are the crowds and spectators merely passive. Perhaps the crowd itself could be consulted to judge the most sporting athlete – the man of the match or game rather than just the first past the post.

Here is one I would love to see in reality. The large display screen shows replays of the sporting events. It then shows a worthy cause – for example, anti-malaria mosquito nets – and a large graph showing a target for charitable donations during the course of the sporting event – on the day or during the whole of the Games – from the crowd and the watching world TV audience. The crowd is encouraged – let's hit that target before the game ends. We watch in the background as the display grows towards a worthy target. In 2016, the target could be 100 million nets!

For a greater experience, for a truly memorable life-enhancing occasion – for the crowd itself – we need novel technology and innovation.

Let the Games begin! And let us all truly participate!

GEARING UP

This feature first appeared in the January 2011 issue of the IOM3 publication, *Materials World*

One of the most eye catching and technically challenging arenas built for the London 2012 Olympics is the cycling velodrome, **Ruth Hopgood-Oates**, Senior Engineer at Expedition Engineering, outlines the construction process.

Cycling has inspired the concept for the 2012 London Velodrome. The bike is an ergonomic object, honed for efficiency, and the team behind the Velodrome wanted the same application of design creativity and engineering rigour that goes into the design and manufacture of the bike to be present in the building. Not as a mimicry of the bicycle but as a 3D response to the functional requirements of the stadium. By applying the same thought processes and form finding approach, the aesthetics and shape of the stadium have emerged. Tight budget constraints with stringent Olympic Delivery Authority (ODA) targets were set out in the Olympic Park materials strategy. The aim is to reduce waste through design – 90% of demolition material and site waste has to be reused or recycled, and at least 20% of this reused in permanent venues and associated works. The Velodrome is beating these targets with 95% of waste being recycled and 33% of materials made with recycled or partly recycled content. The team's design strategy has focused on creating efficient elements that perform several functions.

RAISING THE ROOF

A doubly curved roof shape evolved as the form that would best meet the stadium's needs. The saddle-shaped roof form 'shrink wraps' the building around the track, minimising the venue's volume and reducing heating and cooling requirements. Following cross-checks against traditional schemes using arches and trusses, a cable net was found to be suitable for the form and 140m span, while providing programme and construction safety advantages.