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Technology, Innovation, and the Future of the Sport Industry in Asia Pacific

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In December 2015, Klaus Schwab, the founder and executive chairman of the World Economic Forum proclaimed that we have entered the age of the fourth industrial revolution (Nankervis, Connell, Montague, & Burgess, 2021). So radical are the speed and scope of societal transformation facilitated by the recent technological innovation that the current situation cannot be merely seen as the continuation of the third (Schwab, 2016). For instance, the use of artificial intelligence, virtual reality and biotechnology to name a few have reshaped nearly every aspect of socio-economic environments such as the process of governance, the management of organisations and the production of commodities (Hamdan, Hassanien, Razzaque, & Alareeni, 2021; Kumar, Zindani, & Davim, 2019; Schwab, 2016). The mode of human interaction has also been experiencing dramatic changes because of the fast-evolving digital communication technology (Nowak, 2015). The sport industry is no exception. This editorial specifies three major trends in sport and technological advancement: 1) the establishment of esports competitions, 2) the demonstration of new technology at sport mega-events and 3) the application of smart devices to training and exercise programmes.

Esport in Asia

In 2021, the International Olympic Committee (IOC) implemented the Olympic Agenda 2020+5 as its strategic roadmap for the next five years (IOC, 2021a). This new initiative highlights the digitalisation of the Olympic Movement as one of the five principal objectives (IOC, 2021b). Understandably, the sport governing body promotes the institutionalisation of computer-mediated competitions such as simulated sports and competitive video gaming as part of the Olympic programme by 2025. In line with this

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digital strategy, the inaugural Olympic Virtual Series, which was comprised of five disciplines including baseball, cycling, rowing, sailing, and motorsport, took place from 13 May to 23 June 2021 (Palar, 2021). This online Olympics attracted more than 250,000 participants from 100 plus countries (Cohen, 2021). Following the success of this first Olympic Virtual Series, the IOC decided to organise the 2023 Olympic Esports Series in Singapore (CNA, 2022). This development seemingly signals that the Olympic online Games is consolidating as a regular occasion in the IOC's schedule.

Most notably, the upcoming Olympic Esports Series includes virtual taekwondo which is the only combat sport at this digital Olympics (Barker, 2023). Virtual taekwondo is a simulated competition which involves motion-sensing sparring. This contest allows the participants to compete without making actual physical contact. This format also permits the contestants to fight universally regardless of weight or gender divisions and geographical limitations (WT, 2021). These characteristics exemplify a more accessible quality of esports which transcends the existing social and physical barriers harnessed by global online connectivity and a human-computer interface. In this respect, the President of World Taekwondo said "we have long been committed to aligning with the IOC's Olympic Agenda 2020 and now 2020+5 vision in growing digital engagement" (WT, 2021). The demonstration of this simulated martial art at the 2022 Commonwealth Games in Birmingham also drew attention from the representatives of the IOC, Paris 2024 and Los Angeles 2028 (Brennan, 2022). Virtual taekwondo may present the beta version of a hyper-real sport in the future Olympics.

East Asia is one of the major strongholds of information and communication technology, and it is no surprise to observe that esports culture was already established in early 2000 in this region. The South Korean Government and Samsung jointly sponsored the foundation of the World Cyber Games (WCG) in 2000, and since then this esports governing body organised an annual international competition until 2014 (Taylor, 2012). The very first competition in Seoul attracted 174 participants from 17 countries, and the 2008 WCG was the largest-ever contest which was held in Cologne, Germany where 800 gamers from 78 nations attended (Hutchins, 2008). The WCG was often called the Olympics of computer gaming and South Korean stakeholders were mainly in charge of the organisation of this competitive video game contest. The prize money was so lucrative that many East Asian gamers even turned professional (Taylor, 2012). Not unrelated to this vibrant esports culture in Asia, the 2018 Asian Games in

Jakarta and Palembang staged competitive video games as a demonstration event, and the official programme of the 2022 Asian Games in Hangzhou to be held in September 2023 due to the pandemic will include esports competitions with 28 medals across eight virtual games (Venkat, 2021). Effectively, this Asian Games marks the first multi-sports mega-event that recognises virtual sports as a proper athletic discipline.

The entrance of digital sports to the mainstream athletic scene is rapidly expanding the contours of the sport industry today (Ward & Harmon, 2019). At the same time, such a digital shift also triggers an academic debate on the meaning and definition of sport in the first quarter of the twenty-first century (Hallmann & Giel, 2018). The welfare and career development of esports participants, which are known to be somewhat different to those of traditional athletes, are still very much under-researched area (Hong, 2022). Whether or not you welcome this permeation of virtual connectivity in the world of sport, we expect that this online-based sporting contest is likely to prosper in the foreseeable future at least. Therefore, this physical and digital interface in the sporting arena engenders several research themes and questions that need to be scrutinised from the perspective of social sciences.

Technological Innovation at Sports Mega-Events

Sports mega-events are not simply a stage for displaying sporting excellence, but also a platform for showcasing cutting-edge technology and innovation. The 2020 Olympic Games in Tokyo impressed world audiences with Japan's advanced robotics (Banks, 2019; Japan Gov, 2021). Nicknamed a robot Olympics, this event utilised robotic technology in order to make the Games more enjoyable, accessible and efficient (McCaskill, 2019). With the absence of international fans at the Olympic venues due to the COVID-19 restrictions, the Tokyo 2020 robot mascots, Miraitowa and Someity, alternatively greeted, entertained and cheered for Olympic athletes from different countries (Kochi, 2021). The Field Support Robots helped operating staff on the field to retrieve thrown objects such as javelins and hammers, and the Human Support Robots assisted spectators, especially less-abled persons, to find their seats and even deliver food and drink to them (Wade, 2019). The Power Assist Suit was deployed at the Para Powerlifting event. This wearable robot enables the support staff to load and unload heavyweights from barbells without much physical effort (IPC, 2019) The utilisation of advanced robotics at this Olympics, to some extent, uplifted the mood of

this rather sombre quarantined game taken place during the pandemic.

The 2022 Winter Olympic Games in Beijing is yet another high-tech sports mega-event. China boasted about its technological innovations through the deployment of the largest-ever 8K floor display during the opening ceremony and the first-ever 5G studio on a high-speed passenger train (Berkeley, 2022; O'Brien, 2022). The 5G studio for Chinese News Network was housed on a bullet train operating between the Olympic clusters in Beijing and Zhangjiakou. Not only was this train equipped with 5G networks for athletes and officials, but it also housed a television studio which can transmit a live broadcasting signal at the speed of 350 km per hour (Owen, 2022). The field in the Beijing National Stadium is floored with the largest HD screen on which the cultural performance of the Opening Ceremony was choreographed. This 10,393 square meter floor display can show an 8K resolution picture, and the installation of such a gigantic and cutting-edge digital device in the Olympic stadium appears to demonstrate the Chinese effort to revamp its image as a technological powerhouse (O'Brien, 2022; Smith & Jett, 2022).

FIFA actively embraces digital technology to develop international football further. The football governing body first introduced its online competition, the Interactive World Cup, in 2004, and this virtual event was later renamed the FIFA eWorld Cup in 2018 (Crookes, 2014). This video game World Cup gave rise to a new symbiotic relationship between FIFA, PlayStation, and Electronic Art which opened an era of the sport organisation and tech industry nexus (Casciato & Addison, 2009). FIFA's new vision published in 2020 also enshrines the use of innovative technology in football as a major policy promise (FIFA, 2020). The 2022 World Cup Finals in Qatar encapsulates FIFA's technological ambition. Semi-automated offside technology, an AI-powered video assistance referee (VAR) system, the FIFA Player App, goal-line technology, and the football data ecosystem are the most distinctive innovations at Qatar 2022 (FIFA, 2022). Specifically, the VAR system in combination with the semi-automated offside technology and goal-line technology helped referees make more accurate decisions and this computer-assisted refereeing also affected the performance and behaviour of players on the pitch (MacInnes, 2022). Kubayi, Larkin, and Toriola (2022) compared the match statistics from the 2014 and 2018 FIFA World Cups in order to measure the impact of the VAR system on the football fixtures. Their research shows that the employment of video refereeing significantly increased the number of

penalty kicks awarded and extended stoppage time allowed whereas it reduced the number of offside fouls offended (Kubayi, Larkin, & Toriola, 2022). This study implies that the application of digital technology makes the football competitions fairer and the referee's decisions less controversial.

Technology and Training

The training of elite athletes is yet another domain where technological innovation rapidly and repeatedly occurs. In preparation for the 2022 Beijing Winter Olympics, China built the world's largest wind tunnel training centre for competitive ski jumpers in 2019 (Lanlan, Xiaoyi, & Mingyang, 2022). Inside this special training facility, skiers can sense and manipulate their body movements thereby allowing them to make necessary adjustments while staying in the air. This physically simulated training enabled Team China to secure three places in the Olympic ski jumping competition for the first time in its history (Li & Chen, 2022). The advancement of technology surely makes visible contributions to the augmentation of human potential.

The South Korean national archery team offers another example of how state-of-the-art technology assists in the improvement of sporting performance. The Hyundai Motor Group, a major sponsor of Korean Archery, devised five high-tech training and performance devices for the Korean national team through its automobile R&D programme (Kang, 2021). These include high-precision shooting machines, automatic score recorders, vision-based heart rate measurement, deep learning vision AI coaches and customised grip (ANI, 2021). With this innovative technological support, the Korean archers could create an optimal training environment where not only were they able to enhance the precision of the shooting efficiently, but they also could measure the level of physical and mental stress they need to endure accurately. The AI coach also provided immediate but informative feedback on their practice and performance. Not unrelated to the efficacy of such computerised training methods, Team Korea managed to win three gold medals at the 2020 Summer Olympics in Tokyo.

Elite athletes are not the only ones who benefit from the technological advancement. Ordinary people can also enjoy the advantage that the application of digital technology to sports can bring. With wearable devices that collect and analyse users' biometric information, an individual can maintain a more scientific and professional exercise regime. Virtual reality allows people to experience various sports

from running through cycling to golf in many different simulated paths, routes and courses on Earth without making long-distance travels. They even compete with other players remotely both synchronously and asynchronously. Virtual sporting participation became increasingly popular during the COVID-19 pandemic when people's mobility was strictly controlled (Hanifah, Ito, Yao, & Suyama, 2022). Most notably, online workout channels multiplied in this period, and many personal trainers offered remote cardio-exercise sessions via webcast. While aerobic exercise videos have been available since the 1980s, the prevalence of relatively low-cost digital social media networks effectively propels the production, circulation and consumption of virtual workout courses. This trend was more manifest during the pandemic when people tended to stay at home, avoiding a physical contact with other people outside their household (Kim, Kim, & Cho, 2022). In the end, as information and communication technology is fast advancing, people promptly learn how smart equipment and digital devices can enrich and diversify their sporting experiences.

Technology has played a significant role in human progress and social development. While the overt emphasis upon automation, mechanical efficiency and instrumental rationalisation may make humanity dependent too much on technology potentially leading us to a dystopian future, it is difficult to deny that sensible use of technological innovations improves the condition of our social and economic life (Ellul, 1964; Marcuse, 1964/2002). The introduction of new technology has also facilitated the enhancement of sporting performance and the enrichment of personal involvement in sport. The recent advancement of digital technology almost revolutionarily changes the way people practise and participate in sporting activities. In this respect, it is important to think about the relations between technology and sport development theoretically. Technological determinism, despite being criticised often as a reductionist theory which subordinates any form of societal transformation to technological factors, deserves more attention when assessing the recent changes being occurred in the world of sport (Dafoe, 2015). Political economy stressing the power of corporations that develop a new high-tech device and own the means of technological innovation also offers another theoretical framework for the nexus of sport and technology (Betancourt, 2016). Agency theories such as the uses and gratification theory contemplate how an individual utilises various available technological tools for satisfying their needs for improving the quality of sport participation and performance (Blumler & Katz, 1974).

A systematic theoretical interpretation of the impact of new technology on the training of elite athletes and the consumption of sport will lead to a better understanding of the sporting environment surrounding us.

This Special Issue

At this juncture, it is legitimate to consider critically the impact of technological innovation on the sport industry in Asia-Pacific from the perspective of social sciences. Clearly, the use of digital technology enhances the performance of elite athletes, optimises the organisation of major sporting events, and augments the consumer experience of spectator sports. Yet, it is questionable whether people in the Asia Pacific region equally benefit from this sport and technology connection. This is particularly so given that Asia-Pacific is a region consisting of high, mid and low-income nations, and this economic gap often gives rise to the digital divide between the countries in Asia-Pacific. Moreover, technological doping poses a danger to the integrity of sport today. Again, it is normally tech-savvy rich nations who can gain this competitive advantage by tactically adopting hi-tech equipment. While the WADA prohibits the exploitation of technology that artificially enhances the performance of sport, there is a grey area between technological advancement and mechanised doping. Therefore, while the recent innovation in digital technology certainly makes the sport industry more appealing and exciting, an uneven spread of new technology can result in the formation of an unlevel playing field.

This year's Asia Pacific Sport and Social Science special issue of *Sport in Society* consists of two sections: 1) technology and innovation in sport in the Asia-Pacific region and 2) major sporting events in Asia Pacific. The first section contains five original research articles which critically examine the use of digital technology in various sport settings and contexts in this area. Jungho Kim and Yunjung Kim investigate the emerging online exercise culture via YouTube during the COVID-19 pandemic in South Korea. This study reveals meaningful differences in the patterns and contents of virtual fitness programmes between the pre and post-pandemic periods. Next, Ling-Mei Ko, Wei-Chun Tai and Ping-Chao Lee examine the roles that "exergames" plays in changing and reshaping exercise behaviour in Taiwan. With reference to the means-end chain theory and structuration theory, this study suggests the design and promotion of fitness-related video games in post-pandemic settings.

Minhua Li and Huan Xiong analyse esports culture in China. From a critical sociological perspective, this research shows how female esports players challenge a dominant male-centred gender norm by creating virtual identities in digital space. After this article, Xiaoqian Richard Hu, Jiantong Zhao, Jianghua Li and Alan Bairner survey the consumption pattern of the English Premier League's live streaming service. They delve into the mindset of Chinese football fans who subscribe to licensed fee-paying online channels despite the plethora of pirated websites in the country where people can watch live EPL content for free albeit illegally. The final essay in this section deals with the transformation of the Chinese sport manufacturing industry from an imitator to an innovator. Yang Ma considers the impact of technological development in this transition.

The section on major sporting events includes four empirical essays. First, Cheng-Hao Huang, P. David Howe and Mei-Chun Lin undertake a historical survey of sporting competitions for the disabled. These authors offer a post-structuralist interpretation of the organisation of para-sporting events in Taiwan as a way to control people with disabilities within the framework of national development. Second, Shushu Chen, Yonghui Yu and Emma Baker compares the impact of the urban development projects associated with the 2010 Asian Games and the 2022 Commonwealth Games. They argue that measuring the developmental legacies of hosting a major sporting event is a complicated business, questioning the sustainability of these events. The third paper is concerned with the 2032 Olympic bidding process. In this study, Aaron Tham examines the contents of Brisbane's documents submitted to the IOC in order to identify the reasons for the Australian city's successful Olympic campaign. Michelle E. Seanor and her colleagues present the last article in this section. This research critically investigates the social and cultural pressure that Olympic gymnasts in Australia had to bear because of abusive and exploitative media coverage of these athletes.

Asia Pacific is a dynamic and energetic area and the sport industry in this region has been burgeoning recently. Sport in this part of the world has been constantly attracting meaningful academic attention. As the editors of this special issue, we sincerely hope that the collection of essays in this Asia Pacific Sport and Social Science stimulates reader's social scientific imagination which can promote critical investigation into sport in Asian society further.

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