

Preface

It was towards the end of the 19th century that the major forms of professional sport, including leagues and tournaments, were formed. As a consequence, so too were the institutional and administrative frameworks that made them work. It is extraordinarily remarkable that this happened in different types of sports and in different countries and locations, all at the same time. We do not know precisely why. The common denominator of location is that the societies appear to have been highly urbanized, and the richest economies in the world at the time. Most notably, two nations were involved: the United States and the United Kingdom. Key sports included soccer, cricket, tennis, and rugby in the United Kingdom; baseball, basketball, and American football in the United States; and golf and horse racing in both. Many organizations in these countries have become the major financial beneficiaries of the electronic recording and distribution of sports. That it was in these two nations that the computer age was initiated, the English language has been cemented as the *lingua franca* of digital and sport worlds, ensuring the ease of their interaction: a relationship examined by Forster.

As an introduction to this volume, Forster presents *Digital Technologies and the Intensification of Economic and Organizational Mechanisms in Commercial Sport*. He presents a model of the digitisation of sport, paying particular attention to the role of the price mechanism as a guiding force in the adoption and impacts of digital technologies. He also considers the nature of home entertainment technologies. Here there has been a revolution. It was a revolution that took place over the long term—a century or perhaps a little less—but it is one that produced enormous changes in sport. That revolution transformed the household from a solitary producer and consumer of its own entertainment, into a networked purchasing and consumption center of entertainment. It is into this well established framework that the “digital revolution” and professional sports, as well as other forms of entertainment, are channeled. Forster argues that digital technologies did not create this revolution, but were able to take advantage of it and intensify it. The impacts of these events and trends upon sport are immeasurable. They have also provided an impetus to the digital revolution.

These technologies have cemented the arrival of the superstar, a phenomenon little seen before the advent of music recording technologies. The recording and replaying of sports events, leagues, teams and tournaments has given a select few superstar status. The economic nature of superstardom is described by Forster, especially the theories that attempt to explain why a few superstars garner the rewards while others of only slightly less talent, or even equal talent, receive very little. The digital phenomenon has apparently cemented these relationships, even though recording and replaying of sport has become dramatically cheaper, and of much more uniform quality.

The phenomenon of superstars means, in part, that much more attention is paid to these individuals, teams and tournaments than others. John J.H. Forster therefore examines the nature of attention. The argument is that, where information (digital content) has become cheap and even costless through ease

of recording and reproduction, then it is attention by consumers of information that has become scarce; the attention of consumers therefore has to be bought. Forster reviews tournaments and argues against the major theory of competitors' payments. The standard theory suggests that the payment structure of sports tournaments, with rewards very heavily biased towards the winners, is an incentive structure. That incentive structure is to induce players to perform at their very best. It therefore explains players' rewards on the production side. Forster presents a diametrically opposed argument, which operates on the demand side. It is argued that players are paid according to the attention they garner during the tournament. He uses this analysis to explain the same bias of winners taking a very high proportion of the pay to players. A major part of the discussion is the presentation of a new model of sports tournament incentives to athletes.

The section on training and participation begins with a chapter by Sean Reilly, Peter Barron, Vinny Cahill, Kieran Moran, and Mads Haahr, entitled *A General-Purpose Taxonomy of Computer-Augmented Sports Systems*. This chapter accepts that sport and digitization are becoming more multi-disciplinary. By presenting a common vocabulary as well as a classification of systems by both form and function, they allow for the easier interchange of knowledge between different practitioners and researchers in the area. In Chapter III, Veljko Potkonjak, Miomir Vukobratović, Kalman Babković, and Branislav Borovac extend this concept by presenting the math behind robotic design (*Dynamics and Simulation of General Human and Humanoid Motion in Sports*) along with illustrations to further explain their point to the non-scientific user. Again, this contributes to our multi-disciplinary approach. Importantly, it also discusses the use of robotics to improve human safety and development.

Following this discussion of safety and athletic development, Brendan Burkett in Chapter IV, *Technologies for Monitoring Human Player Activity Within a Competition*, presents an overview of the available technologies for athletic development in order to reduce time and expense, while at the same time improving sporting performance. This is followed in Chapter V, *Video-Based Motion Capture for Measuring Human Movement*, in which Chee Kwang Quah, Michael Koh, Alex Ong, Hock Soon Seah, and Andre Gagalowicz conjoin the biomechanical aspects discussed earlier by Potkonjak et al., with the concept of video monitoring through digital technology. Most impressive about this ongoing research is that it offers a marker-less system of observing human biomechanical movement.

The use of technology training applications for the purpose of enhancing the performance of sports participants is further explored in Chapter VI. One specific example is tennis, where technology is being used to monitor the player's action in order to achieve enhanced stroke play and game improvement. Amin Ahmadi, David D. Rowlands, and Daniel A. James present this in *Technology to Monitor and Enhance the Performance of a Tennis Player*. Their chapter explains some of the various strokes in tennis and the importance of each during the tennis match, though they pay particular attention to the serve, examining the biomechanics of this stroke. Further, the authors detail the major technologies to monitor and analyze the tennis swing, including high speed digital cameras, marker-based optical systems, and inertial sensors. Each of these technologies offers advantages and disadvantages in monitoring the tennis player. Amin Ahmadi, David R. Rowlands, and Daniel A. James present examples of how the technologies can be applied.

Extending the previous chapter, Daniel A. James, Andrew Busch, and Yuji Ohgi present a detailed examination of inertial sensors in Chapter VII, *Quantitative Assessment of Physical Activity Using Inertial Sensors*. They review this technology, its function and implementation, with particular emphasis on the use of accelerometers for the biomechanical quantification of sporting activity. Traditionally, athletic and clinical testing for performance analysis and enhancement has been performed in a laboratory,

using simulators and other instrumentation that cannot be easily used in the training and competition environments. Recognizing this, Daniel A. James, Andrew Busch, and Yuji Ohgi argue that inertial sensors are ideal for the portable environment to perform athlete assessment. The authors discuss a number of emerging sporting applications, including the use of inertial sensors in golf, rowing, cricket, and ski jumping.

With advances in computing technology, the market is seeing new commercial products that merge digital gaming with physical sports activities, in order to offer users both health and social benefits. In Chapter VIII, *Computer Supported Collaborative Sports: An Emerging Paradigm*, Volker Wulf, Florian ‘Floyd’ Mueller, Eckehard F. Moritz, Gunnar Stevens, and Martin R. Gibbs look at the use of technology to affect the social aspects of sport. In particular, they examine the way that computer gaming technology can be applied to increasing communal exercise participation. In *Digital Sport: Merging Gaming with Sports to Enhance Physical Activities such as Jogging* (Chapter IX), Florian ‘Floyd’ Mueller explores such technologies. He demonstrates the potential for this relationship, with the presentation of a design prototype called “Jogging over a Distance”. This system offers social joggers the opportunity to run together, even though they may be in two different locations. Further, it not only supports conversation, but also uses audio to communicate pace, which can serve to motivate joggers and provide a truly shared sportive experience. Unlike many other chapters in this book, Mueller’s focus is on casual users seeking to enhance their jogging experience.

Computer gaming technologies may also be used by elite players for training purposes. In Chapter X, *Double Play: How Video Games Mediate Physical Performance for Elite Athletes*, Lauren Silberman describes how video game simulations offer learning opportunities that may benefit elite players. She presents personal insights, results from observational research, and anecdotes with soccer players and other athletes to describe how real players are using game technologies, not just for entertainment purposes, but also education.

Donald P. Roy and Benkamin D. Goss present Chapter XI, *A League of Our Own: Empowerment of Sport Consumers Through Fantasy Sports Participation*. They give an overview of fantasy sports, but also a conceptual framework of the influences on consumption by postmodern sports fans. This is of interest, because there has been little inquiry into the forces that influence one to become a fantasy sports player. Roy and Goss propose that fantasy sports consumption is impacted by the interplay of psychological characteristics internal to consumers, social interactions, and external influences controlled by fantasy sports marketers. This framework serves as a useful tool for marketers to utilize in their examinations of fantasy sports participants.

To end this section, Jean-Pierre Dussault, Michael Greenspan, Jean-François Landry, Will Leckie, Marc Godard, and Joseph Lam offer Chapter XII, *Computational and Robotic Pool*. In this, they examine the game of 8-ball and discuss the problems of simulating the game to an extent that one could create a robot that would be able to compete with a human on a real table. Such a robot would be able to assist with the training of a human player, as well as be a source of great pleasure. The editors wonder if they would cheat!

Digital technology is also being used to support business in sport, so our second section deals specifically with this aspect of sport digitization. For example, Internet technologies are being used in various ways to support activities in business, though little has been written about the adoption and use of such technologies by sporting clubs. In Chapter XIII, *A Framework for the Adoption of the Internet in Local Sporting Bodies: A Local Sporting Association Example*, Scott Bingley and Stephen Burgess explore Internet adoption in local sporting bodies, and the impact on clubs and volunteers. They present

a framework that traces the adoption of an Internet application from initial knowledge of the application, through the decision to adopt, and eventual confirmation of the usefulness of the application by continuance/discontinuance of its use. They apply the framework to the adoption of an Internet application by a local cricket association in Australia, finding that the framework provides a useful means to classify the events that lead to the eventual adoption/non-adoption of a particular innovation.

Not only is the Internet being used for operational activities in sporting clubs, but in the domain of sport, it is increasingly being used to engage with distant fans. Globalization and advances in communications technology have expanded the potential marketplace for professional teams, creating fan bases of millions of people who can indirectly consume sport via television and/or the Internet. Kerr refers to these foreign consumers as “satellite supporters”. In Chapter XIV, *Online Questionnaires and Interviews as a Successful Tool to Explore Foreign Sports Fandom*, Anthony K. Kerr explores the team identification of satellite supporters, and demonstrates how online research methods can contribute to sports fan research, particularly with regards to distant participants. He adopts a case study approach using mixed methods (including questionnaires and semi-structured interviews in an online environment) to study supporters of the Australian Football League from the Australian Football Association of North America; supporters of Ajax F.C. from Ajax USA; and supporters of Liverpool F.C. from Liverpool F.C.’s Association of International Branches. Kerr concludes that mixed methods can be successfully employed online to explore fandom.

Technology is also being used in the arts. Physical museums possess several limitations including the constraints of time, space and interaction channels. To address these constraints, digital museums are being developed with the aid of computer technologies and other advanced information technologies. However, even here there are limitations, including the over-reliance on static demonstrations, poor virtual simulation, low rendering quality, and an overall lack of interaction with users. These weaknesses are particularly problematic when it comes to presenting a digital museum for something as complex as the Olympic Games. Indeed, all of the aforementioned limitations are evident in the current digital Olympic museum. Using virtual reality, Gaoqi He, Zhigeng Pan, Weimin Pan, and Jianfeng Liu take this a step further to create a *Virtual Digital Olympic Museum* (VDOM) (Chapter XV). In this chapter, the authors discuss the design of the VDOM, its relationship to virtual reality, the use of digital networks and related technologies, as well as the improved experience created for users. What is special about their application is that the VDOM captures the dynamic elements necessary to present the Olympics. It extends the main functionalities of the traditional physical Olympic museum by combining sports, humans, entertainment and education. He, Pan, Pan, and Liu propose solutions for digital-museum oriented data storage and retrieval, modeling and rendering of the digital museum, the virtual demonstration of sports and virtual humans, as well as virtual reality based sports simulation.

There have been a number of changes in the consumption of home entertainment that have impacted digital and other forms of mass sports consumption. One such home entertainment technology that has impacted sport is electronic games. Kerri-Ann L. Kuhn presents a review of this industry in Chapter XVI, *The Market Structure and Characteristics of Electronic Games*. She presents a detailed analysis and classification of all the various forms of games; explores key motivators for game play; examines the game medium and its characteristics; and reviews academic research concerning the effects of play. Of particular significance is Kuhn’s discussion of the emerging relationship games share with sport. She suggests that games can replicate sports, facilitate sports participation and be played as a sport. These are complex relationships that have not yet been comprehensively studied.

With the growth of electronic games, the business relationship between sports and advertising has taken on new forms. Beth A. Cianfrone and James J. Zhang present a review of a rising form of promotion in Chapter XVII, *Sport Video Game Sponsorships and In-Game Advertising*. They introduce various types of sponsorships and in-game advertising, and review current literature concerning marketing effectiveness. In examining the stakeholder relationships, they identify that corporations are advertising within sport video games in order to reach sport fans, while game publishers benefit from the enhanced realism the advertisements provide. However, while research has begun in this area and found that sport video game advertising can influence gamers' brand awareness, little is known about the impact on brand attitudes or behavior. Beth A. Cianfrone and James J. Zhang forecast future trends and call for timely examinations in line with technology advancements, in order for this segment of the sport industry to remain successful.

Answering Beth A. Cianfrone and James J. Zhang's call for research, Mark Lee, Rajendra Mulye, and Constantino Stavros explore *In-Game Advertising: Effectiveness and Consumer Attitudes* in Chapter XVIII. Contrary to other studies, these researchers found an unusually low favorability toward in-game advertising, particularly among experienced gamers. They also found that memorability was affected by the game environment, something well within the control of designers.

Monica D. Hernandez and Sindy Chapa also examine in-game advertising (or brand placement), but in online advergames. Specifically, in Chapter XIX, *The Effect of Arousal on Adolescent's Short-Term Memory of Brand Placements in Sports Advergames*, they find more accurate short-term memory (brand recognition) when subjects are exposed to a high arousal advergame than to a moderate arousal advergame. These results resolve contradictory findings in the literature addressing the effect of arousal on memory of brand placements in online settings. The authors recommend that advertisers wishing to target adolescents could strengthen the recognition of their products and brands by relying on fast paced or competitive game genres, which are likely to stimulate stronger emotional responses.

In our twentieth and final chapter (*Schemas of Disrepute: Digital Damage to the Code*), Ellen L. Bloxsome and Nigel J. Ll. Pope offer a worked demonstration of the use of social network analysis to examine consumer schemas, as they relate to perceptions of sponsors and athletes. They show that it is possible to quantify the attitudes of sport fans through analysis of social networking sites and identify any possible damage that an athlete's behavior may do to a sponsor's image.