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An Examination of the Technological Innovation Diffusion Among the Rural Tourism Microentrepreneurs in Economic Development

Yasong Wang
Indiana University of Pennsylvania

Abstract

The current study focuses on how rural tourism microentrepreneurs adopt and utilize the online tourism marketplace as an innovation example of information and communication technology (ICT) to promote their business, the study aims to explore the barriers and constraints they face in engaging such technology with the community-based tourism development initiative. By utilizing the case study methodology, the in-depth interviews with a phenomenological approach were conducted. The data analysis results indicate that unlike the previous research, the findings in the present study demonstrate the lifestyle and family-centered goals are the primary motivation for rural microentrepreneurs to adopt innovation. The findings of present study indicate that it is important for rural regional developers and policy makers to take such primary motivations into consideration when they develop plans of advocating the adoption of technological innovation for rural economic growth.

Keywords: Rural tourism entrepreneurs, information and communication technology, and economic development

Yasong Wang is with the department of Hospitality Management, Indiana University of Pennsylvania, Indiana, PA. Address author correspondence to Yasong Wang at yswang@iup.edu.

Introduction

Tourism as one of the largest economic sectors in the world plays a significant role in creating job opportunities and generating different types of income for the host communities (WTTC, 2018). In particular, the promotion of small-scale tourism is intuitively perceived as a suitable form of economic development for rural areas (Eadington & Smith, 1992; Echter, 1995; Fleischer & Felsenstein, 2000). As Getz, Carlsen, and Morrison (2004) asserted, small-scale tourism business has been dominant in rural and peripheral areas "because of traditional land-owning patterns and the impracticalities of operating larger corporations in marginal economies" (p.2). Nevertheless, due to the unique characteristics of tourism industry, its primary products, which are the intangible service and experiences, unlike durable goods cannot be physically demonstrated or inspected before purchasing. Therefore, in tourism market, the decision of purchasing tourism products is almost exclusively based on representations and descriptions provided by the dominant leading corporations and other intermediaries, because they obtain and control the direct access to the target market through the traditional tourism distribution system (Buhalis, 2000). Their dominant control in the marketplace makes it difficult for local people to raise their own voices in tourism project design, planning and management. Some researchers have reported that tourism is often a mechanism that objectifies heritages and local identities and thus transforms host communities into passive objects or tourees (Cohen, 2001; Seba, 2012). As a result, by taking this one side of story as granted, the majority of research in tourism field has been built upon such top-down and unbalanced development approach, but it has neglected the rapidly- emerging force from the host side in shaping the development path of local community.

Since the late 1990s, with the rapid development of information and communication technologies (ICT), in particular, the wide adoption of the Internet and the World Wide Web, it becomes possible for host communities to engage directly with consumers and challenge the role of intermediaries by displaying their offerings globally using multimedia interfaces (Buhalis & Law, 2008; Smith & Jenner, 1998). Since timely and accurate information satisfying consumers' needs is always the key for the success of business in the tourism industry, the host communities could take the advantage of ICT by directly providing the potential customers with the updated information about destinations without interference of intermediaries. Meanwhile, by directly building the information channels with the host communities through ICT, travelers cannot only be empowered by the timely and accurate information, but also create the personalized travel experiences in a cost-effective way (Buhalis, 2000; Buhalis & Law, 2008). Thus, the effective use of ICT is critical to the host communities for their business viability in the modern tourism market. However, studies have shown that small and medium-sized enterprises as well as independent, seasonal and family run, which are composed of 80 per cent of the tourism industry workforce at the global level (International Labour Organization, 2010), are getting marginalized in the tourism market because they lack both resources and expertise to take advantage of the emergent technologies (Buhalis, 1999, 2003; Morrison & Thomas, 1999; Mgijima & Flowerday, 2012; Standing, Borbely, & Vasudavan, 1999).

Nevertheless, such adverse situations those small firms are facing do not mean they cannot take advantage of the rapid development of ICT in building their business success. On the contrary, there is evidence suggesting that some innovative microentrepreneurs are increasingly creating their properties' presence on Internet and utilizing interactivity as part of their marketing strategy (Buhalis and Keeling, 1999; Martin 2004; Thomas, Shaw, & Page 2011). As Poon (1990, p.118) states, "there will be no place for the small stand-alone participants, but the world can become the oyster for the small, innovative, flexible and networked enterprises". It means that microentrepreneurs need support from public tourism organizations as well as collaboration of local tourism enterprises to build networks of shared costs-resource-information, which would pool resources and share development and operation costs (Buhalis and Cooper, 1998; Buhalis 2000). Thus, in order to benefit the prosperity of both local enterprises and destinations, community-based online tourism marketplace systems should be established to enable micro enterprises to distribute their products through global distribution systems and the Internet (Archdale, 1993; Collins, Buhalis, and Peters, 2003). More importantly, such online marketplace systems provide the infrastructure for distribution of tourism products and therefore enable smaller players to obtain a certain degree of intra-channel power, while competing for profit margins with larger competitors. Meanwhile, concerning, mobile and wireless technologies, which have a greater penetration even to digitally excluded communities due to ICT development (Buhalis and Law, 2008), should be a vital part in building such systems.

Despite the substantial impact of such online marketplace on the prosperity of rural microenterprises, it is unknown how feasible it is for the rural microentrepreneurs to adopt such technology-oriented development approach and what are the challenges for them to apply it in their business. In particular, concerning the underdeveloped infrastructure in rural areas and the technological disadvantage of micro enterprises which have comparatively more constraints in obtaining easy access to new technologies (Tiessen, Wright, & Turner, 2001), it warrants an in-depth examination of the difficulties the rural microentrepreneurs have experienced in adopting ICT solution, such as online marketplace, for their business viability.

The Study of Technological Innovation Diffusion Among the Rural Tourism Microentrepreneurs

The current research is built upon new economic growth theory; sometimes referred to as endogenous growth theory. Although the theory is built upon the neoclassical growth theory of Solow (1956) and Swan (1956) who propose the long-run economic growth rate is determined by the scientific and technological progress, it argues that the technological progress is not separate from and independent of economic forces. On the contrary, the theory suggests that "the economic growth is an endogenous outcome of an economic system, not the result of forces that impinge from outside" (Romer, 1994, p.3), because the technological progress takes place through innovations, which are the result of economic activities. Therefore, a key feature of new growth theory is to make technological change and innovation endogenous to the regional growth model. Building on Arrow's (1962) "learning-by-doing" framework, Romer (1994) incorporates technical change as an endogenous parameter within a competitive equilibrium model of economic growth. He asserts that "the aggregate rate of discovery is endogenous…is still determined by things the people do" (Romer, 1994, p.13). In other words, the regional economic growth heavily replies on the opportunities available for local people to create and diffuse technological innovation.

The present study targets at community-based tourism which aims to provide benefits to local populations by encouraging local people's participation in planning, implementing and managing tourism development. With the development of globalization and proliferation of Internet application in tourism industry, it is evident that local communities should make any effort to get involved with the application of such new trend in their tourism development so as to improve their wellbeing and achieve sustainable development progress. In particular, for less-developed rural areas where face more constraints in obtaining the necessary development resources. It has become imperative to explore the barriers in adopting the new ICT in rural and less-developed areas among the micro tourism enterprises so as to maximize the positive impact of ICT on the prosperity of host communities.

The present study selected the participants from the economically-depressed rural areas of Pennsylvania. Based on the data from U.S. Census Bureau, the poverty rate in rural Pennsylvania has increased from 11.7% in 2000 to 14% in 2010 and has reached its highest level since 1970. Such unprecedented poverty level in rural Pennsylvania calls for the examination of current economic development alternatives. Although tourism is the second largest industry in Pennsylvania, the benefits generated from tourism are distributed unevenly. Evidence reveals that tourism benefits are clustered in privileged areas of the state and are not trickling down to economically depressed rural areas (Holoviak, 2012). Specifically, in the selected study site, which is in the southwestern part of Pennsylvania, the high unemployment rate and huge percentage of under-poverty-line population require to leverage the force of tourism as a catalyst for equitable economic revitalization in rural Pennsylvania.

To truly leverage the force of tourism as a catalyst for equitable economic revitalization in rural Pennsylvania, it is necessary to circumvent current retail monopolies and give local micro-entrepreneurs access to markets. Research has identified that community-based tourism is a vital developmental alternative to provide local society with direct and long-term benefits by getting local residents involved in tourism development (Matarrita-Cascante, Brennan, & Luloff, 2010; Tao & Wall, 2009). Meanwhile, tourists are increasingly interested in services and products delivered by real local people and they want to know that their expenditures make a direct contribution to the well-being for their hosts. Therefore, a platform which can provide such direct market link between suppliers and customers is necessary for economically depressed rural areas to obtain equal development opportunity.

With the development of ICT, it becomes possible for host communities to engage directly with consumers and challenge the role of intermediaries (Buhalis & Law, 2008). Recent research has found that by employing weblogs local people can speak and actually define which aspects of their heritages/identities are suitable for sharing with visitors and to generate needed income (Wang & Morais, 2014). In other words, by constructing such direct communication or product supply channels between hosts and guests through ICT, local people are strengthening their control of tourism development in their own communities. In particular, the fragmentation of the rural tourism market has made the internet ideal for promoting rural micro enterprises online (Buhalis & Murphy, 2009). However, the research in tourism and hospitality field about this new development trend is still in the infancy stage. In particular, it is unknown what major barriers that rural micro enterprises are facing when they engage in such community-based tourism development initiative.

The present research focuses on an online tourism marketplace (i.e., www.peoplefirsttourism.com) that mediates interactions and transactions between tourists looking for services from their home or mobile web browsers and local tourism products suppliers in rural host communities. By examining how rural microentrepreneurs adopt and utilize this online tourism marketplace to promote their business, the study aims to explore the barriers and constraints they face in engaging with such community-based tourism development initiative. The study findings can provide an in-depth understanding about the determining factors influencing the applications of ICT among rural microentrepreneurs in their business. Although tourism scholars have agreed that using technology and the internet is becoming inevitable for rural micro enterprises, the research in adoption of ICT innovation among rural microentrepreneurs and how ICT can be more applicable for rural micro enterprises is rare. In particular, since the level of economic activities is relatively lower in the less developed rural areas, it warrants further study on how to facilitate the adoption of innovation by mitigating the primary barriers to innovation adoption in these areas. Meanwhile, the findings of present study can facilitate policy makers and regional development planners in developing policies and strategies to facilitate the diffusion of innovations and improve ICT engagement among rural microentrepreneurs.

METHODOLOGY

The present study seeks to understand how rural microentrepreneurs adopt an online tourism marketplace (i.e., www.peoplefirsttourism.com) as an economic development initiative and identify the barriers in this adoption process. To accomplish the study objective, a case study methodology has been utilized. According to Yin (2009), case studies are optimal when seeking to answer the questions of why and how certain decisions are taken. Such methodology provides a deeper-level understanding of the social processes in a place or places by interviewing informants and conducting participant observation (Denzin, 1989).

Twenty-two local microentrepreneurs were invited to participate in the study and eighteen of them accepted the invitation. Methods of participant observation included the following: having conversations with participants; working with participants together to set up their webpages on the online tourism marketplace to make their products accessible to customers; and observing how participants use the online tourism marketplace. The interviews were conducted by using open-ended questions focusing on participants' experiences of using the online tourism marketplace. A phenomenological approach based on in-depth interviews was employed. Phenomenological studies examine the meaning of human experiences through the detailed descriptions provided by the people being studied (Creswell, 1994). Sensitizing concepts were used in order to provide a general sense of reference, or direction for the analysis of the data (Patton, 1990) including the concepts of barriers. The interviews followed a semi-structured format in which the main topics covered remained the same, but the order of questions varied between the interviews. Each question was followed by a series of probes designed to obtain a fuller description of experiences and more detailed responses.

The process of data analysis began as soon as the initial interviews were completed and it lasted throughout the duration of the study. The data were analyzed using constant comparison technique (Glaser & Strauss, 1967). First, the author read interview transcripts to develop a broader understanding of the topic. Emergent major themes were color coded to aid in the identification and consolidation of findings. Subsequently, each transcript were re-read several times by the author in order to identify sub-themes and to ascertain that they truly represent the information gathered during the course of the interviews. New observations, emerging themes and issues that surfaced during the interviews were followed up in subsequent conversations, which facilitate verification of external consistency of the previously obtained material. After the completion of all interviews, the transcripts were re-read once again and relevant information that confirmed as well as contradicted emerging themes were identified.

Trustworthiness, credibility and confirmability of data analysis were achieved through reflexibility and triangulation (Guba & Lincoln, 1989). By contrasting identified themes from the interview data with notes made during the participant observation process, reflexibility was reached. The researcher located consistency among the themes discovered in both types of data collection methods. Triangulation was accomplished by sharing and discussing findings with academic colleagues and research assistants when interview data were analyzed and interpreted (Flick, 2005; Wolcott, 1994).

In order to improve the validity of the study, particularly to enhance the accuracy and credibility of interview content and its interpretation, the author double checked the informants' view. Interview transcripts were sent to the interviewees for verification and feedback. While informants' verification is a standard practice used to increase the internal validity of the data, because interviewees can read the transcripts and assure themselves that the sensitive information that they provide is not altered in any way. Furthermore, in order to test for the internal validity of the data, themes that emerged from the study were presented to selected interviewees and their comments and suggestions were followed in the data analysis stage. Finally, external consultants who did not have connection with this study were also invited to examine whether the findings, interpretations, and conclusions are supported by the data in order to help in assessing reliability of the qualitative data.

FINDINGS AND DISCUSSION

By being involved with participants in establishing the online tourism marketplace for their business, having conversations with them and their family members, and observing their daily activities, a basic understanding about participants' background, purposes for their own business, and major concerns for their future development was formed. First, all of participants were small business owners and the types of business are very diversified which include wine making, crafts making, children books writing, farming, and restaurants operations. Second, the most popular reasons for participants to own their business include taking control of their own destinies and inheriting family business. Third, participants also demonstrated their primary concerns about their future business growth. Their major concerns can be categorized into three main aspects.

First, some participants felt lack of support from neighbors or local community because they were living in the isolated rural area and there were not a lot of neighbors. In particular, they demonstrated strong interest in knowing how online marketplace could help them reach more potential customers, concerning the difficulty to get advertise known to larger market due to expensive advertising fees and their business was located far away from big communities and towns. The second most commonly shared concern was the challenges from government. For example, one of the participants reported that

> *The biggest challenges are from government, every time when government needs money it hits small business. The local law enforcement has started to focus on small game of chance licenses. Because I have a liquor license, the liquor control enforcement division of state police is making me to enforce their law to make sure the people to come to have events here to have small game of chance licenses. So, they cannot do 50/50 anymore, do ruffles, can't do basket ruffles, all these non-profit organizations would have meeting here to raise money for their events now requires to go through small game of chance licensing, and a lot of groups are small. That's example of regulations asking me and hold me being accountable if they have it. If they do not have paperwork, I will be fined. The biggest change I am facing right now is the property taxes, the local government is taking more tax from local business. Therefore, my property tax goes up. The govern-*

ment is holding me back from growing. The more employees I have the more regulations I have to comply with. It seems I am buried by the government stuff.

Another participant expressed the similar concern:

Various kinds of tax on a single item and overwhelming information about tax regulation need to know, difficulty to follow the guidelines in order to avoid breaking the tax law and being fined. Hard to find timely help to complete the tax claims on time. New information and stuff about tax issue come every year. Various kinds of tax on a single item and overwhelming information about tax regulations in different states make small business less competitive. Because PA does not become a reciprocal state among the major vine-making states in the U.S., such as CA, WA, and NY, winemakers in PA cannot be waived the tax if they sell their wines to those states.

Last, most participants also shared their difficulty in competing with the big corporations and training the current employees. Overall, the observation findings provide a glimpse of participants' background, the reasons for pursuing on their current business, and their major concerns.

Meanwhile, the in-depth interviews provide more information about participants' perception about the primary barriers to prevent them from adopting the possible technology, such as the online marketplace in this study. Based on the analysis of data from interview transcripts, two major themes were identified from the interview data. First, most participants reported that they felt the online market place required them to spend a lot of time to track and monitor customers' requests and inquiries. They demonstrated the reluctance to adopt the online market place as a primary tool to promote their business in the future, because of the large amount of time they have to consume every day and distract them from other critical issues, such as family responsibilities. For example, one of the participants, who is a farm owner, shared the following comments in the interviews

During the harvesting season, I and my family have to work whole day in the farm and it is quite tough to keep answering any questions from the visitors who plan to visit my farm. In particular, I've three kids to take care of and it's quite hard to have enough time to respond visitors' requests or inquiries in a timely manner. I think the biggest challenge to keep using this online marketplace is the limited time I have.

Such finding exposed how the characteristics of rural microentrepreneurs' daily life affect the adoption to ICT. As previous research identified that the rural micro enterprises are characterized by small and family-centered operations (Fleischer & Pizam, 1997; Galston & Baehler, 1995). Such family-oriented structure and the conflict between business development and family responsibilities directly influence the owners of rural micro enterprises in the process of innovation adoption. Meanwhile, unlike the previous research (i.e. Anckar & Walden, 2001; Main, 2002), the participants did not consider lack of resources, lack of skilled employees, and lack of easy to use technology adapted to their business as the barriers to cause the limited adoption of

ICT in their business.

Another theme demonstrated in the interviews focuses on the limited benefits perceived by participants from the adoption of ICT. Many participants reported that the profit improvements achieved through the adoption of ICT could not outweigh their sacrifice of lifestyle. In other words, they believed it would be more beneficial if the ICT could make their daily schedule more flexible and create more free time and family time for them. For instance, one bakery shop owner made such comments

> *"The reason for me to quit my previous job and open this bakery shop is I hope I could have more time to take care of my little kids. My current customers, most of them, are my friends and other people introduced by my friends. I am very interested in the possibility of letting more people know my bakery shop and patronize my business through using this online market place. However, I hope such change will not affect my personal time staying with my kids."*

This finding echoes the previous rural tourism research which identified that the rural tourism and hospitality sectors dominated by small family and owner-operated business were motivated primarily by lifestyle and family-centered goals (Getz & Carlsen, 2000; McKercher, 1998). Meanwhile, such finding also supports other researchers' argument that the lifestyle motivations rather than economic growth as a primary motivation are considered as constraints for regional economies (Atejevic & Doorne, 2000; Mehraliyev, 2014). In other words, to make technological change and innovation endogenous to the regional growth model, it is necessary to take the lifestyle motivations as a major concern, in particular, for rural micro enterprises.

Based on the data collected from both observation and semi-structured interviews, the findings in the present study provide an in-depth understanding about what the participants perceive as their major challenges for future development and barriers for them to adopt technology innovation and why they consider those factors influence their decision on how they develop their business. The findings in the present study provide an alternative way of understanding about the economic development approach which is built upon innovation adoption and technology progress. In other words, to facilitate the economic development in the host communities by fostering the innovation adoption among local rural micro enterprises, the policy makers and economic developers need to consider how new technologies or innovation could help people to pursue on their favorite lifestyles and make a match between their business growth and family responsibility fulfillment. In particular, going beyond the traditional thesis that innovation generation and adoption is controlled by the level of economic activities, the findings of present study demonstrate the necessity of exposing the influences of other non-economic causes or factors on innovation adoption. In addition, by identifying the unique types of barriers to innovation adoption in the economic-depressed rural areas, the present study may encourage more in-depth research on identifying the primary barriers to innovation adoption in the developing regions and countries.

CONCLUSION

Tourism has been an important tool in rural areas for economic growth. In particular, the promotion of small-scale tourism is intuitively perceived as a suitable form of economic development for rural areas. Meanwhile, the new economic growth theory credits the regional economic growth on the opportunities available for local people to create and diffuse technological innovation. With the development of globalization and proliferation of Internet usage in tourism market, it is important to understand how to make ICT more favorable for rural microentrepreneurs to adopt. By actively adopting and applying ICT in their business, such new technological development would make significant contribution to the local economy. However, to make technological change and innovation endogenous to the regional growth model, it is necessary to identify the major barriers to cause the limited adoption of ICT among the rural micro enterprises. The data analysis results in the present study indicate that unlike the previous research (i.e. Anckar & Walden, 2001; Main, 2001), the participants did not consider lack of resources, lack of skilled employees, and lack of easy to use technology adapted to their business as the barriers to cause the limited adoption of ICT in their business. However, the findings in the present study demonstrate the lifestyle and family-centered goals are the primary motivations for rural microentrepreneurs to adopt innovation.

Such results provide a unique point of view about how rural microentrepreneurs make decisions to adopt and apply ICT in their business. By knowing their major interests and concerns in employing ICT to enhance their business growth, the rural regional developers and policy makers may create and implement more effective measures and policies to advocate and facilitate the utilization of ICT so as to encourage local people to create and diffuse technological innovation. Meanwhile, participants also demonstrated their primary concerns about their future business growth. Their major concerns include lack of support from neighbors or local community because they were living in the isolated rural area and there were not a lot of neighbors; the challenges from government, and their difficulty in competing with the big corporations and training the current employees. Such identified issues provide useful information for future economic development in the less-developed rural areas. In particular, such findings create the possible dialogue opportunities for policy makers and local small business owners. By taking care of such primary concerns, rural regional developers and policy makers may provide more necessary and effective support and assistance to local business, and eventually, locate and shape a sustainable way of economic development which can be endogenous to the local growth model.

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An Optimal Decision Making Process for Players of the Chinese Taipei National Volleyball Team

I-Chin Chen, Mei-Jung Chen, & Jin-Long Lin
Takming University of Science and Technology
Robert Alman
Indiana University of Pennsylvania

Abstract

The primary goal of this study is to investigate the evaluation process for Chinese Taipei national volleyball team members by seeking integrated weights for systematic aspects and indicators of players in different positions, exploring the most appropriate ranking for players in various positions, and building a selection and training model for national volleyball team players. The study methods used are as follows: first, via interviews with experts and scholars, and Analytic Hierarchy Process questionnaire for evaluating the performance of players on the national volleyball team was compiled. This step was followed by the application of the AHP to an actual selection and training process for the definition of 4 systematic aspects and 15 indicators for setters, 4 systematic aspects and 14 indicators for spikers, and 3 systematic aspects and 10 indicators for liberos. The study results are as follows: the integrated weights for the aspects and indicators of players in different positions were calculated, and the most appropriate ranking for players in different positions was computed. Finally, comparing the rosters of the actual national team selectees for the 2011 Asian Men's Volleyball Championship, the accuracy rate was 100%, a result that will be an important reference for future selection and training and international competitions. Conclusion: for volleyball athletics decision-makers, this study's results provide a clear-cut tactic for development that includes priority ranking and development based on all aspects and indicators, and for the study of volleyball, brand-new application, management, analysis, and research directions.

Keywords:* *setters, spikers, liberos, mental, offense and defense

I-Chin Chen, Mei-Jung Chen, and Jin-Long Lin are with Physical Education Office, Takming University of Science and Technology, Taiwan. Robert Alman is with the Department of Kinesiology, Health and Sport Science, Indiana University of Pennsylvania, Indiana, PA. Address author correspondence to Robert Alman at balman@iup.edu

Introduction

From the academic viewpoint, seeking a path to a practical and theoretical understanding of the sport of volleyball is an objective that volleyball professionals should actively pursue. A panoramic view of the correlated studies on volleyball athletics reveals that an investigation can be conducted from 3 standpoints: physiological, mental, and technical. Koch and Markus (2009) investigated men and women professional beach volleyball athletes, performing a comprehensive technical analysis of 15 men's and 14 women's matches at Klagenfurt, Austria in 2005. In this study, Chi-square tests were applied to understand performance differences between the genders. The study results suggested that 6 main elements indicate a significant difference: serving ($p<.01$), receiving a serve ($p<.05$), setting ($p<.01$), spiking ($p<.01$), blocking ($p<.01$), and defending ($p<.01$). Of these elements, serving and spiking also exhibited significant differences within the groups. Davids, Kingsbury, Bennett, and Handford (2001) investigated the main concept of information-movement coupling and combined it with experimental research and practice organization to investigate the external-time task distribution of volleyball competitors. The study results suggested that information-movement coupling is an important element in organizational structure and that the volleyball competitors' own external-time task distribution is an even more important factor in achieving the objectives of athletic action and organization.

Next, from the mental viewpoint, Lafrenière, Jowett, Vallerand, and Carbonneau (2011) applied a Dualistic Model of Passion to investigate the influence exerted by the coach's passion on the athlete's recognition of training and the athlete's relationship with the coach. The subjects of the study were 103 coaches and athletes (volleyball, gymnastics, and soccer); the results of Structural Equation Modeling calculations suggested that a coach's training-coordinated passion has a positive influence on autonomy-supportive behavior and that an athlete's autonomy-supportive behavior also predicts a high-quality relationship between the athlete and the coach, as well as the athlete's degree of happiness. Based on organizational psychology theories, De Backer et al. (2011) investigated the recognition of the coach's justice and the needs support within a sports team. The subject of the study was the responses to a comprehensive questionnaire on the achievement of recognition and support by Belgian top-level women volleyball competitors ($N=56$; $M=22.33$). After analysis of the data via structural equations, the results suggested that the recognition of justice and needs support, along with team competitor recognition during training, reached significant levels ($p<.05$) and that team recognition positively predicted the competitor's tasks and social unity ($p<.001$) and was the intermediate for the relationship between justice and form.

As for the third part, the investigation of volleyball sports tactics and technique, the correlated studies can be said to be abundant and pluralistic (multi-elemental). These studies are characterized by different research methods, different research grounds and objects, and different technical discussion viewpoints and are of major aid and benefit in training and technical practice.

In comparison with the above physiological, mental, and training and technique aspects, topics in which volleyball professionals are discussed from the "management" standpoint appear inadequate. Then discussion from the management standpoint, precisely because volleyball is a sport that is particularly focused on the team and is composed of different team members and because the evaluation of the team and its players must be considered in many respects, decision-making and correlated problem-solving are Multi-Criteria Decision Making (MCDM) theory problems. Tzeng (2003) characterized MCDM as effective in resolving the problems present in social science and noted that the correlated topics observed in our everyday lives penetrated into the multivariate inputs of MCDM theory and that decision-making programs for multivariate output projects seek a rational, feasible path toward resolution. Hence, the determination of how to penetrate objectified, quantified scientific training to enhance the performance of athletes is the main topic pursued in current training. Thus, cross-disciplinary application of the Analytic Hierarchy Process (AHP) in MCDM fully yields a resolution scheme in terms of simplifying the problem and can be considered an effective and appreciated tool. The application of this tool to athletics can be said to be increasing every day, and the concomitant results appear substantial (Bodin, & Epstein, 2000; Thomas, 2002; Bodin, 2006; Lin, Tung, Chen, & Chen, 2011). The research topics are relatively pluralistic and wide-ranging, and with regard to volleyball studies, represent even greater innovation and breakthroughs. In volleyball, Budak, Kara, and İç (2017) used AHP to weight the positions and skills of volleyball sport; He, and Bai (2018) utilized Fuzzy Analytic Hierarchy Process based volleyball quality evaluation for college teaching; Hu, Cheng, and Wu (2018) applied Analytic Network Process (ANP) for professional volleyball development in Taiwan's sports industry.

From the viewpoint of the sports team, Zilla (1998) applied the analytic hierarchy approach to predict the ranking of the 16 soccer teams of the Israeli National League. Partovi and Corredoira (2002) presented a model with AHP and quality function deployment (QFD) for prioritizing and designing rule changes for the game of soccer to make it more attractive to soccer enthusiasts. Shahbazi, Rahimizadeh, Rajabi, and Abdolmaleki (2011) applied the AHP to discuss the mental and physical characteristics of the Iranian men's national handball team; Lee and Walsh (2011) applied a Strengths, Weaknesses, Opportunities, and Threats (SWOT) and AHP hybrid model in a case study that investigated NCAA Division I schools' outsourcing of athletic event sales for their sports teams. In recent years, the achievements of the Chinese Taipei national volleyball Team in international matches have not been prominent, and the national team's performance in international matches will directly influence the development of this sport in this country. Lin et al. (2011) applied the AHP to investigate the selection and training methods for Chinese Taipei national baseball team members. For the 2009 World Cup Baseball, they modeled an optimal pitch ranking in the selection and training process for pitchers; at the same time, they confirmed that the selection results had an accuracy rate of 91%, a rate that can serve as a reference for the selection and training of other sports teams. The purpose of this study was to examine a multiple-criteria decision making model to select appropriate players for the Chinese Taipei national volleyball team using the analytic hierarchy process.

Scientific studies on and the application of the AHP are becoming increasingly common and have yielded rich results. The research topics are relatively wide-ranging, demonstrating the importance of MCDM to the field of sports management. However, from the management standpoint, studies that investigate efficiency and productivity are relatively rare, and the selection and training methods for the Chinese Taipei national volleyball team are in need of further research to increase the effectiveness of volleyball training. Hence, determining how to investigate, via the management layer, the new research applications and directions regarding the sport of volleyball and thus provide volleyball decision-makers with a clear-cut tactic for development can be considered an important start. At the same time, the reference information on the actions of volleyball organization managers and decision-makers is of maximum aid and benefit in boosting managerial effectiveness in volleyball.Volleyball professionals should actively study the correlated measures and practices and gradually develop proper characteristics for the sport of volleyball, subsequently using them as references for volleyball competition and training practice.

Method

The AHP is a multi-objective, developmental decision method developed in 1971 by the U.S. scholar Thomas L. Saaty (1980). The main area of the AHP application is decision-making problems regarding uncertain situations and multiple assessment criteria. The hierarchical framework is the main skeleton of an entire system's framework and is used to investigate the interaction among all criteria and essential factors within the hierarchy and their influence on the entire system. Moreover, each level is only influenced by another level. The AHP simplifies a complex system into a simple and clear hierarchical system of essential factors, relies on a nominal scale for the pairwise comparison of the essential factors at all levels, and then establishes a pairwise comparison matrix. The eigenvectors used to solve for the matrix serve as priority vectors for this hierarchy and represent the priority among all essential factors. The AHP then solves for the eigenvalues, which constitute the basis for determining strength/weakness consistency in the pairwise comparison matrix for assessment and are used as the indicator of the acceptance/rejection or further assessment of a decision. The main steps of the process can be divided into 6 parts: 1. problem analysis and listing of the assessment factors; 2. construction of the hierarchical framework; 3. establishment of the pairwise matrix; 4. solving for the eigenvalues and eigenvectors; 5. verification of the consistency of the pairwise matrix; and 6. determining the dominant proportion values of all factors. In this study, the AHP provides weights for computation, and then a consistency verification analysis is performed. Using multi-functional applications, Vaidya, and Kumar (2006) collected approximately 150 papers on the pairing of the AHP with an MCDM tool. These studies were applied in the areas of selection, evaluation, benefit-cost analysis, allocations, planning and development, priority and ranking, decision-making, forecasting, medicine, and related areas, and the AHP was applied using quality function deployment (QFD).

Selection Process for the Chinese Taipei National Volleyball Team

The present study, focusing on the 2011 Asia Cup Men's Volleyball Championship and conforming to the selection and training system of the Chinese Taipei Volleyball Association (CTVA), seeks to determine the most suitable ranking of volleyball technical capabilities and national team members and construct a selection and training model for National Volleyball Team members. 1. To determine the views of Taiwanese volleyball professionals on the National Volleyball Team's technical capability, the present study focuses on the National Selection and Training Committee members (7 members) interviewed. 2. To determine the most suitable ranking and to build a selection model via the actual selection and training situation, this study defined 4 systematic aspects and 15 indicators for setters, 4 systematic aspects and 14 indicators for spikers, and 3 systematic aspects and 10 indicators for liberos. The present study focuses on the national team's player selection list for the 2011 Asia Cup Men's Volleyball Championship, which contains a total of 18 players (Table 1).

Table 1

The list of 2011 Asia Cup Men's Volleyball Championship necessitated the selection

no.	player	position	team
1	player 1	spiker	MIZUNO
2	player 2	spiker	MIZUNO
3	player 3	spiker	MIZUNO
4	player 4	spiker	Taiwan power
5	player 5	spiker	Taiwan power
6	player 6	spiker	Guan-yi sport
7	player 7	spiker	Guan-yi sport
8	player 8	spiker	MIZUNO
9	player 9	spiker	National Sports Training Center
10	player 10	spiker	Taiwan power
11	player 11	spiker	MIZUNO
12	player 12	spiker	Guan-yi sport
13	player 13	spiker	Taiwan power
14	player 14	setter	Guan-yi sport
15	player 15	setter	MIZUNO
16	player 16	setter	Taiwan power
17	player 17	libero	National Sports Training Center
18	player 18	libero	Guan-yi sport

Hierarchy establishment

To select and analyze nationally outstanding volleyball players, 7 National Volleyball Team Selection and Training Committee members and scholars were invited for interviews. Via these interviews with experts and the application of the AHP framework to MCDM theory, the various changes and basic situations encountered in volleyball practice were explored. A questionnaire was constructed for the evaluation of the performance of players on the National Volleyball Team. The framework of the study's hierarchical model focuses on the actual state of current outstanding volleyball athlete selection and synthesizes the views in the literature and those expressed by scholars and experts. The views can be categorized into 3 patterns: views on setters, views on spikers, and views on liberos.

During the "setters" portion, via the interviews with the experts, 4 large main systematic aspects were established: offensive and defensive statistics, setting capability, mental qualities, and individual experience. Then, under each systematic aspect, 15 assessment indicators (criteria) were constructed to complete the various basic capabilities for the optimal setter performance evaluation model and the roles they play. The evaluation framework is shown in Table 2.

During the "spikers" portion, via the interviews with the experts, 4 large main systematic aspects were established: offensive and defensive statistics, attacking capability, mental qualities, and individual experience. Then, under each systematic aspect, 14 assessment indicators (criteria) were constructed to complete the various basic capabilities for the optimal spiker performance evaluation model and the roles they play. The evaluation framework is shown in Table 3.

During the "liberos" portion, via the interviews with the experts, 3 large main systematic aspects were established: defensive capability, mental qualities, and individual experience. Then, under each systematic aspect, 10 assessment indicators (criteria) were constructed to complete the various basic capabilities for the optimal libero performance evaluation model and the roles they play. The evaluation framework is shown in Table 4.

Measurement and Procedure

The first step used in the present study to establish the framework for the national team player selection and training model was the building of performance evaluation models for volleyball setters, spikers, and liberos (Table 1, 2, and 3, respectively) as the basis and the revision of these models for conformity with the analysis framework for actual needs. The second step was to input the correlated data on the systematic aspects (the criteria and indicators) into the AHP computer software and thus solve for the efficiency values and perform the data analysis. The third step was to input the statistical data on all selection/training athletes to be assessed into the AHP computer software to solve for the most suitable ranking. The fourth step was to obtain the most appropriate volleyball player roster for the national team.

Results

Setter aspect and criteria priorities

The results of this study indicated that all 7 experts and scholars believe that the weights and important priorities for the setter evaluation model's systematic aspects were as follows: "setting capability" (0.4858), "mental factors" (0.2534), "offensive and defensive statistics" (0.1463), and "individual experience" (0.1145). The consistency ratio (CR) was 0.0796, reaching an acceptable level (Table 2).

Table 2

The setter aspect and criteria priorities

GOAL	ASPECT	CRITERIA
	offensive and defensive statistics (.1463)	serving score (.1463)
		spiking score (.4858)
		blocking score (.2534)
		opponent's mistake score (.1145)
	setting capability (.4858)	setting technique (.5936)
		attacking success rate (.1571)
		error rate (.2493)
Setters	mental factors (.2534)	adjustment to pressure and handling of adversity (.1720)
		motivation (.1976)
		teachability (.1720)
		concentration (.2607)
		self-confidence (.1976)
	individual experience (.1145)	elected by media voting (.1311)
		coach recommendations (.6608)
		number of times selected as a national team player (.2081)

The weights and importance priorities for the setter evaluation model's offensive and defensive statistics aspects were as follows: "spiking score" (0.4858), "blocking score" (0.2534), "serving score" (0.1463), and "opponent's mistake score" (0.1145). The CR was equal to 0.0568, reaching an acceptable level.

The weights and importance priorities for the setter evaluation model's setting capability aspects were as follows: "setting technique" (0.5936), "error rate" (0.2493), and "attacking success rate" (0.1871). The CR was equal to 0.0462, reaching an acceptable level.

The weights and importance priorities for the setter evaluation model's mental factors aspects were as follows: "concentration" (0.5607), "self-confidence" (0.1976) and "motivation" (0.1976), and "adjustment to pressure and handling of adversity" (0.1720) and "teachability" (0.1720). The CR was equal to 0.0483, reaching an acceptable level.

The weights and importance priorities for the setter evaluation model's individual experience aspects were as follows: "coach recommendations" (0.6608), "number of times selected as a national team player" (0.2081), and "elected by media voting" (0.1311). The CR was equal to 0.0462, reaching an acceptable level.

Spiker aspect and criteria priorities

The weights and importance priorities for the spiker evaluation model's systematic aspects were as follows: "mental factors" (0.4531), "attacking capability" (0.2616), "offensive and defensive statistics" (0.1671), and "individual experience" (0.1182). The CR was equal to 0.0957, reaching an acceptable level (Table 3).

Table 3

The spiker aspect and criteria priorities

GOAL	ASPECT	CRITERIA
	offensive and defensive statistics (.1671)	serving score (.3478)
		spiking score (.3478)
		blocking score (.0975)
		opponent's mistake score (.2068)
	attacking capability (.2616)	attacking success rate (.8333)
		error rate (.1667)
Spiker	mental factors (.4531)	adjustment to pressure and handling of adversity (.1675)
		motivation (.1458)
		teachability (.1376)
		concentration (.1458)
		self-confidence (.4033)
	individual experience (.1182)	elected by media voting (.1168)
		coach recommendations (.6833)
		number of times selected as a national team player (.1998)

The weights and importance priorities for the spiker evaluation model's offensive and defensive statistics aspects were as follows: "serving score" (0.3478) and "spiking score" (0.3478), "opponent's mistake score" (0.2068), and "blocking score" (0.0975). The CR was equal to 0.0224, reaching an acceptable level.

The weights and importance priorities for the spiker evaluation model's attacking capability aspects were as follows: "attacking success rate" (0.8333) and "error rate" (0.1667). The CR was equal to 0.0000, reaching an acceptable level.

The weights and importance priorities for the spiker evaluation model's mental factors aspects were as follows: "self-confidence" (0.4033), "adjustment to pressure and handling of adversity" (0.1675), "motivation" (0.1458) and "concentration" (0.1458), and "teachability" (0.1376). The CR was equal to 0.0448, reaching an acceptable level.

The weights and importance priorities for the spiker evaluation model's individual experience aspects were as follows: "coach recommendations" (0.6833), "number of times selected as a national competitor" (0.1998), and "elected by media voting" (0.1168). The CR was equal to 0.0212, reaching an acceptable level.

Libero aspect and criteria priorities

The weights and importance priorities for the libero evaluation model's systematic aspects were as follows: "defensive ability" (0.5469), "mental factors" (0.3445), and "individual experience" (0.1085). The CR was equal to 0.0462, reaching an acceptable level (Table 4).

Table 4

The libero aspect and criteria priorities

GOAL	ASPECT	CRITERIA
Libero	defensive ability (.5469)	serve receiving capability (.2500)
		full-dimensional defensive capability (.7500)
	mental factors (.3445)	adjustment to pressure and handling of adversity (.1720)
		motivation (.1976)
		teachability (.1720)
		concentration (.2607)
		self-confidence (.1976)
	individual experience (.1085)	elected by media voting (.1667)
		coach recommendations (.6667)
		number of times selected as a national team player (.1667)

The weights and importance priorities for the libero evaluation model's defensive statistics aspect were as follows: "full-dimensional defensive capability" (0.7500) and "serve receiving capability" (0.2500). The CR was equal to 0.0000, reaching an acceptable level.

The weights and importance priorities for the libero evaluation model's mental factors aspects were as follows: "concentration" (0.2607), "self-confidence" (0.1976) and "motivation" (0.1976), and "adjustment to pressure and handling of adversity" (0.1720) and "teachability" (0.1720). The CR was equal to 0.0392, reaching an acceptable level.

The weights and importance priorities for the libero evaluation model's individual experience aspects were as follows: "coach recommendations" (0.6667), "elected by media voting" (0.1667), and "number of times selected as a national competitor" (0.1667). The CR was equal to 0.0000, reaching an acceptable level.

Ranking of players

The development of the national team roster for the 2011 Asia Cup Men's Volleyball Championship necessitated the selection of 18 players. For privacy, their full names are not made public, and the players are referred to by code names (as Table 1).

The setter integrated assessment weight necessitated solving for the relative weights of the 15 setter assessment indicators (criteria), and after their comparative appraisal by the experts, solving for the setter integrated indicator weight and most suitable ranking. For the setter portion, a total of 3 players were selected for the 2011 Asia Cup Men's Volleyball Championship national team. Table 5 lists the most suitable ranking and weighted aggregate score for the optimal setters as national team players: 1, player 16 (6.950); 2, player 15 (6.821); 3, player 14 (6.560). Players 15 and 16 were selected for the 12-player final roster. The results of this study are thus consistent with the actual selection and training results.

Table 5

The ranking and weighted aggregate score for the optimal setters

no.	weight score	rank
player 14	6.560	3
player 15*	6.821	2
player 16*	6.950	1

Note: * represents players were selected for the final roster

The spiker portion involved the relative weights for the 14 assessment indicators (criteria), and after the experts' comparative appraisal, solving for the integrated indicator weight and most suitable ranking for the spikers. A total of 13 spikers were selected for the 2011 Asia Cup Men's Volleyball Championship national team. Table 6 lists the most suitable ranking and the weighted aggregate score for the optimal spikers as national team players: 1, player 1 (7.156); 2, player 4 (7.119); 3, player 5 (6.859); 4-5, player 2 and player 6 (6.815); 6, player 12 (6.811); 7, player 10 (6.780); 8, player 7 (6.774); 9, player 11 (6.722); 10, player 8 (6.665); 11, player 3 (6.611); 12, player 13 (6.520); 13, player 9 (6.305). Nine players, 1, 2, 4, 5, 6, 7, 10, 11, and 12, were selected for the 12-player final roster. The results of this study are thus consistent with the actual selection and training results.

Table 6

The ranking and weighted aggregate score for the optimal spikers

no.	weight score	rank
player 1*	7.156	1
player 2*	6.815	4
player 3	6.611	11
player 4*	7.119	2
player 5*	6.859	3
player 6*	6.815	4
player 7*	6.774	8
player 8	6.665	10
player 9	6.305	13
player 10*	6.780	7
player 11*	6.722	9
player 12*	6.811	6
player 13	6.520	12

Note: * represents players were selected for the final roster

The liberos portion involved the relative weights for the 10 assessment indicators, and after the experts' comparative appraisal, solving for the integrated indicator weightings and most suitable ranking for the liberos. For the libero portion, a total of 2 players were selected for the national team at the 2011 Asia Cup Men's Volleyball Championship. Table 7 shows the most suitable ranking and the weighted aggregate score for the optimal liberos as national team players: 1, player 18 (7.381) and 2, player 17 (7.092). Player 18 was selected for the 12-player final roster. The present study's results are thus consistent with the actual selection and training results.

Table 7

The ranking and weighted aggregate score for the optimal liberos

no.	weight score	rank
player 17	7.092	2
player 18*	7.381	1

Note: * represents players were selected for the final roster

Discussion

Conclusions

1. The sport of volleyball has a history of more than 100 years and is popular around the world.
2. At home and abroad, correlated studies on the sport of volleyball also emphasize the importance of athletes' mental hierarchy, and volleyball professionals should actively study correlated foreign measures and practices to develop appropriate characteristics for the sport of volleyball in Taiwan.
3. The correlated studies of tactics and techniques in volleyball have been the focus of scholarly studies and can serve as competition and training references.
4. The relative insufficiency of researches and development investigating the sport of volleyball from the management standpoint increases the importance of this study's investigation of studies on the selection of a national team.
5. The studies on and the application of the AHP by athletics and scholars can be said to be increasingly widespread and their achievements abundant. The study topics are relatively pluralistic and wide-ranging and are deserving of notice from scholars or researchers.

Suggestions

This study investigated a team-member selection model for the National Volleyball Team and sought the development of offensive and defensive statistics and critical capabilities for the sport of volleyball. As the first Taiwanese volleyball research paper written from the standpoint of management and applying MCDM theory to the development of volleyball practices, this study can be considered an important research foundation.

In investigating the training standpoint, the importance of systematic aspects and indicators for players in all positions (setters, spikers, and liberos) and the ranking results have provided the most important and most directly referenced information for decision-makers and managers (on the selection and training committee and among coaches) to use when formulating decisions. In terms of players, the research has provided the most objective keys to enhancing targets and directions.

In investigating the selection and training standpoint, the most suitable ranking of and statistics on volleyball players provide a scientific management basis for enhancing the selection and training of the national volleyball team. The results are not the only objective but also capable of resolving the long-standing problem wherein the selection and training system used for National Team members has tended to exert subjective and inflexible effects. Similarly, the results will have an optimal influence on the enhancement of the Taiwanese volleyball technique.

The investigation of critical capabilities in volleyball has contributed to many areas—selection, training, competition, the derivation of tactics, and even the development of the sport of volleyball in this country. In follow-up studies, researchers should strive to vigorously forge ahead with this investigation.

The national volleyball team member selection model constructed in the present study has been tested via a questionnaire completed by experts and through the application of the AHP. The AHP can not only convert the recognition and reactions of volleyball experts, and scholars into (statistical) weights, providing relative importance information and rankings, but also be considered a case in which practice and theory allow for combination and verification. This capability will be of much assistance and benefit to the practice of the sport of volleyball.

The studies on and application of the AHP by scholars about the subject of volleyball can be said to be increasingly widespread and their achievements abundant. The research topics are relatively pluralistic and wide-ranging and can be considered topics of continuing interest to Taiwanese professionals involved in the sport of volleyball. The present investigation of volleyball's critical capabilities has contributed to many areas—selection, training, competition, the derivation of tactics, and even the development of the sport of volleyball in this country, and through continuing efforts, should continue to be developed to a higher level in follow-up studies. At the same time, future research can extend the investigation to the application of different hierarchies of Taiwanese player selection and training or comparative studies of volleyball in different nations and areas. Also, future studies can be oriented toward sequential development and the expanded collection of panel data for a cross-section of different times to produce important references and applications for the improvement of practices used in the sport of volleyball.

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Controversial Spokesperson is not Negative: A Case of Nike Campaign

Soojin Kim, Eun Yeon Kang, & Yongjae Kim
Kutztown University of Pennsylvania

Abstract

The aftermath of Nike's "Just do it" 30th anniversary commercial featuring Colin Kaepernick caused an immediate public stir and led to polarized consumer responses. Considering the general intentions and strategies that companies adopt celebrity endorsement, Nike's decision to use Kaepernick can be regarded as atypical and has raised a question whether a controversial figure can also be effective. While extant research has extensively examined the celebrity endorsement effects, it has largely focused on positive figures whose image and reputation are favorable. Thus, there is a need for empirical research on how a controversial celebrity spokesperson would perform for an endorsed brand. Accordingly, based on the meaning transfer model (MTM) and persuasion knowledge model (PKM), the current study investigates if and how a controversial celebrity spokesperson plays a role in the consumer's evaluations of a brand and its marketing activity. Employing Nike's commercial featuring Kaepernick, two separate studies are conducted. As a preliminary study, Study 1 explores the presence of celebrity meaning transfer to a brand, and Study 2 extends the analysis of meaning transfer effects by developing a conceptual model. Results of Study 1 show that a controversial celebrity can be associated with both positive and negative meanings implying that controversy with a celebrity is not always necessarily negative. Besides, such meanings, particularly positive meanings, influence consumers' beliefs about a brand. Study 2 demonstrates that the meaning of a celebrity also influences consumers to discern a purpose of advertising and further, the significant impacts of a perceived advertising purpose on the attitudes toward advertising and purchase intentions are found. Specifically, in the current context, consumers who were favorable to Kaepernick perceived Nike's commercial as advocacy advertising, which resulted in more positive attitudes toward advertising and higher intentions to purchase Nike products. It also verifies a mechanism of celebrity endorsement effects by showing the positive effects of attitudes towards a celebrity on brand attitudes and advertising attitudes. Lastly, this study reveals that a perceived advertising purpose mediates the relationship between attitudes toward a celebrity and advertising. This signifies that it is important for marketers to comprehend how consumers view a purpose of advertising for a successful endorsement practice using a controversial celebrity. These findings broaden the scope of celebrity endorsement research by articulating the controversial celebrity effects. Also, for sport scholars, the present study provides meaningful insights into the consumer's cognitive process of sport celebrity endorsement. It further suggests practitioners a new empirical approach to develop effective strategies for their advertising campaigns.

Keywords:* *Colin Kaepernick, Endorsement, Celebrity Controversy, Meaning Transfer Model, Persuasion Knowledge Model

Soojin Kim and Yongjae Kim are with Department of Sport Management and Leadership, Kutztown University of Pennsylvania. Eun Yeon Kang is with Department of Business Administration, Kutztown University of Pennsylvania. Address author correspondence to Yongjae Kim at kim@kutztown.edu

1.Introduction

Celebrity endorsement continues to be a popular communication strategy used in advertising. The literature has repeatedly shown direct and positive effects of celebrity endorsement on consumer's cognitive, affective, and behavioral responses (Bergkvist & Zhou, 2016; Knoll & Matthes, 2017). However, there has been mounting concern over negativity associated with the celebrity spokesperson backlashing on the brand and putting the endorsed brand at risk (Erdogan & Baker, 2000; White, Goddard, & Wilbur, 2009). As such, businesses have been particularly cautious in selecting celebrities who carry low risk, while possessing positive attributes and images (Comenos, 2018). In academia, several models measuring the celebrity endorsement effectiveness have been developed focusing on personal attributes of the celebrity, that is, source credibility (Lafferty & Goldsmith, 1999; Lafferty, Goldsmith, & Newell, 2002) and source attractiveness (Freidman & Freidman, 1979; Kamins, 1990). In addition, extending beyond celebrity's personal attributes, meaning associated with the spokesperson has been noted as one of the most important criteria (Batra & Homer, 2004; Erdogan, Baker, & Tagg, 2001), known as the meaning transfer model (MTM; McCracken, 1989).

As a result of kneeling during the national anthem as means to protest of police brutality and racial inequality, Colin Kaepernick has been considered one of the most controversial figures in recent years. In fact, according to a Washington Post-Kaiser Family Foundation poll, over 50% of Americans object to kneeling during the national anthem in protest (Clement & Guskin, 2018). Yet, due to his commitment toward a wide variety of causes and charities over the years (Lauletta, 2018), Kaepernick has emerged as a cultural symbol and is also known as a social activist. Interestingly, in the midst of contention surrounding Kaepernick, Nike launched an advertising campaign featuring Kaepernick as the spokesperson to commemorate its 30th "Just do it" anniversary. Despite equivocal opinions and attitudes toward Kaepernick, the aftermath of the campaign turned out to be a success, in terms of surge in social media (Thomas, 2018).

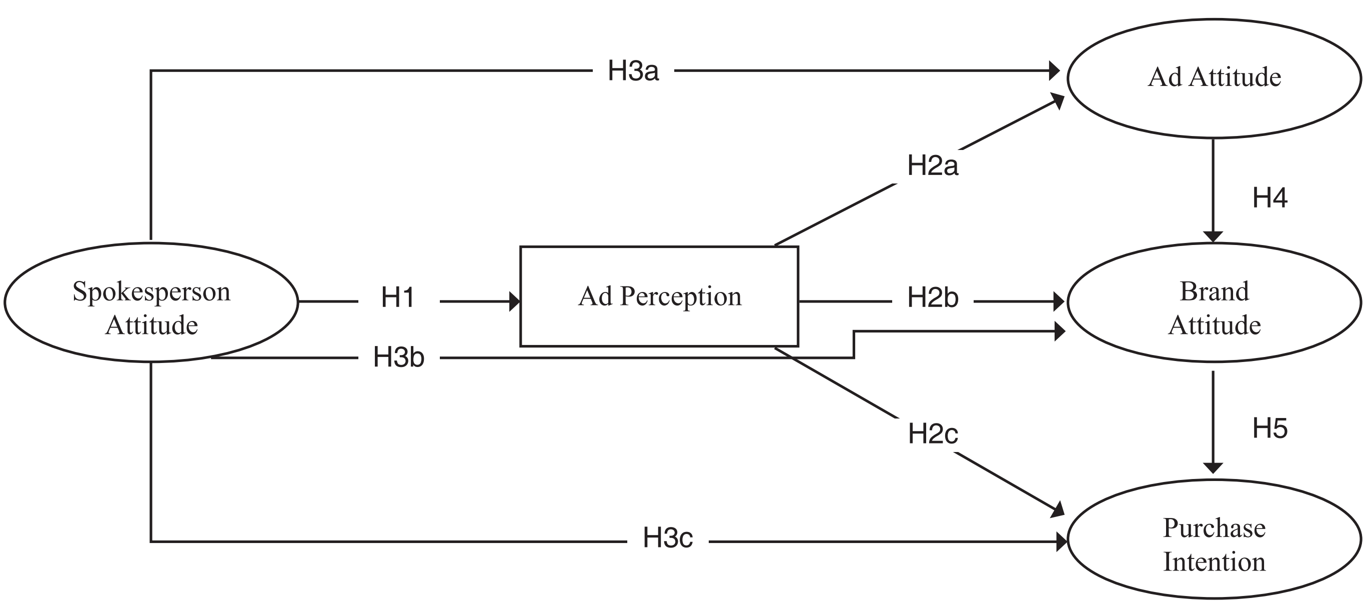
While the effectiveness of celebrity spokespersons has been extensively examined, there exists a void in the literature that limits full explanation of the phenomenon found in Nike's case where a rather controversial/polarized figure was used. Earlier Campbell and Warren (2012) found that negativity associated with a celebrity spokesperson is more easily transferable to a brand than positive associations, and Amos, Holmes, and Strutton (2008) concluded that negative information about the spokesperson can have a significant impact on consumer perceptions. Although opinions toward Kaepernick have been divisive and speculation exists that controversial spokesperson may be perceived in a negative light, it would be premature to conclude one way or the other (positive or negative) and simply equate controversy with negativity without empirical research. Accordingly, by integrating the basic tenets of MTM, this study examines individual's thoughts and beliefs towards Kaepernick by capturing the meanings associated with him and further explores whether the associated meanings subsequently transfer to the brand (McCracken, 1989).

Considering the recent activities of Kaepernick as a social activist, it is reasonable to expect that individuals would take his public roles into consideration to derive meanings, which could eventually have impacts on building their attitudes.

Furthermore, while a corporation's advertising is mostly commercial (i.e., advertising that directly promotes specific products or services), it also engages in non-commercial advertising such as advocacy (i.e., advertising that contains issues of societal relevance). Differently stated, corporations practice their advertising for not only their own benefits, but also the overall social good. Consumers may react differently to such different advertising types because they tend to infer the ultimate purpose of advertising. This tendency can be supported by the persuasion knowledge model (PKM), which offers explanation in relations to how consumers respond to a marketer's persuasion attempt (advertising), wherein the practice of persuasion knowledge may result in either positive or negative attitudes and decisions toward the brand. Based on such premise, we attempt to empirically examine the individual's responses toward the ad, in which perceptions toward the ad would, in turn, influence attitudes and behavior towards a brand. To the best of our knowledge, no study has shed light on the effects of a controversial or polarized spokesperson in the context of celebrity endorsement. In order to fill this gap, the current study investigates Nike's case on the foundation of the MTM and PKM and also provides an extended perspective on existing celebrity effectiveness literature.

Accordingly, the purpose of this study is twofold: 1) to examine the presence of celebrity meaning transfer and 2) to examine how attitudes toward spokesperson ($A_{spokesperson}$) and perception of advertisement influence attitudes toward advertising (A_{ad}), attitudes toward brand (A_b), and behavioral intention. More specifically, a structural model delineating the relationships among the

Figure 1. *The Structural Model*



aforementioned variables is developed and tested (see Figure 1). In the model, it is hypothesized that $A_{spokesperson}$ is positively associated with advertising attitudes, brand attitudes, and purchase intention via perception of advertisement. Finally, it is proposed that advertising attitudes positively affect brand attitudes, which lead to purchase intentions.

This study includes two separate studies. Within the framework of MTM, Study 1 explores meanings associated with the celebrity and transferability of meanings to the brand. Study 2 extends this work by testing a conceptual model of celebrity endorsement effects based on PKM. This study suggests valuable findings, which strengthen the extant body of research on a role of celebrity in advertising and the development of effective strategies for marketing communication campaigns.

2.Theoretical Background and Hypotheses Development

2.1 Meaning Transfer Model and Celebrity Endorsement Effectiveness

As a means to enhance the performance of marketing communication practices in the cluttered marketplace, celebrity endorsements have endured popularity. A celebrity endorsement refers to an agreement between an individual who enjoys public recognition (a celebrity) and an entity (e.g., a brand) to use the celebrity for the purpose of promoting the entity (Bergkvist & Zhou, 2016, p.644). Scholars have explored the persuasive power of celebrities and found a significant effect of celebrity endorsement on consumer’s cognitive, affective, and behavioral responses (Bergkvist & Zhou, 2016; Knoll & Matthes, 2017). Focusing on personal attributes of the celebrity, two models notably, source credibility (Lafferty & Goldsmith, 1999; Lafferty et al., 2002) and source attractiveness (Freidman & Freidman, 1979; Kamins, 1990) have been widely applied. Nevertheless, these source models fail to clarify the role of the source, thus as an alternative, McCracken (1989) developed the meaning transfer model (MTM). The basic premise of the MTM is that celebrities are public figures who possess a variety of meanings, wherein consumers through experience identify with such symbolic properties that has been created for, and by the celebrity (McCracken, 1989). Accordingly, the model suggests that the effectiveness of the celebrity is dependent upon the meanings that is brought into the endorsement process, which subsequently transfers to the respective product or brand (McCracken, 1989).

Langmeyer and Walker (1991a, 1991b) were one of the first to demonstrate the applicability of the MTM framework. In their study (1991a), the celebrity’s symbolic meanings were more likely to transfer to the endorsed product than meaning transferring to a product within a non-endorsed context. In addition, Langmeyer and Walker (1991b) examined meanings communicated by different celebrities by combining with products. The findings of their study supported the basic premise of the MTM and further provided empirical support by conducting three studies employing an experimental research design. Batra and Homer (2004) showed that celebrity’s personality traits transfer from the spokesperson to the endorsed brand while Miller and Allen

(2012) upheld the celebrity's meaning transfer effects focused on mature brands. Campbell and Warren (2012) found that there exists the stronger impact of negativity associated with the celebrity than positive traits on brands. More recently, by integrating the tenets of metaphor theory in marketing, Roy (2018) added a new perspective and validated the MTM model. It was concluded that celebrity's meaning can be explained through metaphors, and the metaphor would be transferred to the brand. In the light of such significant celebrity meaning transfer effects and Nike's commercial featuring Kaepernick whose meanings are inconsistent, we consequently formulated two research questions to explore the effectiveness of the celebrity spokesperson on the foundation of MTM.

RQ1: What are the established meanings associated with Colin Kaepernick?

RQ2: Do established meanings associated with Colin Kaepernick transfer to a brand through advertising?

In the advertising and communication literature, extensive research has well-recognized the impacts of celebrities on the consumer's decisions. Particularly source credibility (Lafferty et al., 2002) and source attractiveness (Kamins, 1990) have been the focal point, while persuasive effects specifically tied to $A_{spokesperson}$ has been limited. However, as source attractiveness has been used in determining the liking for the spokesperson, a more general perspective exists, viewing attractiveness as comprehensive attitudes toward the celebrity (Bergkvist & Zhou, 2016; Silvera & Austad, 2004). In prior studies, attitudes toward the celebrity have often been labeled as celebrity liking or celebrity likability. As a construct that encompasses one's cognitive (belief and thoughts) and affective (feelings) reactions to a given object or person (Katz & Stotland, 1959; Rosenberg, 1968), attitude formation typically occurs as a result of learning, modeling others, and experience (Pickens, 2005).

Interestingly, the phenomenon that followed upon Kaepernick's kneeling was not merely confined to divisive opinions and attitudes toward Kaepernick. It is conceivable that such attitudes further influenced consumers' perception toward the Nike ad. Closely related to attitudes, perception is known as a process whereby individuals interpret information to something meaningful based on their prior experiences (Pickens, 2005). The perception that one holds, however, can be substantially different from reality. According to selective perception theory developed by Bem (1967), individuals tend to be selective in what they perceive and interpret information in a way that is congruent with their values and beliefs, while ignoring opposing viewpoints. This means, the individual's interpretation of advertising messages can vary by their existing beliefs; it is critical to examine the perceived intent of the advertisement from the recipient's perspective than the communicator's (Sethi, 1979).

Although the common purpose of corporations' advertising is commercial, corporations also engage in non-commercial advertising (i.e., advocacy). Considered as one form of institutional/image advertising (Haley, 1996), the intent of the advocacy advertising is to have the audience think favorably about the company in taking appropriate stands on key issues (Fox, 1986). Despite corporate intention behind their communication efforts, consumers are likely to interpret the message differently (Sethi, 1979) because intention of advocacy advertising is implicit, whereas commercial advertising is explicitly and solely for the company. Using Kaepernick as the spokesperson of the message, it may have created a perception of advocacy to some, while others, regardless of the lack of product or service embedded, may simply consider the ad as commercial, given that by nature, ads are a for profit organization's communication effort, and thus readily perceived as such (Baker & Churchill, 1977).

Therefore, in accordance with the MTM and Kaepernick's protest, it is assumed that individuals who are favorable to Kaepernick will believe that Nike's commercial is to support a social cause (racial equality). This leads to the following hypothesis:

H1: Individuals with positive attitudes toward the spokesperson will perceive the ad as non-commercial rather than commercial.

2.2 Persuasion Knowledge Model (PKM) and Consumer Responses to Advertising

Consumers tend to have doubts about a marketer's ultimate goal and motives in implementing marketing activities, and also question the trustworthiness of advertising messages when encountering persuasive communication (MacKenzie, Lutz, & Belch, 1986). In an attempt to better understand consumers' propensity to consciously avoid advertising, Friestad and Wright (1994) proposed the PKM. The model posits that through exposure to a series of persuasion episodes, consumers develop persuasion knowledge and strategies designed to defend against the message (Friestad & Wright, 1994). Persuasion knowledge is known as a loose set of beliefs in and knowledge of a company's goals, persuasion motives, strategies and tactic, which may or may not be accurate (Friestad & Wright, 1994). Such knowledge enables consumers to recognize, interpret, evaluate, and remember marketing and advertising strategies, and influences the extent to which individuals accept or resist the persuasive communication (Taylor & Barber, 2012).

In the context of advertising, consumers' persuasion knowledge elicits skepticism and triggers negative attitudes toward advertising and brand (Lee, 2013), as well as purchase intentions (Obermiller & Spangenberg, 1998; Chen & Leu, 2011). Nevertheless, when it comes to non-commercial advertising (e.g., advocacy), consumers are known to be less skeptical than general advertising due to the lack of commercial motive (Kim, Yim, & Ko, 2013). Kim et al. (2013) indicated that non-commercial messages (e.g., pro-social messages) suggested by a corporate can mitigate skepticism toward advertising, and that consumers tend to trust and support advertising claims. However, when consumers perceive the message as a way to fulfil advertisers' self-serving motives, they are more likely to distrust the corporate and be skeptical to the ad, which consequently leads to consumers' negative responses to the brand (Manuel, Youn, & Yoon, 2014). One of the reasons for such tendency might be cognitive biases because people categorize and interpret sensory information based on their particular frame of reference. Furthermore, as previously stated, individuals are apt to recognize and construe information in a way that their values and beliefs are promoted (Bem, 1967). Thus, building on the PKM and previous literature on how perception of different types of advertising influence consumer's subsequent responses, three hypotheses were proposed as follows:

H2a: Non-commercially perceived ad will be positively associated with attitudes toward advertising.

H2b: Non-commercially perceived ad will be positively associated with attitudes toward the advertised brand.

H2c: Non-commercially perceived ad will be positively associated with purchase intention.

2.3 Celebrity Endorsement Effectiveness

In academia, scholars have explored the persuasive power of celebrities on the consumer's brand evaluation. Specifically, a celebrity appearance in advertising generated greater message believability and more favorable attitudes toward advertising and toward the endorsed brand or product (Knoll & Matthes, 2017). Further, with regards to the celebrity's effectiveness on consumer behavior, researchers showed that celebrity endorsement motivated consumers to make a purchase (e.g. Chi, Yeh, & Huang, 2009; Roozen & Claeys, 2010).

Given that individuals are likely to maintain cognitive consistency to achieve a balanced psychological state (Heider, 1946), applying such notion to celebrity endorsement, it can be implied that if a consumer is favorable to a celebrity, he/she will eventually have positive responses toward a brand in order to ensure balanced cognitive links among oneself, celebrity, and brand. Thus, on the foundation of the theoretical concepts and extant findings about celebrity endorsement effects, the following hypotheses are proposed:

H3a: Attitudes toward the spokesperson will be positively associated with attitudes toward advertising.

H3b: Attitudes toward the spokesperson will be positively associated with attitudes toward the advertised brand.

H3c: Attitudes toward the spokesperson will be positively associated with the consumer's purchase intentions.

2.4 Impact of Advertising on Brand Attitude and Purchase Intention

As a personal reactive disposition, A_{ad} refer to the individual's psychological status formed in accordance with the evaluations of a given idea or object (Lin, 2008). The A_{ad} can be two kinds – cognition and affection, which implies thinking and feelings respectively (Vakratsas & Ambler, 1999). Much of the empirical evidence have shown A_{ad} as a strong element in the consumer's brand attitude formation. Prior research suggests that the consumer's A_{ad} has a significant impact on their brand attitudes (e.g. Batra & Stephens, 1994). Yoo and MacInnis (2005) also manifested that regardless of advertising types, a consumer's evaluation of advertising directly affected their A_b. Further, irrespective of the consumer's brand familiarity, their attitudes toward advertising could significantly increase their purchase intentions, especially when their affective reactions were aroused by advertising (Goldsmith, Lafferty,

& Newell, 2000). In the same vein, a positive relationship between a consumer's brand attitudes and purchase intentions has been indicated with rigorous evidence in many studies (Batra & Ray, 1986; Phelps & Hoy, 1996).

In addition to such direct associations of A_{ad} and A_b with purchase intentions, scholars demonstrated an indirect flow of these three constructs. When a consumer builds positive A_{ad}, he/she will become favorable to an advertised brand, which will in turn motivate him/her to have greater purchase intentions (Brown & Stayman, 1992; Mackenzie et al.,1986). Following these findings, a causal relationship between A_{ad} and purchase intentions through brand attitudes is expected, which leads to the following hypotheses:

H4: Attitudes toward advertising will positively influence attitudes toward the advertised brand.

H5: Attitudes toward the advertised brand will positively affect the consumer's purchase intentions.

3.Study 1

Study 1 provides preliminary evidence regarding the relationship between the consumer's perceived meaning of a celebrity and a brand endorsed by the celebrity. This experiment was a precursor to Study 2, which looks into a cognitive mechanism of celebrity effects on a brand. Employing the Nike's commercial featuring Kaepernick, the first step of Study 1 was to identify the most prominent meanings that the celebrity possesses. Then, consumers' responses to advertising were analyzed and compared with the meanings conveyed through the celebrity to clarify if a consistency in an evaluation of each entity would exist.

3.1 Participants and Procedure

One hundred and sixty-eight undergraduates enrolled in sport management and business classes at a medium-size East Coast university in the United States were recruited. The majority of participants were male 60.70% (n = 102) and white 70.1% (n = 117). The age of respondents ranged from 18 to 46 years old with 20.6 years being the average age.

Participants were first asked to read and sign an informed consent. Once consent was obtained, they were asked to complete a pre-survey designed to collect the background information on their existing thoughts and beliefs about Kaepernick and Nike, and their demographic information. After the pre-survey, participants watched the Nike commercial featuring Kaepernick, and finally completed a post-survey containing questions about their attitudes and beliefs toward the brand. This experiment was conducted in a classroom setting.

3.2 Measurement

All measures were adopted from previous research with some modifications in accordance with Nike's case. To gauge the consumer's attitudes toward the celebrity, four items (bad/good; not likeable/likeable; unpleasant/pleasant; uninteresting/interesting) on a 7-point semantic differential were adopted (Silvera & Austad, 2004). Similarly, brand attitudes were measured using six items (good/bad; appealing/unappealing; pleasant/unpleasant; attractive/unattractive;

interesting/boring; like/dislike) developed by Bruner (1998) on a 7-point semantic differential scale. Lastly, a standard thought-listing technique was employed to explore the participants' beliefs about Kaepernick and Nike (Cacioppo & Petty, 1981). Participants had open-ended questions and were asked to freely write down their thoughts or ideas regarding the celebrity or the brand.

3.3 Data Analysis and Results

3.3.1 Identified prominent meaning associated with a celebrity

Once collected, the semantic contents of participants' cognitive responses (i.e., listed thoughts) were coded into celebrity-thought categories by three judges who were blind to the experiment. The participants were able to identify a total of 812 meanings about the celebrity (M = 4.86, S.D. = 2.66) including both positive and negative cognitions. The results showed that about 35.5 percent of individuals' thoughts indicated positive attributes of Kaepernick. *Strong/brave (11.7%)* is the most prominent positive meaning that Kaepernick possesses, followed by *Determined/dedicated (7.9%), Inspirational (6.5%), Activist/leader (5.3%), and Proud (4.2%).* The negative meanings of Kaepernick identified were: *Controversial (4.3%), Irritable/annoying (3.6%), Disrespected (2.3%), Attention seeker (2.0%), Inappropriate/irrelevant (1.7%), and unpatriotic (1.2%).*

3.3.2 Assessing meaning transfer using cognitive responses pairing

To examine the influence of a celebrity's meaning on brand beliefs, participants' cognitive responses, listed thoughts, to the brand in a pre-survey and a post-survey were compared. As shown in Table 1, participants expressed both positive and negative reactions to the brand before and after watching the commercial and in specific, *Inspirational* and *Activist/leader* were most commonly mentioned in both conditions. However, the participants' brand beliefs became more consistent with the celebrity's meanings after watching the commercial such as *Strong/brave*, *Determined/dedicated*, as well as *Inspirational* and *Activist/leader*. In addition, the negative perceptions of the brand were also revealed in the post-survey such as *controversial* and *attention seeker*. Additionally, the Paired Sample T-test was performed to compare the brand attitudes in the pre- and post-condition, and the results indicated that there was not a significant difference between pre-ad brand attitude scores (M = 5.98, SD = 1.12) and post-ad brand attitude scores (M = 6.01, SD = 1.28): $t(164) = -.52$, $p = .601$).

Table 1 *Cognitive Response Categories and Frequencies*

Category		Kaepernick	Nike	
			Pre-Ad	Post-Ad
		No. (%)	No. (%)	No. (%)
Cognitions				
	Positive			
	Strong/Brave	95 (11.7)	18 (1.7)	34 (4.4)
	Determined/dedicated	63 (7.9)	11 (1.1)	31 (4.0)
	Inspiration	53 (6.5)	52 (5.0)	56 (7.2)
	Activist/Leader	43 (5.3)	63 (6.1)	72 (9.3)
	Proud	34 (4.2)	0 (0.0)	3 (0.4)
	Negative			
	Controversial	35 (4.3)	0 (0.0)	16 (2.1)
	Irritable/annoying	29 (3.6)	14 (1.4)	5 (0.6)
	Disrespected	19 (2.3)	0 (0.0)	0 (0.0)
	Attention seeker	16 (2.0)	31 (3.0)	46 (5.9)
	Inappropriate/irrelevant	14 (1.7)	6 (0.6)	8 (1.0)
	Unpatriotic	10 (1.2)	0 (0.0)	0 (0.0)
Irrelevant		176 (21.7)	60 (5.8)	54 (6.9)
All others		225 (27.7)	781 (75.4)	452 (58.2)
Total		812 (100)	1036 (100)	777 (100)

4.Study 2

In Study 2, the proposed conceptual model delineating the impact of attitudes toward celebrity and a perception of an advertising purpose on advertising attitudes, brand attitudes, and behavioral intention was tested using the general public sample (see Figure 1).

4.1 Participants and Procedure

A total of 305 participants were recruited using Amazon Mechanical Turk (MTurk) for Study 2. Participation was limited to those who were 18 years or older and restricted to take the survey only once. After eliminating 41 participants not meeting the aforementioned criteria, data from 264 surveys were retained for analysis. The majority of the participants were White (72.0%) and male (56.8%). Approximately 64.1% reported having a bachelor's degree or higher. The average age of the participants was 35.13 years old (range:

20-71 years old). Individuals between the ages of 21 and 40 represented 73.9% of the participants.

Prior to completing the survey, participants were asked to review the IRB consent form to agree with a voluntary participation in the survey. Upon providing their agreement, participants were first asked to answer questions about social cause involvement. Thereafter, they were presented with a short description of Kaepernick regarding his protest during a pre-season game in 2016. Participants were asked to answer questions about their attitudes toward Kaepernick supporting a social cause, and then watched the Nike commercial featuring Kaepernick. After the Nike commercial, they completed a survey asking about their responses to the commercial. Finally, they answered several demographic questions at the end of the survey. To encourage participation and also as a way to express appreciation, respondents who successfully completed all questions were awarded a $.50 incentive.

4.2 Measurement

The survey was composed of three major sections: (1) attitudes toward spokesperson, (2) consumer attitudinal responses, and (3) consumer behavioral responses.

4.2.1 Attitudes toward spokesperson. Four items (bad/good; not likeable/likeable; unpleasant/pleasant; uninteresting/interesting) on a 7-point semantic differential scale were adopted to express the participant's attitudes toward Colin Kaepernick supporting a social cause (Silvera & Austad, 2004).

4.2.2 Consumer Attitudinal Responses to the Nike Ad. This section included three instruments: the perception of advertising, A_{ad}, and A_b. To determine participant's perception of the advertising, they were inquired to identify the main purpose of the ad. Participants' responses (to increase sales) were then recoded as 1 (commercial advertising) and 0 (non-commercial advertising).

To capture A_{ad}, four items (bad / good; not likeable/likeable; unpleasant/pleasant; uninteresting/interesting) on a 7-point semantic differential were adopted (Silvera & Austad, 2004). Similarly, participants' A_b was measured using six items (good/bad; appealing/unappealing; pleasant/unpleasant; attractive/unattractive; interesting/boring; like/dislike) developed by Bruner (1998) on a 7-point semantic differential scale.

4.2.3 Purchase Intention. Four items (unlikely/likely; improbable/probable; uncertain/certain; definitely not/definitely) on a 7-point semantic differential scale were adopted from Bearden, Lichtenstein, and Teel (1984) to measure the participants' purchase intention.

4.3 Data Analyses and Results

A two-step approach was adopted to test the hypothesized relationships in the proposed research model and measurement scale. First, a measurement model was tested to denote the conceptual distinctions among latent variables and to establish construct validity. Second, a structural model was tested to examine the overall model, including the relationships among $A_{spokesperson}$, advertising perception, advertising attitudes, brand attitudes, and purchase intention. Anderson and

Gerbing (1988) noted that the two-step approach allows researchers to gain proper assessment of construct and nomological validity by separately estimating the measurement model prior to the estimation of the structural model. Thus, the properties of the measurement model and the structural model were tested separately. Following guidelines from Preacher and Hayes (2008) on multiple mediation models, we used bootstrapping procedures to examine the total effects containing both the direct and indirect effects of variables in the model. In the bootstrapping procedures, the path coefficients, standard errors, 95% bias-corrected confidence intervals were produced with 5000 times re-sampled data (Cheung, 2007). Structural equation modeling (SEM) was conducted using analysis of moment structure 24 with the maximum likelihood method of estimation.

4.3.1 Measurement model

To verify the appropriateness of measurement models for the current study, a Confirmatory Factor Analysis (CFA) was performed. The data met the linearity assumption, and severe multicollinearity was not detected. The measurement model was assessed using various fit indices and cutoff criteria recommended by Hu and Bentler (1999): Comparative Fit Index (CFI) > .95, Tucker Lewis Index (TLI) > .95, Standardized Root Mean Square Residual (SRMR) < .08, Root Mean Square Error of Approximation (RMSEA) < .06. The CFA results revealed that the five-factor model fits well with the sample data (S-B $\chi 2/df$ = 315.4/125 = 2.52, CFI = .97, TLI = .96, SRMR = .05, RMSEA = .06).

Table 2

Measurement Model

Factors and Items	λ	AVE	CR
Attitude toward Spokesperson		0.89	0.97
Bad – Good	.96		
Not likeable – Likeable	.89		
Unpleasant – Pleasant	.97		
Uninteresting - Interesting	.96		
Advertising Perception			
Commercial or Non-Commercial	-	-	-
Attitude toward Advertising		0.88	0.97
Bad – Good	.93		
Not likeable – Likeable	.95		
Unpleasant – Pleasant	.95		
Uninteresting - Interesting	.93		
Attitude toward Brand		0.87	0.97
Bad – Good	.92		
Unappealing – Appealing	.91		
Unpleasant – Pleasant	.93		
Unattractive – Attractive	.94		
Uninteresting - Interesting	.95		
Purchase Intention		0.89	0.97
Unlikely / likely	.97		
Improbable / probable	.96		
Uncertain / certain	.90		
Definitely not / definitely	.95		

Notes: Average variance extracted (AVE), Construct reliability (CR)

As shown in Table 2, all factor loadings were high ranged from .92 to .97. All reliability coefficients were larger than .70 (ranging from .75 to 97). The average variance extracted (AVE) estimates for each construct ranged from .87 to .89, indicating that the amount of variance explained by the constructs was greater than the variance explained by measurement error (Hair, Black, Babin, & Anderson, 2010). In addition, the square roots of AVE values for all constructs were larger than the corresponding inter-construct correlations (Table 3), supporting the discriminant validity of the measurement platform. Based on the overall results of the CFAs, it is deemed that the measurement model was acceptable with good model fitness. The analysis also demonstrated strong evidence of reliability and validity in the scale.

Table 3 *Means, Standard Deviations (SD), Correlations, and Squared Roots of AVE*

Construct	Mean	SD	1	2	3	4	5
1. Attitude toward Spokesperson	5.13	1.93	.94				
2. Ad Perception	.47	.50	-.16	--			
3. Ad attitude	5.83	1.52	.63	-.25	.94		
4. Brand Attitude	5.63	1.55	.59	-.26	.87	.93	
5. Purchase Intention	5.38	1.82	.50	-.30	.61	.77	.94

Notes: The square roots of the Average Variance Extracted (AVEs) for each construct appear in boldface on the diagonal of the correlation matrix.

4.3.2 Structural Model

A structural equation model (SEM) analysis was conducted to test the overall research model and hypothesized relationships among the research constructs. The goodness-of-fit indices of the structural model fits well with the data (S-B $\chi 2/df = 308.53/126 = 2.45$, CFI = .97, TLI = .97, SRMR = .03, RMSEA = .07). Table 4 presents parameter estimates for the structural model assessing the theoretical relationships among $A_{spokesperson}$, advertising perception, advertising attitudes, brand attitudes, and purchase intention. The SEM results revealed that $A_{spokesperson}$ had a negative relationship with advertising perception ($\beta = -.16$, $p < .01$), supporting Hypothesis 1 which anticipated that individuals with favorable $A_{spokesperson}$ tends to perceive advertising associated with the spokesperson as non-commercial advertising. As displayed in Table 3, confidence intervals indicate significance of the relationship between $A_{spokesperson}$ and advertising perception, which do not contain zero between upper and lower bound distribution estimates.

As expected, advertising perception had significant influences on advertising attitudes ($\beta = -.16$, $p < .01$: Hypothesis 2a supported) and purchase intention ($\beta = -.10$, $p < .05$: Hypothesis2c supported), but not for brand attitudes (β = -.04, p = n.s.: Hypothesis 2b not supported).

Regarding the impact of spokesperson, $A_{spokesperson}$ had significant influences on advertising attitudes (β = .60, p < .05: Hypothesis3a supported) and brand attitudes (β = .09, p < .05: Hypothesis3b supported). However, $A_{spokesperson}$ did not exhibit significant influences on purchase intention (β = .05, p = n.s.: Hypothesis3c not supported). As predicted in hypothesis 4 and 5, the relationship between A_{ad} and A_b (β = .80, p < .05), and the relationship between brand attitudes and purchase intention (β = .73, p < .01) are both statistically significant.

Using bootstrapping technique, we tested indirect effects of $A_{spokesperson}$ on advertising attitudes, brand attitudes, and purchase intention through multiple mediators in the model. As shown in Table 4, the indirect effect of $A_{spokesperson}$ on advertising attitudes through advertising perception (β = .09, *S.E.* = .01, p < .01), brand attitudes through advertising perception and advertising attitudes (β = .43, *S.E.* = .04, p < .01), and purchase intention through all mediators (β = .37, *S.E.* = .04, p < .01) were all statistically significant. The variance explained by the latent constructs was 41.7% (advertising attitudes), 75.5% (brand attitudes), and 63.4% (purchase intention).

Table 4 *Hypothesized Structural Model using Bootstrapping Procedures*

	Bootstrap estimate		95% Confidence Interval Bias-corrected	
Hypothesis: Path	B	SE	Lower	Upper
H1: Attitude Spokesperson →Ad Perception	-.16**	.06	-.29	-.05
H2a: Ad Perception → Ad Attitude	*-.16***	.05	-.27	-.06
H2b: Ad Perception →Brand Attitude	-.04	.03	-.10	.03
H2c: Ad Perception →Purchase Intention	-.10*	.04	-.19	-.01
H3a: Attitude Spokesperson → Ad Attitude	.60*	.04	.52	.67
H3b: Attitude Spokesperson → Brand Attitude	.09*	.05	.01	.19
H3c: Attitude Spokesperson → Purchase Intention	.05	.06	-.06	.15
H4: Ad Attitude → Brand Attitude	*.80**	.04	.71	.87
H5: Brand Attitude → Purchase Intention	.73**	.04	.64	.80
Indirect Effects				
Attitude Spokesperson → Ad Attitude	.09**	.01	.01	.06
Attitude Spokesperson → Brand Attitude	.43**	.04	.43	.60
Attitude Spokesperson → Purchase Intention	.37**	.04	.37	.52

Notes: Two-tailed tests of significance - *p < .05, **p < .01, ***p < .001

5.Discussion and Implications

Despite a plethora of celebrity effectiveness research within marketing and communication literature, little empirical research exists to fully explain the impact of a controversial/ polarized figure. The current study was conducted to fill the conceptual void existing in this particular area of research by combining the MTM with the PKM.

The MTM framework posits that a celebrity's effectiveness stems from the celebrity's meanings, which pass on to the endorsed product/ brand. Given that transfer of meanings celebrity embody is facilitated and accomplished by advertising (Batra & Homer, 2004; McCracken, 1989), the celebrity's effectiveness was examined within such context. Consistent with previous studies using MTM framework, this study provides empirical evidence supporting the transfer of meaning from celebrity to brand. It should be noted that both positive and negative meanings were present toward the controversial spokesperson considered in this study. Thus, although speculation surrounding controversial spokesperson being perceived in a negative light, controversy does not simply equate with negativity, but as found in this study, rather positive and negative association may coexist. Unlike the finding of Campbell and Warren (2012), this study shows that positive meanings associated with the celebrity were dominant, which has a more significant impact on brand beliefs than negative association. This provides insight into the impact of controversial spokesperson on brand beliefs and advertising effectiveness.

To further explore the impact and effectiveness of the celebrity spokesperson, a follow-up study was conducted to test the conceptual model. Accordingly, Study 2 hypothesized and sought to examine individuals' $A_{spokesperson}$ based on meanings derived from and accumulated through a public role. The result confirmed H1 that individuals with favorable $A_{spokesperson}$ are more likely to perceive the ad as non-commercial. Although a celebrity's persuasive effect specifically tied to $A_{spokesperson}$ has been limited, in line with prior studies that have considered attractiveness as a comprehensive $A_{spokesperson}$, this supports general conception that the attractiveness (likeability) of the spokesperson has an impact on consumers' perception of the ad (Baker & Churchill, 1977). It is to be noted, however, that such a finding be interpreted with caution as it may hold true confined to the specific case context. The significance of this study lies in that unlike previous studies which viewed and used attractiveness or likability to measure feelings toward the spokesperson (Bergkvist & Zhou, 2016; Silvera & Austad, 2004), the current study applied MTM and examined individuals' specific $A_{spokesperson}$, responding to a particular meaning. As such, taking into account Kaepernick's role in supporting a social cause, it may have led to varied interpretations of the ad and ultimately those more favorable toward Kaepernick perceived the persuasive attempt as advocacy. Thus, it could be implied that the source effect is present on how consumers interpret and perceive the ad is not merely because of the attractiveness/ likability of the celebrity spokesperson as previous research suggests, but rather a result of the attitudes toward the celebrity's meaning.

To further investigate the effectiveness of the celebrity spokesperson, we explored the relationships between $A_{spokesperson}$ with A_{ad}, A_b, and purchase intention. The results were consistent with previous studies showing that $A_{spokesperson}$ had significant positive effects on A_{ad} and A_b (Amos et al., 2008; Silvera & Austand, 2004). Interestingly, contrary to the previous studies (e.g., Chi et al., 2009), a significant relationship between $A_{spokesperson}$ and purchase intention did not emerge. Kaepernick has been representing Nike since 2011, but not until the 30th *"Just do it"* anniversary commercial did the endorsement deal and the relationship between Nike and Kaepernick become prominent. Thus, in order for Nike to realize a significant relationship leading to purchase intention, Nike and Kaepernick may need to establish a stronger and continuous linkage. Such a finding could also be partially explained given that the ad did not deliberately support or appear with a product or service.

Further, of particular interest in this study was to examine how advertising perception influences attitudes and behavior. As expected in H2a and H2c, consumers perceiving the ad as non-commercial were positively associated with A_{ad} and purchase intention. Consistent with the findings of previous research (Kim et. al., 2013; Manuel et al., 2014), this suggests that advertising perception influenced advertising attitudes and purchase intention, as measured from these constructs. However, a direct impact of advertising perception on brand attitudes (H2b) was not detected. This may be due to a positive and strong relationship that exists between advertising attitudes and brand attitudes (H4) found in prior research on advertising (e.g., Yoo & MacInnis, 2005). In other words, this provides speculation that when advertising perception affects brand attitudes through advertising attitudes, the strong relationship between advertising attitudes and brand attitudes may overshadow the direct impact of advertising perception on brand attitudes. The results of the current study showed that advertising perception results in favorable brand attitudes through advertising attitudes.

In addition, this study found an indirect effect of spokesperson attitudes on advertising attitudes via advertising perception. This confirms the premise of the PKM model and establishes the important mediating role of advertising perception. Consumers are generally skeptical of advertising, which may trigger negative A_{ad} (Lee, 2013). However, when it comes to non-commercial advertising, consumers are more receptive and are more likely to positively evaluate the ad (Kim et al., 2013). This provides speculation that the favorable attitudes toward Kaepernick's voluntary behavior supporting of a social cause may affect how consumers perceived the ad, and via the path, subsequently influenced A_{ad}.

A major contribution of this study to existing communication and marketing literature lies in providing a fundamental base for understanding celebrity endorsement effectiveness. The current study extends the line of research on advertising effectiveness, focusing on a controversial spokesperson in advertising. In particular, the proposed models in this study combined the MTM with the PKM as a background theory. This conceptual framework provides insights into how consumers perceive and accept advertising.

The findings that $A_{spokesperson}$ have both direct and indirect influences on attitudinal and behavioral outcomes through advertising perception serve as benchmark data that will spark future research in this growing area of sport marketing communication. This study demonstrated that the MTM and PKM theory appeared to provide sport scholars a theoretically sound and parsimonious model that can be used to predict consumers' A_{ad} and A_{b}, and purchase intention.

The results also provide sport practitioners with several meaningful implications. First, in this study, $A_{spokesperson}$ is the most significant determinant of celebrity endorsement effectiveness. There has been some speculation that controversial spokesperson may lead to a negative outcome. However, an encouraging finding of this study is the notion of controversy. As found in this study, simply equating controversy with negativity is premature as using such a spokesperson for communicating a brand could be equally effective and have a strong impact on consumers' cognitive, affective, and behavioral responses to adverting. A precondition is, perhaps, that the controversy or negativity not to be associated with celebrity transgression that are deemed unethical or immoral (e.g., marital infidelity, assault, drugs). How individuals perceive the cultural and social significance, the meaning of the spokesperson, thus is of an importance which will dictate one's $A_{spokesperson}$. Accordingly, this provides insight into the importance of identifying celebrity spokesperson who possess favorable symbolic properties that will not only resonate well with intended consumers, but also whether such meanings are desirable for the respective brand. It suggests that sport organizations should make efforts to select the right spokesperson in order to maximize the effectiveness of marketing communication activities.

Second, advertising perception is found to be one of the most important determinants of advertising attitudes. This result indicates that consumers tend to be less skeptical to advertising when they perceive advertising as non-commercials. In addition, according to the PKM, individuals are more receptive toward advertising when congruent with their values and beliefs. This suggests that companies should engage in executing a marketing communication strategy that focuses on tapping into values and beliefs consistent with their targeted audience. In particular, marketers can reduce resistance from target markets by creating brand associations with a spokesperson who may possess a particular meaning as found in this study.

6.Limitation/Future Research

There are several limitations that need to be acknowledged in this study as it provides important guidelines for future research. First, the current study attempted to increase the generalizability of the study by recruiting participants via Amazon's crowdsourcing platform, MTurk. Although the MTurk's respondent pool is known to be much more diverse and representative of the population than a typical student sample or online panels (Buhrmester, Kwang, & Gosling, 2011), it was found that Mturk samples were more politically liberal, younger, less religious, and less racially diverse compared to the U.S. population (Berinsky, Huber, & Lenz, 2012; Huff & Tingley, 2015). As such, caution is needed in interpreting and generalizing the findings. Thus, in order to develop a more comprehensive view of celebrity effects and to increase generalizability of the present research findings, efforts should be made to replicate this study using a different sample. In addition, this study was restricted to U.S. residents. However, given that a successful advertising in one country may not hold true in others, this research can be extended to diverse cultural settings in different countries.

Another limitation revolves around the fact that the present study was confined to one brand (Nike), which is a well-established and mature brand. Previously Shimp, Stuart, and Engles' (1991) study concluded that advertisement has differing effects on brand attitudes which is dependent on the level of brand novelty. In the future, research should continue to examine and compare the effects of a controversial or polarized spokesperson on unknown, moderately known, and mature brand in different contexts. Further, Nike's spokesperson, Colin Kaepernick, brings to light a specific social issue (social equality), hence a particular cultural meaning associated. Therefore, future research investigating how meaning attached to the spokesperson subsequently transfer to the different level of brand novelty should provide more guidance for advertisers.

Lastly, in this study as a means to measure consumer's behavioral response, purchase intention was used. As empirical results in this study brought forward the cultural significance of the spokesperson playing a critical role, it is worth to investigate in future research the effect of the celebrity spokesperson extending to other behavioral response with respect to their role (e.g., support for racial equality).

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Management Efficiency of Sport Centers Based on the Provision of Public Sports Viewpoint

Wen-Bin Lin
Taipei National University of the Arts
Richard Hsiao
Indiana University of Pennsylvania
Shao-Wei Yeh
Hunan University of Technology and Business

Abstract

This study used cross-domain research in efficiency, productivity, and sports management to investigate the management efficiency in integrating Taipei sports centers with government units, thus highlighting the importance of the public issues of sports policy and exercise, a literature review revealed a research gap involving a lack of performance assessment of those sports centers. There were two major findings: (1) The research context of "data envelopment analysis" (DEA) and "two-stage" analysis could determine efficiency factors that affected decision-making units (DMUs) in the use of research methods for measuring truncated data or censored data models (truncated regression, Tobit model); and (2) A "metafrontier model" was used to assess metafrontier efficiency for investigating the meta-technology ratios (MTRs) between different environment levels. In the second phase, truncated regression was used to investigate the environmental variables that affected operational efficiency. In the third phase, the concept of the metafrontier was used to determine MTRs. The research results provided various types of efficiency analyses of Taipei sports centers, environmental variables that affected the management efficiency of those sports centers, and MTRs. The study concluded that it is expected that the cross-domain application of performance assessment research on the public issue of sports will be able to identify and develop directions and topics in the field of diversified sports-management research.

Keywords: efficiency and productivity, truncated regression, dummy variables, environmental variables, metafrontier

Wen-Bin Lin is with the Physical Education Center, Taipei National University of the Arts, Taiwan. Richard Hsiao is with the Department of Kinesiology, Health and Sport Science, Indiana University of Pennsylvania, Indiana, PA. Shao-Wei Yeh is with the Department of Physical Education & Research, Hunan University of Technology and Business, China. Address author correspondence to Wen-Bin Lin at winbeing@ccnia.tnua.edu.tw.

1.Introduction

At the end of August 2010, the Taipei City Government formally announced the completion of the one-sports-center-per-district sports map that had been planned over a 10-year period. According to the Taipei City Government, Department of Budget, Accounting, and Statistics (2011), the 12 Taipei sports centers had attendance of up to 10 million people (with an average monthly attendance of up to 880,000 people) at of the end of 2010. This project not only enhanced residents' demand for sports and recreation and activated public interest and welfare but also created industrial competitive advantages. This project can be described as the display of a winning policy for the city government, residents, and industry. Currently, the 12 Taipei sports centers have adopted a public-private operate-and-transfer (OT) model. The city government builds sports complexes and entrusts their daily management to the private sector, while providing supplemental features such as charitable activities, low prices, and diversified services to attract residents' participation and to achieve the goal of increasing the number of people who exercise regularly. The Ministry of Education, Sports Administration (2014) has noted that in addition to the 12 sports centers built in Taipei City's administrative districts, 6 sports centers were then built in New Taipei City, for a total of 18 different sports centers. Unlike in the past, when domestic sports complexes were government-operated, Taipei sports centers now operate pursuant to an outsourced model. Exceptional private-sector businesses were selected through open bidding to operate and manage these sports centers pursuant to a contract; those businesses unleashed their effectiveness, improving the government's past plight in operating the sport complexes.

In the future, the operation and management of civil sports centers will become an important issue. The 12 Taipei sports centers and the Xinzhuang Civil Sports Center in New Taipei City were built entirely by county and city governments, whereas the others were built with subsidies from the Ministry of Education, Sports Administration. The Ministry of Education, Sports Administration will handle advance work such as preliminary planning, design, and assessment of the feasibility of promoting participation for 32 civil sports centers in Keelung City, New Taipei City, Taoyuan County, Hsinchu City, Hsinchu County, Taichung City, Changhua County, Yunlin County, Chiayi City, Tainan City, Kaohsiung City, Pingtung City, and Yilan County (Ministry of Education, Sports Administration, 2014). The successful development of these sports centers is attracting a great deal of attention. From the perspective of the government units involved in operations, the research with the most practical and useful value related to performance assessment includes Benito, Solana, and Moreno's (2012) efficiency assessment of Spanish cities' provision of public sports facilities, Kung and Taylor's (2010) investigation of the performance management of sports centers in the United Kingdom, and Liu, Taylor, and Shibli's (2007) measurement of the operation and management of 105 sports complexes and swimming pools in the United Kingdom in 2001. It might be said that few studies are in line with the aforementioned topic and that there is a relative lack of related studies. In reality, provided the management unit builds an efficient operating and management system, makes good use of organizational resources, acts in concert with opportunities for change and with the pulse of the times, and uses a performance-assessment system to manage people, matters, effectively, then the efficient operation and sustainable management development of sports centers can be achieved regardless of which type of operating mode is used (build-operate-transfer (BOT), build-transfer (BT), build-transfer-operate (BTO), rehabilitate-operate-transfer, build-own-operate (BOO), build-lease-transfer (BLT), etc.). Accordingly, the implementation of scientific management and the provision of effective analytical results and correct sequential implications have positive meaning.

The four major functions of management studies include the following: planning, organization, leadership and control. The concept and application of "efficiency and productivity" belong to the functional category of "control": they have already been used broadly in all types of fields and industries because of their powerful effect and function in practical use (Cooper, Seiford, & Tone, 1999; Emrouznejad, & Yang, 2018). The use of efficiency and productivity in investigating and developing the field of sports is equally impressive (Lewis, Lock, & Sexton, 2009). Efficiency has been explored in baseball (Lewis & Sexton, 2004a, 2004b; Lewis et al., 2009; Lin, & Chen, 2015; Lin, Hsu, Chen, & Chen, 2016; Lin, Yeh, & Yang, 2015; Sexton & Lewis, 2003; Volz, 2009), basketball (Beaulier, & Elder, 2011; Cooper, Ruiz, & Sirvent, 2009; McGoldrick, & Voeks, 2005; Rimler, Song, & Yi, 2010), soccer (Carmichael, & Thomas, 2008; Espitia-Escuer, & García-Cebrián, 2004; González-Gómez, & Picazo-Tadeo, 2010; Guzmán, 2006; Haas, 2003; Barros, Assaf, & Sá-Earp, 2010), golf (Fried, Lambrinos, & Tyner, 2004), American football (Einolf, 2004; Hersch, 2012), and the participating countries of mega sport events especially the Summer Olympic Games (Li, Liang, Chen, & Morita, 2008; Lin, 2010; Lin, 2015; Lins, Gomes, Soares de Mello, & Soares de Mello, 2003; Lozano, Villa, Guerrero, & Cortés, 2002; Percy, 2019; Wu, Liang, & Chen, 2009; Wu et al., 2009). The topics for investigation had become broad, and the level of application had become increasingly deep, highlighting the urgent need for development in the field of the efficiency and productivity of sports.

Research methods and concepts continue to evolve and develop. We observe the recent use of economic production theory and mathematical and statistical tools to conduct a deduction and estimation of the production frontier, thus measuring the methodology of decision-making units (DMUs) of productivity and presenting an extensive interdisciplinary reference. The evolutionary context of efficiency and productivity research is particularly worthy of continuous tracking and investigating by the field of sports management to identify the appropriate research direction, topics, and discourse. Through continuous observation and literature review, this study discovered that recent research applications in the field of efficiency and productivity involved two major research contexts and findings.

Simar and Wilson (2007) have found 801 studies related to "data envelopment analysis" (DEA) and "two-stage" analysis via Internet keyword search and 537 studies in the keyword search for "data envelopment analysis" and "Tobit." The number of related studies was very impressive, indicating this research context was flourishing and developing. However, from a methodological perspective, Simar and Wilson (2007) note that truncated regression must be used in place of Tobit regression to measure truncated data or censored data models. Only thus could the parameterized form of the likelihood function be overcome (because DEA is a non-parametric method) and the occurrence of assumption errors and the generation of inconsistent estimation be avoided. In the literature review, two important articles investigated and played a significant role in modeling the "environmental variables" that affected the subject of this study. Barros et al. (2010) have investigated the topic of competitive efficiency in professional soccer teams, whereas Benito et al. (2012) have used Spanish cities' provision of public sports facilities as the subject of research to perform an efficiency assessment on sport facilities in the public domain.

According to Farrell's (1957) original view, the concept of a metafrontier meant that manufacturers belonging to the same technology set were confronted by the same production frontier, and thus, productive efficiency could be measured by the radial distance ratio between the actual production level and the potential production level at the production frontier, allowing for cross-manufacturer comparisons. However, because individual DMUs belong to different technology sets, when confronted by different production frontiers and using efficiencies represented by the distance ratios, it would be impossible to make mutual comparisons because of inconsistent benchmarks. Therefore, Battese, Rao, and O'Donnell (2004) have proposed an estimation architecture using a metafrontier production function to overcome this restriction. They use the metafrontier of stochastic frontier analysis (SFA) in linear programming modeling to allow for comparative analysis of DMUs' efficiency based on the metafrontier. Subsequently, the distance function was converted into a metafrontier production function, and the estimation architecture of a deterministic non-parametric method (DEA) was described that further extended the concept of the metafrontier to the field of measuring the total factor productivity (TFP) index. Recently, methods using the metafrontier assessment of efficiency have received increasing attention (Battese et al., 2004; O'Donnell, Rao, & Battese, 2007). The metafrontier concept originated from an economic model. Therefore, the current status of research development is most advanced in the field of economics, followed by gradual entry into production and job management; leisure, recreation, and hospitality management; energy research; transportation research; banking operations; and other finance-related application fields and disciplines. In the field of sports management, Lin and Chen (2012) have used the metafrontier to investigate the competition efficiency of World Baseball Classic teams, comparing the efficiency frontier of the teams eliminated in the first round with the metafrontier of all participating teams, obtaining the technology gap ratios (TGRs), and proposed relevant recommendations worthy of continuing follow-up research.

In summary, through its literature review, this study applied cross-domain efficiency and productivity to research in the field of sports management, imported research trends in national sports policy and public exercise topics, and found research gaps. Ultimately, three major phases in the management efficiency of Taipei sports centers were collected, organized, and measured.

2.The present study

2.1 Truncated regression

Benito et al. (2012) used Spanish cities' provision of public sports facilities as the subject of research to obtain an efficiency assessment of physical facilities in the public domain was published in the International Journal of Sport Finance. These studies had research value and served as a reference model for the so-called "environmental variables" under investigation in this study.

Hersch (2012) uses ordinary least squares (OLS) to determine team efficiency value and then conducts a truncated regression to investigate the effect of head coach replacements and player drafts on American professional football teams. The dummy variables used by Hersch (2012) included applications from hotel management and other leisure, tourism, and hospitality fields, providing this study with a foundational reference for investigating sports centers' environmental variables. In reality, truncated regression is already commonly applied in production and job management; leisure, recreation, and hospitality management; efficiency and productivity; and other fields.

2.2 The metafrontier model

Assaf (2009) uses a metafrontier model to analyze the technical efficiency of large and small airports in the United Kingdom, finding both that the efficiency of various types of airports showed a progressive increase and that large airports were often more technologically efficient and less wasteful than small airports. In addition, the factors of the airport's size and location, use of technology, and amount of capital affected efficiency. Kontolaimou and Tsekouras' (2010) survey of European commercial banks uses a metafrontier methodology both to discern technology gaps of various types of banks and to decompose the key elements in their input and output. That study's results show that cooperative banks were closest to the metafrontier of European banks, a dichotomy seemed to have evolved in the common banking type, and a technology gap emerged in the output cost. Assaf, Barros, and Josiassen (2010) use the concept of the metafrontier to investigate environmental factors and technological changes related to various types of hotels. Various types of hotels (according to their composition) were compared based on homogeneous technology using longitudinal data from 78 hotels in Taiwan. The study's results clearly indicate that hotels' size, ownership, and classification had an important impact on efficiency. The so-called TGR is between the group frontier corresponding to the actual production point and the metafrontier. An expansion of the TGR corresponds to a reduction in the technology gap.

2.3 Sports centers

This study aims to investigate the management performance of sports centers. The most relevant study is that of Benito et al. (2012), which uses Spanish cities' provision of public sports facilities as the research subject to perform an efficiency assessment on physical facilities in the public domain. This study used one input indicator—total cost of sports (per capita cost according to cost subfunction, including physical education, sports, and recreation)—and two output indicators—one indicator for the total surface area of the municipalities' indoor and outdoor sports complexes (surface area in square meters per capita of all of the sports installations (indoor and outdoor) owned by each municipality) and another indicator for the conservation and appropriateness of service at public sports facilities (an index built from the survey on the suitability of the service that indicates the sports installations' state of conservation). The five environmental variables investigated by this study were as follows: per capita income, comparative index of each municipality's importance to tourism, comparative index for the entirety of each municipality's economic activity, population density by urban area, and the party in power in each municipality. The importance of the public issues of sports policy and exercise were clear.

Liu et al. (2007) uses output-oriented DEA to select data from the United Kingdom National Benchmark Service database, screening operational costs, operational hours, and indoor surface area as three input variables and operational income and number of visitors as output variables. One-hundred-and-five sports complexes and swimming pools were measured in 2001; indoor surface area was viewed as a non-discretionary factor. In addition, four factors that affected efficiency value were divided into various types: (1) Complex type (divided into three categories: dry, wet, and a combination of wet and dry); (2) Complex location (divided into three areas by the ratio of the number of semi-skilled or unskilled labor); (3) Complex size (divided into three categories: less than 1,500 square meters, between 1,500 and 3,000 square meters, and 3 larger than 3,000 square meters); and (4) Management type (divided into four types: self-management and direct service, a commercial contracts system, a non-profit organization entrusted with management, and school-based management). Empirical results indicated both that management type was a significant factor in influencing management efficiency and that the efficiency value of complexes with outsourced management was better than the efficiency value of complexes with self-management.

Kung and Taylor (2010) use data on sports centers from the United Kingdom National Benchmark Service, including various categories of indicators at each center such as users, financial performance, rate of use, and degree of customer satisfaction. Empirical results indicated that even though internal management by local governments achieved a higher degree of customer satisfaction, the financial performance of internally managed centers was worse than the financial performance of centers under commercially contracted companies and trust management. In terms of the degree of customer satisfaction, the performance of centers under trust management was between centers under internal management and centers under commercially contracted company management.

Through a literature review, this study found both a research trend and a gap in "acting on problems as soon as they are discovered" that provide managers and decision-makers of sports organization with the most effective reference information. As a trend, this issue is the future research direction for continuous investigation and study by practitioners of sports management and leisure management research, providing substantial assistance to the sports industry in improving both management efficiency and management practices.

2.4 Summary

Through continuous observation and literature review, this study discovered recent research applications and contexts in the field of efficiency and productivity research. Simar and Wilson (2007) use the Internet to search on the keywords "data envelopment analysis" and "two-stage," resulting in 801 studies; a search on the keywords "data envelopment analysis" and "Tobit" yielded 537 studies. The number of studies was very large, indicating that this research context was flourishing and developing.

In addition, the application of dummy variables in the second phase—for example, in Hersch's (2012) study of topics related to American professional football teams and Chen, Yeh, and Hu's (2012) related application aimed at hotel operations and management along with other leisure, tourism, and hospitality fields—provided a foundational reference for the environmental variables of sports centers investigated by this study. Viewed from the field of sports, although truncated regression has already become popular, there is a relative lack of research on government units and the public topic of exercise targeted by this study. Therefore, this study developed a new research context and methodology in this field. Cross-domain application from the field of efficiency and productivity research resulted in two major findings: (1) The "data envelopment analysis" and "two-stage" research context could achieve an understanding of the environmental variables that affected sports centers' efficiency; and (2) A "metafrontier model" was used to obtain the TGRs between different environmental levels. On this second point, related research in economics, management, finance, and other fields had gradually become popular, and applying this model to the efficiency analysis of various groups of sports centers make a similar contribution. The integration of the two findings with the issue of sports centers' management efficiency had not previously been seen in a field related to sports management; accordingly, this integration conferred irreplaceable advantages, added research value and initiated a new way of thinking.

3.Method

This study archived data related to 12 Taipei sports centers from 2008 to 2011. In the first phase, a management efficiency analysis was performed (Banker, Charnes, and Cooper (BCC) output-oriented model). In the second phase, the environmental variables that affected management efficiency were investigated (truncated regression). In the third phase, the meta-technology ratio (MTR) was applied, and the TGR was analyzed (metafrontier and TGR). The research objectives were as follows:

• To conduct a management efficiency assessment

of Taipei sports centers that covers recent years (2008 to 2011);
- To investigate the environmental variables that affected the management efficiency of Taipei sports centers; and
- To investigate the meta-production frontiers and MTRs of Taipei sports centers from 2009 to 2011.

3.1 Data collection

3.1.1 First phase

The topic of this study can be described both as innovative and as a reference for the relative deficiency in the literature. The four major factors of production in economics are land, labor, capital, and technology. The input and output settings in the fields of tourism and hospitality directed at hotels' operational efficiency and management mostly follow this principle. Benito et al. (2012) use the provision of public sports facilities by Spanish cities as their research subject, obtaining an efficiency assessment of public-domain sport facilities. Although Benito's study is different from this study in its scale and investigative perspective, that study had the highest correlation with this study in its use of an overall national scale to investigate the overall efficiency of sports facilities. The Benito study used an input indicator of the total cost of sports. It used the following two output indicators: total surface area of indoor and outdoor sports complexes in the municipalities and an indicator of the conservation and appropriateness of service at public sports facilities. Volz (2009) uses an output-oriented technical efficiency method of the BCC model to investigate Major League Baseball's (MLB) management efficiency by using one input (salary) and one output (games won) variable. Therefore, this study began by considering overall costs and set one input (total cost) and one output (total profit) variable to investigate the management efficiency assessment of Taipei sports centers. All of the data for the input and output indicators were obtained from the Taipei City Government, Department of Budget, Accounting, and Statistics (2011). There was only two years of operating data on Wenshan and Daan Sports Centers from 2008 to 2011.

3.1.2 Second phase

Benito et al. (2012) investigate the environmental variables using five factors: per capita income, a comparative index of each municipality's importance to tourism, a comparative index of each municipality's overall economic activity, population density by urban area, and the influence of the political party in power in each municipality. This study set district/location and facility as two major environmental variables based on the current state of the domestic environment. Eight essential factors affected sports centers' management efficiency; the details are shown in Table 1. The data on all of this study's environmental variables, such as district/location and facility, were obtained via the Taipei City government's information network.

Table 1 Aggregate table on the definitions of environmental variables that affected the sports centers

Environment Variable Definitions (Definition of variables)	
District and Location Environmental Variables (Location)	
Total population by administrative district	
Within 500 meters walking distance of a Taipei metro station	(1 = yes; 0 = no)
Facilities' Environmental Variables (Facilities)	
Attached parking lot	(1 = yes; 0 = no)
International conference hall	(1 = yes; 0 = no)
Shopping department	(1 = yes; 0 = no)
Children's recreation area/room	(1 = yes; 0 = no)
Barrier-free spaces and facilities	(1 = yes; 0 = no)
Community charity activities	(1 = yes; 0 = no)

Note: (1 = yes; 0 = no) is the dummy variable

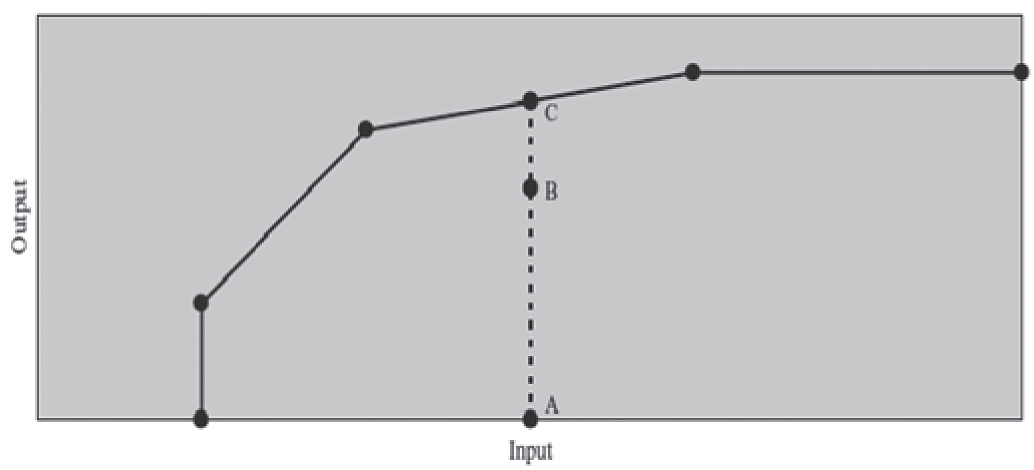
3.1.3 Third phase

Third Phase: After the relevant data and results from the first two phases were obtained in this study, the management efficiency of sports centers was investigated in the third phase by using a metafrontier assessment method via a "metafrontier model." This method applied efficiency analysis to various groups of sports centers by the MTRs at different environmental levels (district/location, facility); this approach can be described as having research value and making a contribution (data from 2009 to 2011 because Wenshan and Daan Sports Centers had been operating for only two years).

3.2 Data envelopment analysis methodology

DEA methodology was a research method proposed by Charnes, Cooper, and Rhodes (1978) to establish a linear programming model. The idea of the DEA originated from Farrell's (1957) concept of productive efficiency. Farrell hypothesized that under constant returns to scale, a unit isoquant explained the relationship with the production isoquant frontier using actual observation points to solve for the size of the technical efficiency. The DEA methodology was used to evaluate relative efficiency between organizational units. The methodology was directed at non-profit organizations and agencies that had environments with multiple inputs and multiple outputs. The primary objective was to determine the efficient frontier of all of the units under analysis and to compare actual production efficiency with the efficient frontier, thereby measuring relative efficiency. If the unit being tested fell on the efficient frontier, then there was relative efficiency. If the unit being tested was inside the efficient frontier, then there was relative inefficiency. This approach was called the Charnes, Cooper, and Rhodes (CCR) model. To find the cause of technical inefficiency, three scholars—Banker, Charnes, and Cooper (1984)—assumed variable returns to scale to solve for pure technical efficiency. This approach was called the BCC model. This study used the output-oriented technical efficiency method of the BCC model and adopted a one-input-one-output model to investigate the management efficiency of Taipei sports centers. The model's efficient frontier is as shown in Figure 1.

Figure 1. Efficient frontier of the one-input-one-output model.



3.3 Truncated regression

The appearance of truncated data was created because the samples were extracted from only a certain range of the parameter. Random variables usually show a normal distribution. However, in certain situations, random variables may be extracted from certain numerical values that are greater than, less than, or between normal distribution; at this time, the sample distribution of the data would form a truncated normal distribution and regression analysis would be performed in accordance with the characteristics of this distribution. Traditionally, when economists or related studies measured censored data models, most of them used the Tobit regression model (Tobin, 1958) as their primary research tool. Although the dependent variable in individual economic data might be undetectable (censored), it must still correspond to the relevant independent variable. For that reason, the distribution of the variables might show a character similar to truncation. A discussion of the cause-and-effect relationship between the variables must take into account the undetectable variable. Because the variable was undetectable, another observable variable must be found as a substitute variable. Assuming the random variable is y, the observed variable is y^*, the inverse of the independent variable matrix is x_i^*, the parameter vector is β, and the residual term is ε, then the basic Equation (1) is:

$$y^* = x_i^* \beta + \varepsilon_i$$

$$y_i = 0, \text{ if } y_i^* \leq 0,$$

$$y_i = 0, \text{ if } y_i^* > 0. \tag{1}$$

Nevertheless, Simar and Wilson (2007) highlight from a methodology perspective that undistributed points remained in the Tobit regression. When using the DEA method to measure the efficiency of DMUs, there is no need to preset functions and parameter estimations. When using a Tobit regression, it is assumed that the DMU's efficiency error distribution term is a normal distribution. If assumption errors occur in the parameterized form of the likelihood function, then the Tobit regression's estimation equation would generate inconsistencies. Accordingly, Simar and Wilson (2007) have developed a truncated regression to overcome the aforementioned restrictions and supplement it with the bootstrap method for testing to verify the reliability. The equation is as follows:

$$TE_j = \alpha + \Sigma_{t\text{-}1}^{w} \; Z_{tj}\beta_t + \varepsilon_j, \text{ (j=1,…,n)} \tag{2}$$

In Equation (2), $\varepsilon_i \sim N(0\,;\sigma_\varepsilon^2)$, $\varepsilon_i \geq 1-\alpha-\Sigma_{t\text{-}1}^{w}\; Z_{tj}\beta_t$,α is a constant term, ε_i is statistical interference, and Z_{tj} is both the ^{tth} value of the DMUj specific observed variable and related to the efficiency value (TE_i) of the DMUs.

3.4 Metafrontier model

Battese et al. (2004) provide a solution to estimate production efficiency at the metafrontier, which O'Donnell et al. (2008) further extend to intertemporal technical efficiency and changes in TGRs under the architecture of production efficiency at the metafrontier. Figure 2 shows a simple illustration that explains the single-input-and-single-output metafrontier model. The DMUs (sports centers) in this study belonged to two heterogeneous groups. Therefore, the latter efficiency frontiers of the two groups after computation were represented by *XX′* and *YY′*, respectively, and the DMU of this input-output combination was marked as *A*. In this study, the output-oriented model for the DMU *A* technical efficiency of group frontier (group frontier), *XX′* , and the metafrontier, *MM′*, are computed as in Equation (3):

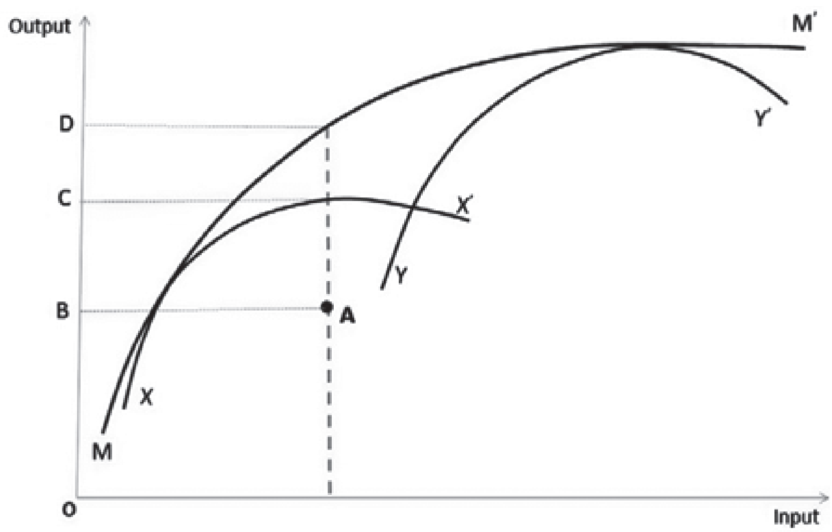
$$TE_{XX'}(A) = \frac{OB}{OC}\,, TE_{MM'}(A) = \frac{OB}{OD}\,. \tag{3}$$

To obtain the MTR, the gap between the group frontier, *XX′*, and the metafrontier, *MM′*, must be analyzed. Therefore, DMU *A* is defined by Equation (4)

$$MTR_{XX'}(A) = \frac{TE_{MM'}(A)}{TE_{XX'}(A)} = \frac{OB/OD}{OD/OC} = \frac{OC}{OD} \tag{4}$$

The MTR measures how close the group frontier is to the metafrontier and is shown in Equation (5), following a reorganization of Equation (4). The technical efficiency of DMU*A* is measured as the metafrontier, which can be reorganized as the technical efficiency frontier of group production (representing group characteristics and status) and the technical efficiency ratio of group frontier, XX' (representing the group frontier's degree of closeness to the metafrontier)

Figure 2. Illustration of the metafrontier and the group frontier (O'Donnell, et al., 2008).



$$TE_{XX'}(A) = TE_{MM'}(A) \times MTR_{XX'}(A) \tag{5}$$

For a DMU with $TE_{MM'}$=0.4 and $TE_{XX'}$=0.6, the MTR value is 0.667. This shows that the same production unit under the production technology of Group XX', using the same essential factor input combination, can only attain 66.7% of the metafrontier production technology. A greater MTR value shows a greater distance in the production technology of specific group XX', and the opposite means a smaller distance.

4.Results

4.1 Management efficiency assessment of Taipei sports centers from 2008 to 2011

Volz (2009) uses the output-oriented technical efficiency method of the BCC model to investigate MLB's management efficiency by using a one-input (salary) and one-output (games won) model. This study complied with this concept by setting one input (total cost) and one output (total profit) variable to investigate the management efficiency assessment of sports centers in Taipei City. The 12 Taipei sports centers were referred to using a code ranging from Sports Center A to Sports Center L.

The term "GDP deflator" refers to a calculation based on the gross domestic product (GDP): The ratio of the money used between nominal GDP and inflation-corrected GDP (namely constant-price GDP or real GDP) that is the most macro measurement of price levels. The GDP deflator is also used to calculate GDP components, such as personal consumption expenditures. Moreover, the U.S. Federal Reserve switched to using the personal consumption deflator and other deflators as a reference for formulating "anti-inflation policies." GDP Deflator = (Nominal GDP/Real GDP) x 100. This study was based on the production and deflation indicators of all of Taiwan's domestic industries over the years archived by the Directorate-General of Budget, Accounting and Statistics, Executive Yuan (2012). This study used 2006 as the base period and set the arts, entertainment, and leisure-service industry as the basis by which to deflate the input and output indicators. The data were imported into DEA-Solver Version 7.0 software for calculation. Details on the management efficiency of the Taipei sports centers from 2008 to 2011 are shown in Table 2.

Table 2 Aggregate table on the operational efficiency of Taipei sports centers from 2008 to 2011.

Sports Centers	2008	2009	2010	2011
A	0.8284	0.9685	1.0000	1.0000
B	0.8991	0.9484	0.9852	0.8978
C	-	-	0.9720	1.0000
D	0.9272	0.9719	0.9522	0.7902
E	-	-	1.0000	0.9222
F	-	0.9590	0.8819	0.8040
G	1.0000	1.0000	1.0000	0.9352
H	0.9139	0.9250	0.9869	0.9149
I	-	1.0000	0.9745	0.8673
J	1.0000	1.0000	1.0000	0.8762
K	1.0000	0.9434	0.9488	0.8698
L	-	0.7636	0.9577	0.8765

4.2 Environmental variables that affected the management efficiency of Taipei sports centers

Through a literature discussion, expert interviews, and the actual use of a rule of thumb, factors that affected the efficiency of Taipei sports centers were set (environmental variable investigation). The environmental variables of this plan were divided according to differences in property: (1) Location variables – total population by administrative district, within 500 meters walking distance of a Taipei metro station; and (2) Facilities variables – community charity activities, barrier-free spaces and facilities, surface area for use, international conference hall, metro, children's recreation area/room, and shopping department.

With the exception of total population by administrative district, the items were processed using dummy variables, including community charity activities, barrier-free spaces and facilities, surface area for use, international conference hall, metro, children's recreation area/room, shopping department, etc. This study followed the recommendation of Simar and Wilson (2007) and performed a repeated sample extraction 2,000 times to reduce any errors generated by DEA in the second phase. Details are as shown in Table 3.

Table 3 Aggregate table on environmental variables that affected the operational efficiency of Taipei sports centers.

Variables	Coefficient	Standard Deviation	t Statistics
Constant	0.938***	0.065	15.707
Total population by administrative district	-0.000	0.000	1.289
Community-building events	-0.029	0.034	-0.859
Barrier-free spaces and facilities	-0.098**	0.045	-2.152
Surface area for use	0.000*	0.000	-1.686
International conference hall	-0.011	0.040	-0.282
Metro	0.002	0.029	2.507
Children's recreation area/room	0.082**	0.033	2.508
Shopping department	0.002	0.039	0.061

Note: Log likelihood function=26.399

***Indicates $\alpha = 0.01$; **Indicates $\alpha = 0.05$; *Indicates $\alpha = 0.1$ significance levels

The first result involves the transportation convenience of “barrier-free spaces and facilities”: At a 5% significance level, the existence of barrier-free spaces and facilities had a significant effect on and negative correlation with the management efficiency of the sports centers. This phenomenon shows that the convenience and safety of barrier free space increased the willingness of consumer groups with mobility issues to enter the premises but had no influence on enhancing the management efficiency of the sports centers. The second result involves the “Children’s recreation area/room”: At a 5% significance level, the existence of a children’s recreation area and facilities had a significant and positive effect on the management efficiency of the sports centers. This phenomenon shows that the convenience and safety of children’s recreation area increased the willingness of families with children to enter the premises and had great influence on enhancing the management efficiency of the sports centers. The third result involves the “Surface area for use”: At a 10% significance level, the existence of sufficient space for use had a significant and positive effect on the sports centers’ management efficiency. This phenomenon shows that a larger space for use increased consumer groups’ willingness to enter the premises and had a strong influence that enhanced the sports centers’ management efficiency. The research results on the three environmental variables of “barrier free spaces and facilities,” paces and’s recreation area/room,” and “surface area for use” provided a reference for sports centers’ senior management staff and employees in the hope of achieving the goal of enhancing management efficiency.

4.3 Metafrontier and technology gap ratios of Taipei sports centers from 2009 to 2011

When using cost to perform metafrontier measurement of organizational performance, the most important arbitration indicator is the TGR, the value of which is the group frontier stochastic cost value for measuring the sports centers with respect to the gap ratio with the metafrontier cost value. When the TGR value increases (approaching 1), the gap in cost between the group frontier and metafrontier decreases (that is, the two are becoming closer). Conversely, when the TGR value decreases (approaching 0), the gap between the two becomes larger, indicating that the distance in cost between the group frontier and metafrontier have grown farther apart. Therefore, the cost-efficiency situation of sports centers at various technology levels (or across groups) can be compared based on this gap ratio. In this study, there were only seven sports centers in 2008; the number of DMUs was insufficient, and it was impossible to differentiate among various groups and solve for the TGR value according to surface area for use. Therefore, 2009 to 2011 was set as the time limit for investigating the TGR (there were 10 sports centers in 2009). Moreover, a surface area for use of 57,309 square meters (17,340 ping) was set as the reference line for differentiating Taipei sports centers into a large-scale group (Sports Centers B, D, G, K, L, C) and a small-scale group (Sports Centers A, F, H, I, J, E). The TGR values of the 12 Taipei sports centers were aggregated. Details are as shown in Table 4.

Table 4 Aggregate table on the TGR of Taipei sports centers from 2009 to 2011.

Sports Centers	2008	2009	2010	2011
B	Large Scale	0.9484/ 0.9624 0.9855	0.9852/ 1.0000 0.9852	0.8978/ 1.0000 0.8978
D		0.9719/ 0.9810 0.9907	0.9522/ 1.000 0.9522	0.7902/ 1.000 0.7902
G		1.0000/ 1.0000 1.0000	1.0000/ 1.0000 1.0000	0.9352/ 0.9711 0.9630
K		0.9434 /0.9457 0.9976	0.9488/ 0.9881 0.9375	0.8698/ 0.8959 0.9709
L		0.7636/ 1.0000 0.7636	0.9577/ 0.9733 0.9839	0.8765/ 0.9514 0.9212
C		-	0.9720/ 0.954 0.9874	1.0000/ 0.8258 0.8258
A	Small Scale	0.9685/ 1.0000 0.9685	1.0000/ 1.0000 1.0000	1.0000/ 1.0000 1.0000
F		0.9590/ 0.9897 0.9689	0.8819/ 0.9095 0.9696	0.8040/ 0.8426 0.9542
H		0.9250/ 0.9605 0.9630	0.9869/ 0.9869 1.0000	0.9149/ 0.9238 0.9904
I		1.0000/ 1.0000 1.0000	0.9745/ 0.9745 1.0000	0.8763/ 0.8773 0.9989
J		1.0000/ 1.0000 1.0000	1.0000/ 1.0000 1.0000	0.8762/ 1.0000 0.8762
E		-	1.0000/ 1.0000 1.0000	0.9222/ 0.9868 0.9435

The TGR values of the two groups were between 0.7636 and 1.0000. The TGR mean value of the small-scale sports center group was better (0.9784), implying that most of the samples of this group were closer to the cost metafrontier (least cost). Conversely, the TGR mean value of the large-scale sports center group was lower (0.9384), indicating that most of the samples of this group were farther from the cost metafrontier; the mean cost of this group exceeded the cost metafrontier by 7%. The maximum TGR values in the two groups were 1.0000. At this time, the stochastic cost of the group frontier was at a point of tangency with the cost metafrontier, implying that the sample was located at the most efficient point.

To further understand whether the differences in the TGR values of sports centers organized by different scale groups (surface area for use) were statistically significant, this study performed the Mann-Whitney U statistical test. Details about the result of the difference test are shown in Table 5. At a 5% significance level, the TGR values of the sports centers in this study with difference scales of surface area for use showed a significant difference. Taking into consideration the improved management efficiency of sports centers, the small-scale group showed better potential, whereas the large-scale group's urgency in making great effort and improving was explained.

Table 5 TGR value difference test of various scale groups.

	Large Scale
Small Scale	.041*

*p< .05; p value based on analysis of the Mann-Whitney U test

5.Discussion

Comparing Taiwan with the developed countries, the construction of sports centers plays a role in nurturing citizens' exercise ethos and cultivating a population of people who exercise regularly. Choosing to build diversified sports facilities at convenient locations or bases would be more effective in promoting exercise (Ministry of Education, Sports Administration, 2014).

The performance assessment of the management efficiency of 12 Taipei sports centers showed that management efficiency was not significantly affected by whether the sports centers were built earlier or later. New Taipei City's sports centers in New Taipei City have been operating for less than two years, and those in other counties and cities have been operating for less than one year. Differences in regional characteristics, length of operation, and the unit entrusted with operations management will generate heterogeneous differences in the operating status and performance of sports centers in each county and city. Subsequently, Taiwan will successively build 50 sports centers. After the Executive Yuan agreed on and approved the amendment plan on November 10, 2011, the Ministry of Education, Sports Administration (2014) revised the target number of "civil sports centers" from 50 to 32 and extended the overall promotion period to six years.

In Taipei City, there are approximately 118,000 physically and mentally disabled citizens. There are approximately 401,500 people aged 65 or above. The sum of the physically and mentally disabled and the elderly population is approximately 519,500 people. The preferential policy at Taipei sports centers shows how to meet the needs of an aging society by allowing senior citizens (age 65 or above) and people holding proof of physical or mental disability to enter the premises free of charge during public hours. The results of this study corresponding to the transportation convenience of "convenience of spaces and facilities" indicated that even though the convenience and safety of a barrier-free space could not enhance the management efficiency of Taipei sports centers, they could increase the willingness of consumers with mobility issues to enter the premises. Thus, the implementation of the barrier-free policy not only responded to government policy but was also in line with a social atmosphere of providing care to minority and disadvantaged groups.

The results of this study on "on stud's recreation area/room" had a significant and positive effect on the management efficiency of the sports centers at a 5% significance level in terms of the existence of a children's recreation area and facilities. Taipei City's population of children aged 0-9 is approximately 254,000. In the environment of an industrial and commercial society, most parents are in two-income families. The convenience and safety of children's recreation space offered by sports centers increased the willingness of families with children to enter the premises. From a government perspective, in addition to enhancing the sports centers' management efficiency, this feature provided a friendly environment for Taipei City's people to take care of children while engaging with the global trend of low birth rate, creating a win-win opportunity for both the sports centers and the public.

As of January 2016, Taipei City's total area was approximately 272 square kilometers with a population of 2,704,974 people; Taipei City is the area in Taiwan with the highest population density (9,952.09 people/square kilometer). The results of this study indicated that providing sufficient "surface area for use" had a significant and positive effect on the sports centers' management efficiency, showing that a larger space would better increase consumer groups' willingness to enter the premises. Prior to the establishment of sports centers in New Taipei City, the residents of New Taipei City often crossed the district to neighboring sports centers in Taipei City to exercise and spend money. This phenomenon improved slightly after New Taipei City successively built six sports centers, indicating the public's need for a place to exercise.

To further subdivide the sports centers organized by different scale groups (surface area for use), this study compared sports centers' TGR values with various scales of surface area for use and found significant differences. To improve sports centers' management efficiency, the small-scale group with a surface area for use equal to or less than 57,309 square meters showed better management performance, thus indicating that appropriate space planning and utilization and improved site design and dynamic lines seem to be more important in Taipei City, where land is expensive. Of course, Taipei City's existing sports centers with larger operating spaces must improve space management, planning, and capacity. This situation can be an important reference for other counties and cities in Taiwan for building sports centers in the future.

5.1Limitations

- This study only investigated the management efficiency assessment of Taipei sports centers from 2008 to 2011.
- This study only investigated set indicators and variables (input, output, environmental variables). The rest were not included because they were within the scope of this study.

5.2 Suggestions and Future Studies

Four companies have obtained operating rights to the 12 Taipei sports centers. China Youth Corps operates six sports centers, Young Men's Christian Association (YMCA) operates two sports centers, Far East Steel Manufacturing operates three sports centers, and Hui Yang Bai Huo operates one sports center. According to the structure-conduct-performance theory in industrial economics, the structure of the market would affect the conduct of firms, and the conduct of the firms would in turn affect the performance of the firms. Therefore, the recommendation for future research is to thoroughly investigate either the performance of the firms operating the sports centers or the relationship between the conduct of the firms and performance.

A national sports policy and the public issue of exercise will directly guide the operating direction and efficiency of sports centers. Follow-on research topics include the following:

- An analysis of the contents of sports policies introduced by government units and the proportion of input resources;
- An investigation linking the operation and management of sports centers from a public health and national health perspective;
- The assimilation of complete demographic vari-

ables into the future planning of sports centers and policy references;
- An analysis of sports center input and output models, management efficiency, resource allocation, and management successes and failures from a more detailed performance assessment perspective; and
- A comparison of management performance assessment between sports centers managed by public institutions and those managed by non-public institutions.

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