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Editor's Note

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As the whole world is buckling under a great wave of the COVID-19 pandemic, the concept of "Zero Distance Innovation" influences people's everyday life and their consumption behaviors. Under the impact of COVID-19 pandemic, many different sports area studies have also changed. In particular, we have seen an increase in the collaboration and competition among various sport fields and technology enterprises. The Artificial Intelligence technology and innovative virtual applications provide both game watching and home exercising with more possibilities.

As health has become the key issue during the recent COVID-19 pandemic, both academics and practitioners find it increasingly important to understand how to promote new marketing strategies, implement new business models, and incorporate new cutting-edge technologies to mitigate the negative impact of the pandemic on the sport industry.

As the Asian leading discussion platform in the field of Sport for academics, practitioners and government officials, the Asian Sports Management Review welcomes paper submissions and article contributions from all experts. We hope to provide a platform that facilitates discussions on various topics in this field, including industry development, recent trends and research, challenges and difficulties and strategies and solutions. We thank you for submitting your work in advance, and also appreciate our knowledgeable reviewers. We hope all readers may benefit from each of our special issues and topics, and wish you all peace and health.

Sincerely yours,

Yu-Hui CHOU, Ph. D.

ASMR Asian Sport Management Review **Editor**

Professor/ National Taiwan Sport University (NTSU)

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Content

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Exploring Sport Fans' Smartphone Usage in the Era of Digital Globalization 1

Do Stadium Naming Rights Announcements Impact Stock Prices: A Note on the Japanese Experience 17

Is Data Envelopment Analysis the Best Way to Approach Benchmarking of Sportswear E-Retailing? 33

Textual Analysis of Visual Communication in Sports Events - A Case Study of Roland Barthes' Semiotics 51

Exploring Sport Fans' Smartphone Usage in the Era of Digital Globalization

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The current study examined sport consumers' smartphone usage. Using a cross-sectional survey design, the results of this study revealed three unique motivations (i.e., intrinsic, social, diversion), three constraints (i.e., personal, security, technology), and types of technological perceptions (i.e., hedonic, utilitarian) for smartphone usage in a sport context. Among these factors, intrinsic motivations, personal constraints, hedonic perceptions, and utilitarian perceptions were found to significantly predict actual usage. The information captured in this study is particularly useful when designing a mobile strategy to engage and attract digital global fanbase. Sport managers can also further encourage sport consumers' motivating factors, while reducing the constraining factors by considering technological perceptions of the smartphones.

***Keywords*:** Smartphone usage in sport, global mobile strategy, technology in sport, technology consumption behavior, technology constraints

Exploring sport fans' smartphone usage in the era of digital globalization

Since the release of the first generation smartphone in 2007, it have unquestionably changed the way people communicate, interact, entertain, and manage their daily lives (Emba, 2017). The convenience of keeping track of everything in one device influenced the growing population of 6,378 billion smartphone users in the world (Statista Inc., 2021). Among them, 2.59 billion users represent the Asia-Pacific region (Statista Inc., 2021). The smartphone functions allow sport fans across the globe to watch the games, obtain information, share similar interest, and purchase goods from their favorite teams in a different country. In response, sport organizations are taking an active approach in developing strategies with sport content that are tailored towards the digital global market. From a sport consumers' perspective, the range of effort varies depending on their level of fandom and their comfort level using the technology.

However, not all fans utilize the available functions of smartphones to consume sport. The instant connection to all communication channels and location tracking function may be perceived as a threat to fans concerned with their privacy (Nel and Boschoff, 2017). For others, technical difficulties associated with today's smartphones may cause fans to look for alternative options (e.g., computers, televisions) to follow their sport. Moreover, sport fans must be willing to take full advantage of the technology in hand. The range of effort varies, depending on users' level of comfort with using a smartphone. Although we have witnessed increased use of smartphones in sport, owning a smartphone does not, on its own, guarantee an enhanced sport experience for the users. Technology is only beneficial when users make an effort to make the available functions fit their needs.

It has been over a decade since the introduction of smartphones, but we are still unclear as to why some fans take advantage of their smartphones to connect with their respective sports, and why some choose not to do so. In order to comprehensively examine sport consumers' decision-

making processes, the purpose of this study is twofold: (a) identify sport fans' motivations, constraints, and technology-based perceptions in using smartphones, and (b) further explore the factors that predict smartphone users' actual usage in a sport context.

Theoretical Background

Technology Motivations

In order to capture sport fans' motivation to integrate technology for sport consumption, several approaches were proposed including Motivations Scale for Sport Online Consumption (MSSOC; Seo & Green, 2008), Sport Website Acceptance model (SWAM; Hur et al., 2011), Smart Sport Framework (Ha, Kang, & Kim, 2017), and Sport Fan Model of Goal-Directed Behavior (SFMGB; Yim & Byon, 2020). Among them, the MSSOC (Seo & Green, 2008) is still widely adapted for online-related technology use in sport, including online sport consumption (Sung, Son, & Choi, 2017), sport consumers on social media sites (Fischer, 2019; Lewis, Brown, & Billings, 2017; Li, Dittmore, Scott, Lo, & Stokowski, 2019; Shermak, 2018), smartphone apps (Erasmus, De Villiers, & Phiri, 2018; Kang, Ha, & Hambrick, 2015) and Esports spectating (Sjöblom, Macey, & Hamari, 2019).

The MSSOC ten dimensions of motivations are often modified when adapted to consider the nature of relevant technology and sport fans' behaviors. For instance, Sung, et al. (2017) partially adapted and modified the MSSOC to report convenience, team support and technology knowledge factors to directly influence Korean fans' online sport consumption. In studies examining smartphone apps, Erasmus, et al.'s (2018) study supported two dimensions of motivations from the MSSOC (i.e. information, entertainment) for millennials' fitness app usage and Kang, et al.'s (2015) study supported four dimensions of motivation (i.e. information, entertainment, fanship, economics) in examining college students' sport-related app usage. Likewise, Shermak (2018) used a variation of the MSSOC in coding messages on Twitter into information and entertainment sub-categories.

The finding from relevant studies also indicated team support, fan expression (Fischer, 2019), escape, and pass time (Li et al., 2019) factors as part of their study's identified motivations. The MSSOC was supported to be a valid and reliable measure for sport consumption motivations using technology even when the items are partially adopted (Dwyer & Kim, 2011; Hardin, Koo, Ruihley, Dittmore, & McGreevev, 2012). Beyond the MSSOC, other factors such as basking in reflected glory (BIRGing; Chan-Olmsted & Xio, 2019), convenience, curiosity (Kang et al., 2015) for smartphones, interaction (Billings, Qiao, Conlin, Nie, 2017) for social media sites, personalization (Ha, Chung & Lim, 2017) for moble sport website, and drama, acquisition of knowledge (Sjöblom et al., 2019) for Esports spectating were found to influence sport fans' behaviors in consuming the specific technology. The technology motivations are often derived from sport fans' desire to consume sport using the specific medium of their choice. These studies indicate that motivations may vary depending on sport fans' behavior in why or how they utilize the technology for their benefit.

Technology Perceptions Consideration

While the MSSOC attempts to explain the psychological and behavioral reasons motivating the sport fans, other studies (Chan-Olmstead & Xiao, 2019; Ha et al., 2017; Hur et al., 2011; Li et al., 2019; Yim & Byon, 2020) integrated theoretical frameworks from field of technology to further

understand sport fans' perceptions toward technology. The TRA is employed in studies that attempt to predict fundamental human behavior based on (a) attitude toward behavior and (b) subjective norms. Building upon the core constructs of TRA, the TAM was initially developed to predict users' intention to accept information technology (Davis, 1989). The original model focuses on two constructs: (a) perceived usefulness and (b) perceived ease of use. As technologies evolved, extended variables such as perceived curiosity (Chien, Chu, Lee, Yang, Lin, Yang, Wang, & Yeh, 2019), perceived playfulness (Liang & Yeh, 2019), and various perceptions (e.g. perceived enjoyment, perceived risk, perceived trust, etc.) were tested to further address the influence of technology.

Extending TRA and TAM in sport, the SWAM (Hur et al., 2011) focused on the idea that "sports websites influence intention to use the websites, which in turn influences use of websites" (Hur et al., 2011, p. 211). Similarly, Ha et al. (2017) integrated the frameworks of TRA, TAM, and SWAM to develop the Smart Sport framework in explaining one's intention to consume sport using smartphones. The Smart Sport framework proposed media multitasking, personal attachment, and social influence variables as part of smartphone-specific factors. Among the three variables, sport fans' personal attachment and media multitasking behaviors were reported as contributing factors for fans' smartphone usage intention. Furthermore, Yim and Byon (2020) integrated TRA, Model of Goal-Directed Behavior (Perugini & Bagozzi, 2001), and Theory of Planned Behavior (Ajzen, 1991) to develop SFMGB. In their study, fan engagement was found to significantly predict millennial fans' online activity participation (Yim & Byon, 2020). The integrated frameworks allow researchers to overcome the limitations of each theory's shortcomings in its ability to provide a comprehensive perspective (Shachak, Kuziemsky, & Petersen, 2019).

Another reason for using integrated frameworks is to take into account the unique technology functions. For example, understanding sport fans' ability to interact and communicate on social media platforms represent an important aspect of online technology. In studies examining smartphones, it is important to consider smart technolog functions such as smartphone apps, location tracking, and messaging, as it plays a pivotal role in shaping sport fans' overall media consumption behavior. Accounting for the unique functions, Chan-Olmstead and Xiao (2019) suggested that, "the smartphone is a different kind of sport medium-one that offers targeted information and purposeful social interaction" (p. 190). Through the lenses of U & G and fandom behaviors (e.g. Trail, Fink, & Anderson, 2003), Chan-Olmstead and Xiao (2019) reported media factors such as social media use and video streaming to played a significant role in affecting the use of smartphones for sport consumption. As evident in the studies above, the nature of technology in terms of its unique function and utilization for a specific subject (e.g. sport) should not be undermined.

Technology Motivations and Constraints

The studies analyzing one's intentions and motivations to use technology only show one side of users' behaviors. In order to fully comprehend user behavior related to technology, both their intentions and constraints should be examined to encourage users' intentions, while limiting the constraints (Suh, Lim, Kwak, & Pedersen, 2010). One's technology constraints often occur when he or she is not willing to overcome the barriers associated with the technology. In the field of technology, user's resistance to change (Sanchez-Prieto, Huang, Olmos-Miguelanez, Garcia-Penalvo, & Teo, 2019) and user's desire for privacy and tendency towards risk avoidance (Lutz, Hoffmann, Bucher, & Fieseler, 2018; Mani & Chouk, 2018) were indicated to negatively affect user's positive attitude towards mobile usage.

In sport context, only few studies examined both motivations and constraints related to

personal device use. To their credit, researchers have explored the motivations and constraints related to various types of technology, such as internet usage (Hur et al., 2007), fantasy sports (Suh et al., 2010), social media (Witkemper, Lim, & Waldburger, 2012), and media consumption (Koronios, Travlos, Douvis, & Papadopoulos, 2020). In a study of sport fan internet usage, Hur, Ko, and Valacich (2007) proposed a model incorporating five types of motivation (i.e., convenience, information, diversion, socialization, and economics), and four types of concern (i.e., security and privacy, delivery, product quality, and customer service). The results from their model test revealed motivation to be a significant predictor of actual usage, while no significant path coefficient was found for the concern constructs and actual usage.

On the contrary, Suh et al. (2010) reported a significant path coefficient from constraints, indicating a negative influence of those constraints on attitudes toward participation in fantasy sports. The identified dimensions of these constraints in their study (e.g., releasing private information, the dangers of malware and viruses, etc.) highlight how internet users' behaviors may change as more people became aware of issues related to internet misuse. This finding was also supported by Witkemper et al. (2012), who reported a negative relationship between sport fans' Twitter usage and technological skills. Specifically, the researchers found that the motivation to follow athletes on Twitter positively affected usage, while constraints related to skill and social elements were negatively related to Twitter consumption. As mentioned above, technological constraints are subject to change depending on users' awareness of harm and their comfort level with variations.

In a recent study examining sport media consumption, Koronios et al. (2020) proposed a model incorporating two types of motivations (i.e., external and internal), and three types of constraints (i.e., intrapersonal, interpersonal, and structural) for spectators watching EuroLeague Basketball at home. The results revealed internal (e.g. attachment to sport, team) and external motivations (e.g. drama, role model) to have a considerable impact on fans' consumption intentions, while intrapersonal (e.g. shyness) and structural constraints (e.g. situational) hindered fans' media consumption. Overall, the findings from previous studies indicate that users' resistance to technology is not in direct opposition to their intention to adopt that technology. Understanding one's resistance behavior is complex as it may be situational and derive from functional barriers or psychological barriers (Mani & Chouk, 2017).

Purpose and Research Questions

Considering various motivations, constraints, and technological perceptions, the current study attempted to take a holistic approach to account for multiple factors contributing to sport consumers' smartphone usage. While the findings from previous studies provided important groundwork in connecting technology and sport consumption, little is known about how motivations, constraints, and technology, would together influence sport fans' smartphone usage. Therefore, it is important to first establish a foundation by identifying underlying factors affecting fans' smartphone usage behaviors in a sport context. Once then, the relationship between underlying factors and actual smartphone usage is examined to capture how each identified factor affects sport fans' smartphone usage behaviors. Following the research aim, these specific research questions were addressed:

RQ1: What underlying factors exist that motivate sport fans to use their smartphones to consume sport content?

RQ2: What underlying factors exist that constrain sport fans' use of their smartphones to

consume sport content?

RQ3: What underlying factors exist that affect sport fans' technological perceptions?

RQ4: What relationships exist among sport consumers' motivations, constraints, technological perceptions, and smartphone usage?

Method

Sample

The target population for this study consisted of sport fans who own smartphones. In order to solicit a sample of consumers likely to be interested in consuming sport via their smartphones, a purposive sampling method was employed. With the purpose of exploring a tech-savvy population, participants had to meet the following inclusion criteria: (a) be over the age of 18, (b) self-identify as a sport fan, and (c) own a smartphone. The sample was drawn from the survey population on MTurk, registered Amazon users.

Instrument and Procedure

The questionnaire included five main sections, measuring: (1) motivations, (2) constraints, (3) technological perceptions, (4) smartphone usage, and (5) demographic information. For the first three sections, a 7-point Likert-type scale was used, anchored by 1 = Strongly Disagree and 7 = Strongly Agree. For the motivations section, the scales were primarily adapted from existing measures of sport consumers' motivations (e.g. Erasmus et al., 2018; Fischer, 2019; Ha et al., 2017; Hardin et al., 2012; Kang et al., 2015; Seo & Green, 2008; Sung et al., 2017; Sjöblom et al., 2019; Li et al., 2019). Specifically, the scale items that were most appropriate for the definition of each motivation, and showed sound psychometric properties were selected based on their reported reliability and validity coefficients. Additionally, considering coinciding motivations in the studies above, the following six salient motivations that were applicable to smartphone usage was adapted: (a) information, (b) communication, (c) entertainment, (d) pass time, (e) fanship, and (f) economics. The wording of the questionnaire that originated from the studies examining online motives was modified to reflect smartphones instead of online usage.

For the constraints section, the scales were primarily adapted from existing measures of technology restrictions (e.g., Chan & Wen, 2019; Sanchez-Prieto, 2019) and sport consumption limitations related to technology use (Hur et al., 2007; Suh et al., 2010; Witkemper et al., 2012). The following six salient constraints were identified: (a) time, (b) lack of interest, (c) skill, (d) security, (e) expense, and (f) technology error. The wording of the survey was modified to assess participants' smartphone usage.

For the technology perceptions section, the scale items were adopted from studies that included items that are specific to the technological mediums (Chien et al., 2019; Ha et al., 2017), as well as research investigating behaviors related to technology acceptance (Davis, 1989). The following four aspects of technology perception were identified: (a) curiosity, (b) media multitasking, (c) ease of use, and (d) usefulness. The technology perception constructs were employed to further analyze sport consumers' behaviors related to smartphone-specific activities.

Two items measuring the frequency and time spent on smartphone use were employed, as suggested by studies measuring technology usage in sport consumption (Ha et al., 2017; Hur et al., 2012; Kang et al., 2015). Participants were also asked to include their sport-related interests as part of the demographic information.

Scale Validation

Considering the exploratory nature of the study and the fact that the scale addressing smartphones is under-researched, the author conducted a series of pretests to ensure the reliability and validity of the scores and readability of the instrument. The pretest procedure followed the guidelines suggested by Dillman (2007). First, a panel of experts reviewed the survey items to establish content validity. These experts were chosen based on their experience in developing survey instruments and familiarity with the research purpose. Second, a field test was administered to graduate students across various disciplines at an urban Midwestern university in the U.S. The field test targeted participants outside of the study population, in order to provide feedback on the overall quality of the scale. The respondents were asked to provide insights into the readability and interpretation of the items, and identify any technical problems with the questions. Third, a small pilot test was conducted using the Qualtrics website; this test involved 54 undergraduate students who owned an Amazon account, and were taken as a representation of MTurk workers. The results of this pilot test allowed the researcher to improve the instrument's internal consistency and implementation procedures. The reliability of the scale was measured by examining the Cronbach's alpha, with a threshold of .70 (DeVellis, 2012).

Results

Description of Respondents

Data were collected from 372 respondents who met the inclusion criteria. Respondents' IP addresses were checked to avoid duplicate survey responses. The sample was composed of 65.05% (n = 242) male and 34.95% (n = 130) female respondents. This level of skewness in terms of gender is commonly found in studies examining technology, as young male individuals often more attracted to technological devices (Ha et al., 2017). The participants' ages ranged from 18 to 70 years old, with an average age of 31 (M = 30.92, SD = 9.65). A total of 33.33% (n = 124) of the respondents indicated an annual household income between $25,000 and $49,999, and 29.30% ($n$ = 109) specified incomes between $50,000 and $99,999. Other respondents (26.61%, n = 99) earned less than $24,999, while 10.75% ($n$ = 40) designated that they earned $100,000 or more.

In terms of sport consumers' smartphone usage, participants were asked to indicate how often they followed their particular sport by using the following functions: official sites, sport-related apps, social media, text messages, push notifications, and emails. The participants were also asked to select all of the categories that applied to their usage. Based on a 7-point Likert scale, the mean scores were 4.92 for official sites (SD = 1.55), followed by 4.37 for sport-related apps (SD = 1.79), 4.35 for social media (SD = 1.96), 3.55 for text messages (SD = 2.01), 3.25 for push notifications (SD = 1.95), and 2.87 for emails (SD = 1.89). The results indicated that the sport consumers queried in this study most frequently utilized official sites (e.g., espn.com, nba.com) to most frequently to follow their favorite sports (see Table 6).

RQ1: What underlying factors motivate sport fans to use smartphones?

Considering the exploratory nature of the study, an EFA was conducted to address RQ1. Prior to conducting the EFA, several assumptions were met, including sample size, normality, linearity, and outliers among the variables. Upon meeting all of the assumptions, four criteria were used to determine the number of factors to retain. These included: (1) a Kaiser's eigenvalue greater than 1.0, (2) Cattell's scree test, (3) the number of items loaded onto each factor, and (4) the amount of total variance explained by the factors (Stevens, 2009). In order to determine the underlying factor structure for sport consumers' motivations related to smartphone usage, a Principal

Component Analysis (PCA) with Varimax rotation was conducted for 19 items. Initially, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .93, indicating sufficient correlation among the variables. In addition, the Bartlett's Test of Sphericity was statistically significant ($\chi^2 = 3899.96$, $df = 171$, $p < .001$), demonstrating the data were appropriate for a factor analysis. The extracted communalities from the PCA ranged from .38 to .88. One of the items (i.e., economics) with a low communality of .38 was removed from the analysis. Additionally, one of the items (i.e., pass time) loaded onto the first factor was a theoretical misfit, since the other pass-time items in this analysis were loaded onto the third factor. Considering the factor structure, the pass-time item was removed from the analysis.

Once these two items were deleted, the 17 remaining were re-examined using the PCA with Varimax rotation. The KMO with .913 and Bartlett's Test of Sphericity ($\chi^2 = 3413.42$, $df = 136$, $p < .000$) were still appropriate for a factor analysis. The extracted communalities ranged between .40 (i.e., economics) and .88 (i.e., occupation time). A total of three factors were retained using the four criteria mentioned above. After employing the Kaiser-Gutterman (2004) retention criterion of eigenvalues greater than 1.0, three factors were retained. Additionally, the scree plot showed a turning point at the third component. The total amount of variance accounted for by the first three principal components' solution was 62.08% (see Table 1).

Table 1

Factor Structure Matrix for Smartphone Consumption Motivations

Motivations	Factor 1 Intrinsic	Factor 2 Social	Factor 3 Diversion	h^2
Enjoyable	**0.79**	0.19	0.27	0.58
Fanship	**0.74**	0.20	0.11	0.60
Useful information	**0.72**	0.16	0.14	0.56
A big fan	**0.69**	0.27	0.15	0.48
Free service	**0.67**	-0.12	0.26	0.53
Exciting	**0.65**	0.36	0.18	0.44
Obtain information	**0.64**	0.11	-0.04	0.56
Learn information	**0.64**	0.30	0.26	0.43
Affordable	**0.60**	0.15	0.11	0.40
Fan in general	**0.55**	0.30	0.30	0.57
Amusing	**0.54**	0.28	0.25	0.73
Share opinion	0.19	**0.85**	0.09	0.76
Debating sport issues	0.13	**0.85**	0.15	0.64
Chat about sports	0.19	**0.84**	0.13	0.77
Discuss sports	0.31	**0.73**	0.12	0.76
Passes time	0.24	0.17	**0.89**	0.87
Occupy time	0.27	0.20	**0.88**	0.88
Eigenvalues	7.46	1.90	1.20	
Percentage of Variance	43.86	44.18	7.04	
Internal Consistency (α)	0.90	0.88	0.89	

Note: h^2 = communalities. Factor structure coefficients of .40 or higher are in bold.

Specifically, the first factor had 11 items, including three each from the entertainment, fanship, and information motivation categories. There were also two from the economic motivation

area, which together were named intrinsic motivations. Intrinsic motivations are most commonly considered to be any behaviors driven by internal reward (Coon & Mitterer, 2010). The second factor included four items from communication and were named social motivations. The third factor was comprised of two items that focused on sport consumers' motive to occupy their time by using smartphones to follow sports; therefore, this factor was titled diversion motivations.

RQ2: What underlying factors constrain sport fans from using their smartphones?

In order to address RQ2, sport consumers' constraints related to smartphone usage were examined using PCA, with a Varimax rotation for 18 items. Initially, the KMO measure of sampling adequacy was .89, and the Barlett's Test of Sphericity was statistically significant ($\chi^2 = 2898.67$, $df = 153$, $p < .001$). The communalities extracted from the PCA ranged from .10 (i.e., time constraints) to .81 (i.e., not trusting the security). The time constraint item, with its low communality of .10, was removed from the analysis.

Once the time constraint item was deleted, the 17 remaining were examined again using PCA with a Varimax rotation. The KMO of .89 and Bartlett's Test of Sphericity ($\chi^2 = 2845.14$, $df = 136$, $p < .001$) were appropriate for a factor analysis. The communalities extracted ranged between .40 (i.e., a lack of skill) and .81 (i.e., not trusting the security). A total of three factors were retained, using the four criteria mentioned above. Applying the retention criterion of eigenvalues greater than 1.0, these three factors were again retained. Additionally, using the graphical method of Cattell's (1966) scree test, the three-factor structure was supported because it showed the turning point to be at the third component on the scree plot. The total amount of variance accounted for by the first three principal components was 58.32% (see Table 2).

Table 2 *Factor Structure Matrix for Smartphone Consumption Constraints*

Constraints	Factor 1 Personal	Factor 2 Security	Factor 3 Technology	h^2
Difficulty	**0.74**	0.14	-0.06	0.56
Not enough time	**0.72**	0.11	-0.13	0.54
Busy	**0.72**	0.16	-0.12	0.55
Lack of skill	**0.69**	0.13	-0.01	0.40
Requires money	**0.69**	0.27	-0.05	0.55
Not attractive	**0.66**	0.11	-0.39	0.51
Not interested	**0.65**	0.12	-0.43	0.55
Price	**0.65**	0.29	0.06	0.51
Expense	**0.63**	0.36	-0.08	0.54
Not enjoying	**0.63**	0.10	-0.39	0.59
Technical skill	**0.61**	0.09	0.15	0.50
Personal security	0.19	**0.88**	0.01	0.60
Information security	0.25	**0.85**	0.01	0.79
Not feeling secure	0.23	**0.74**	-0.07	0.81
Connection error	-0.05	-0.09	**0.81**	0.63
Technical error	-0.08	0.05	**0.71**	0.67
Eigenvalues	6.32	2.15	1.44	
Percentage Variance	37.17	12.66	8.50	
Internal Consistency	0.90	0.83	0.72	

Note: h^2 = communalities. Factor structure coefficients of .40 or higher are in bold.

Specifically, the first factor included 11 items from the skill, time, lack of interest, and expense constraints. Considering the characteristics of the items related to one's preferences, the first factor was named personal constraints. The second included three items from security concerns, and thus was named security constraints. The third factor included items from concerns about errors in the technology, and therefore was named technology constraints.

RQ3: What underlying factors exist that capture sport fans' technological perceptions?

Sport consumers' perceptions regarding smartphones were also examined using PCA with a Varimax rotation for 12 items. Initially, the KMO measure of sampling adequacy was .93 and Barlett's Test of Sphericity was statistically significant (χ^2 = 2477.08, df = 78, p < .000). The communalities extracted from the PCA were fairly high, ranging from .48 (for media multitasking) to .70 (for ease of use). Two factors were retained using the four criteria mentioned above. Applying the retention criterion of eigenvalues greater than 1.0, two factors were retained; the eigenvalues were 6.47 for the first and 1.35 for the second. Additionally, the graphical method of Cattell's (1966) scree test supported this decision, with two factors lying above the elbow on the scree plot. The total amount of variance accounted for by the first two principal components was 60.25% (See Table 3).

Table 3 *Factor Structure Matrix for Perceptions of Smartphones*

	Factor 1	Factor 2	
Technological Perceptions	Hedonic	Utilitarian	h^2
Cool new way	**0.74**	0.10	0.54
Discover new things	**0.73**	0.29	0.66
Exploring new function	**0.72**	0.37	0.62
Multitasking while chatting	**0.71**	0.16	0.56
Recommendation	**0.70**	0.21	0.48
Quality	0.65	**0.41**	0.70
Multitasking with other media	**0.64**	0.26	0.51
Multitasking with other activities	**0.64**	0.32	0.52
Easy to work with	0.15	**0.82**	0.69
Clear function	0.19	**0.82**	0.70
Easy to use	0.29	**0.79**	0.60
Useful	0.39	**0.70**	0.64
Assist my fan lifestyle	0.44	**0.64**	0.60
Eigenvalues	6.48	1.36	
Percentage Variance	49.82	10.43	
Internal Consistency	0.88	0.86	

Note: h^2 = communalities. Factor structure coefficients of .40 or higher are in bold.

The items in the first factor originally included four items from perceived curiosity, three from perceived media multitasking, and one from perceived usefulness. However, an item from perceived usefulness (i.e., quality) was cross-loaded onto the first (.65) and second (.41) factors. In cases such as this, the items are usually loaded onto the factors with the highest coefficients. In consideration of the TAM's reliable and valid framework (Davis, 1989) that proposed three items for the perceived usefulness construct, the decision was made to keep all of the items from perceived usefulness together in the second factor. Statistically, loading one item onto the second factor had minimal effect, as the Cronbach's alphas for eight items (α = .88) and seven items (α = .86) indicated

acceptable internal consistency (Nunnally & Bernstein, 1994). Therefore, a total of seven items were loaded onto the first factor and six were loaded onto the second. (See Table 4).

Table 4 *Means, Standard Deviations, and Alpha Coefficients*

Types	Factors	*M*	*SD*	α
Motivations	Intrinsic	5.45	1.18	0.90
	Diversion	5.10	1.02	0.89
	Social	4.61	1.02	0.88
Technological Perceptions	Utilitarian	5.62	0.84	0.87
	Hedonic	5.04	0.99	0.86
Constraints	Technology	5.49	1.09	0.72
	Security	3.60	1.04	0.83
	Personal	2.58	1.45	0.90

Considering the nature of the items included in these factors, the first was named hedonic perceptions. According to Ahtola (1985), hedonic perceptions in consumer behavior studies are often referred to as pleasure experienced or expected by performing a behavior. Similar to prior study, media multitasking behavior in the current study refers to the combination of "traditional multitasking and action to switch between devices" (Ha et al., 2015, p. 162). While the action may be perceived as utilitarian, media multitasking behavior is often observed among fans who wishes to enjoy their favorite game to its full potentials or to divert (e.g. seeking for additional way to entertain) their attention from the game. Thus, the decision was made to keep the items in the first factor. The second factor consisted of a total of six items, three each from perceived usefulness and ease of use. Combining these two perceptions, the second factor was named utilitarian perceptions. The utilitarian aspect of consumer behavior relates to the "usefulness, value, and wiseness of the behavior as perceived by the consumer" (Ahtola, 1985, p. 8).

RQ4: What relationships exists among sport consumers' motivations, constraints, technological perceptions, and smartphone usage?

A multiple regression analysis was utilized to identify factors useful in predicting sport consumers' actual use. Prior to analyzing the data, assumptions of multiple regression, including independence, linearity, homoscedasticity, normality of residuals, multicollinearity, and outliers were all checked (Stevens, 2009). The assumption of independence was met by using the IP addresses of the respondents. Other assumptions were also verified using residual plots, as well as a histogram, Variance Inflation Factor (VIF) analysis, and Cook's distance value. Upon meeting all of the assumptions, the researcher proceeded with the analysis.

The effect of smartphone usage frequency on the set of predictor variables was statistically significant, $F(8, 359) = 53.65$, $p < .01$, $R^2 = .55$. The standardized coefficient (β) indicated that intrinsic motivations (β = .27) explained the most variance, followed by personal constraints (β = -.22), hedonic perceptions (β = .20), and utilitarian perceptions (β = .15). Social motivations ($b = .00$, $t = -.08$, $p = .93$), diversion motivations ($b = .01$, $t = .31$, $p = .76$), security constraints ($b = .01$, $t = 1.04$, $p = .30$), and technology constraints ($b = .02$, $t = 1.28$, $p = .20$) were not statistically significant (see Table 5).

Table 5 *Predictors of Smartphone Usage*

	R^2	*SE*	*b*	β	*t*	Cook's D	Leverage
	0.55					0.003	0.022
Intrinsic		0.01	0.03**	0.27	3.45		
Social		0.01	0.00	0.00	-0.08		
Diversion		0.02	0.01	0.01	0.31		
Personal		0.01	-0.02***	-0.22	-4.17		
Security		0.01	0.01	0.04	1.04		
Technology		0.02	0.02	0.05	1.28		
Hedonic		0.01	0.03**	0.20	2.89		
Utilitarian		0.02	0.03*	0.15	2.11		

Note: * = $p < .05$; ** = p <.01; and *** = $p < .001$

Table 6
Communication Channels

	M	*SD*	*N*
Official sites	4.92	1.55	372
Sport-related apps	4.37	1.79	372
Social media	4.35	1.96	372
Text messages	3.55	2.04	372
Sport fan community	3.42	1.88	372
Push notifications	3.25	1.95	372
Emails	2.87	1.89	372

Discussion

The current study presents a holistic approach to examining sport consumers' motivations, constraints, and technological perceptions related to smartphones. Using EFA, the current study laid the theoretical foundation necessary to identify three factors each for motivations (i.e., intrinsic, social, and diversion) and constraints (i.e., personal, security, and technology), as well as two factors for technological perceptions (i.e., hedonic and utilitarian). This study also expanded upon the previous sport consumption literatures by examining fans' specific behaviors involving the smartphone technology.

Practically, with the growing global fan base, sport managers are constantly challenged to find innovative ways of encourage digital fans' involvement and interaction. Therefore, the current study provides information necessary to those seeking to further enhance current and new sport consumers' experiences. Based on the findings from this study, we first recommend choosing the right communication channel to disseminate news and messages. Participants in this study indicated that the use of official sites, sport-related apps, and social media were their primary communication channels for following their sport of choice. Considering this finding, sport managers should re-examine their organization's mobile websites, paying special attention to the team's official site. Reflecting upon today's media consumption trends, an organization's official sites should be optimized for global smartphone consumers by creating mobile content that is unique to smartphone users in multiple languages.

Second, we encourage sport managers to closely examine factors that most influence sport fans' smartphone usage including intrinsic motivations, hedonic, and utilitarian percpetions that are significant predictors of fans' actual usage. Depending on the intended use of an app or mobile website, practitioners should make a careful decision on determining what factors to emphasize to help promote fan engagement. By using the already built-in smartphone functions, practitioners are able to offer fun and pleasurable experiences, while encouraging the intrinsic motivations. For instance, sport managers should seek out cost-effective options of updating their media campaigns by encouraging sport fans to use their smartphones as second or third screens, thus embracing fans' hedonic perceptions.

Lastly, sport managers should work with mobile developers to find ways of minimizing the factors constraining the use of smartphone technology. The current study's participants indicated that a lack of skill and interest, insufficient time, and prohibitive levels of expense all discouraged actual smartphone use. Although creative approaches to mobile marketing that encourage sport consumers' motivations are expected to counter these constraining factors, practitioners should consider User Experience (UX) design approaches to reduce potential constraints. For example, an increase in app usage often occurs when developers provide short and precise on-screen instructions for first-time users of their apps (Babich, 2017). Sport managers could take the UX design approach by educating sport consumers on how best to utilize their smartphones on the game day to enhance their fan experience both on and off the field. Additionally, finding ways to simplify organizations' current apps and mobile websites will also reduce users' constraints.

Conclusion

In conclusion, understanding sport fans' technology consumption behavior is a complex process. Thus, sport managers should establish clear goals for digital global campaigns. If one such goal is to encourage intrinsic motivations by providing useful information, the approach should provide convenient and easy ways (e.g., push notifications, text messages) to enhance utilitarian perceptions when fans access the disseminated information. Having clear goals in mind and developing ways to integrate intrinsic motivations, personal constraints, and hedonic and utilitarian perceptions will allow sport managers to take advantage of the resources available to the global sport fanbase.

In bridging the gaps between technology and sport consumption, the current study has demonstrated ways to holistically address multifaceted factors relevant to sport fans' smartphone use. Previously. Based on the findings of the current study, parsimonious factors have been provided based on the motivations, constraints, and technological perceptions related to various types of medium (Chan-Olmsted & Xio, 2019; Koronios et al., 2020; Li et al., 2019; Sung et al., 2017; Sjöblom, et al., 2012; Suh et al., 2010; Witkempter et al., 2012). Although exploratory in nature, the present work will serve as a foundation for future studies attempting to adopt or integrate theories of sport and technology with the goal of better understanding sport fans' consumption behaviors related to smart devices.

Limitations and Future Research

Due to the exploratory nature of this study, limitations exist. The participants in the study were sport fans and smartphone users. These users were not separated into categories based on the sports they followed or how they used their smartphones (e.g., participants using their device, spectators using their device, etc.). If participants were separated into different categories depending

on the purpose of their usage, the results might be different. In addition, no distinctions were made between how sport fans used their smartphones during the on and off seasons. Sport fans may use their smartphones differently depending on the season, and the time of data collection may have influenced their responses. In future studies, researchers should develop additional questions to solicit sport-specific data during the on and off seasons.

To date, our understanding of sport consumption using smart technology is limited, as the majority of the studies examining such behaviors are only identifying motivating factors that influence actual usage (Chan-Olmsted & Xiao, 2019; Erasmus et al. 2018; Ha et al., 2015, 2017; Kang et al., 2015). With the limitation, the current study addressed smartphone usage as a general concept without considering how participants approached the sport content (i.e. software, hardware, apps, etc.). Understanding how sport fans utilize technology specifically may contribute to identify variance in actual usage. Furthermore, in order to advance our understanding of technology use in sport, it is important to consider both sport fans who use and don't use smartphones in sport context, especially considering the constraining aspect of technology use.

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Do Stadium Naming Rights Announcements Impact Stock Prices: A Note on the Japanese Experience

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Since the 2002 FIFA World Cup in South Korea and Japan, we have witnessed an increasing number of stadium naming rights deals in Japan. This paper contributes to the literature by examining the market value of naming rights sponsorship beyond the North American experience. We assess the impact of 36 Japanese naming rights deals from 2003 to 2020 on the corporate sponsor`s stock price. The corporate sponsor stock returns are regressed on naming rights announcement dummy variables in a time series regression. Our findings note that the market reacted to the naming rights deal at the time of official announcement only in select cases consistent with the findings in Leeds et al. (2007) for the US market.

***Keywords*:** Naming Rights, Stadiums and Arenas, Sports Finance

Introduction

Stadium naming rights emerged as a contentious issue when Mitsui Fudosan, a major real estate development company, announced its tender offer bid (TOB) for Tokyo Dome Corp., the corporate owner of the Tokyo Dome - home to the Yomiuri Giants baseball team. A naming rights deal was estimated to generate 0.6 billion yen in annual profits (Oasis, 2020; Hongo & Takezawa, 2021). Recent stadium development projects in Japan, as exemplified in the proposal to renovate the Tokyo Dome by Mitsui Fudosan and the Hokkaido Ballpark F Village, will require stable cash flows to finance construction and renovation. Stadium naming rights offer one potentially attractive way to generate such cash flows (Gilliland et al., 2003). Thus, attaining a deeper understanding of the value created by a naming rights deal in order to attract corporate sponsors is an important issue in the business of professional sport.

The history of stadium naming rights in Japan dates back to 2003 when Ajinomoto Co., a recognized consumer foods industry leader, purchased the naming rights to Tokyo Stadium, consummating the first naming rights deal for a publicly owned sports facility in Japan. The stadium, located in western Tokyo, is the product of a Japanese-styled third sector project (Yoshimoto, 2006). Its development was jointly funded by the Tokyo Metropolitan government and private companies such as Keio Railways. As part of the efforts to privatize public facilities in the early 2000s, the Governor of Tokyo required Tokyo Stadium K.K., the stadium owner, to cover all maintenance and personnel expense independent of government support. In response to this privatization policy, Tokyo Stadium K.K. began exploring the possibility of marketing its naming rights to secure a stable source of revenue. Another factor that triggered the widespread acceptance of naming rights was the 2002 FIFA World Cup co-hosted by South Korea and Japan. In the aftermath of the event, owners of several newly constructed stadiums sought out naming rights sponsors to defray the cost of

ongoing maintenance and operations (Nakamura, 2008). Hatakeyama (2020) reports some 80 % of the municipal and local governments introduced naming rights for public facilities to generate revenues for their respective budgets.

An important issue in financing stadiums in Japan is the need for stable cash flows to renovate aging facilities and cover maintenance costs. Naming rights provides an opportunity to generate such stable cash flows. However, in order to attract corporate sponsors, the naming right should be of benefit to the sponsoring firm. This begs the question of whether naming rights is an attractive and effective mode of advertising for corporate sponsors. In an informationally efficient market, we expect stock prices to react to the unexpected news of a naming rights announcement, to the extent investors perceive the naming rights deal as an effective way to improve profitability for the corporate sponsor company. It follows that a positive market reaction to the naming rights announcement signals indirect evidence that the acquisition of naming rights is a net present value positive investment for the sponsoring firm. Therefore, the purpose of this study is to examine whether sponsoring stadium naming rights impact the stock price of the corporate sponsor. Yet there is a dearth of empirical research related specifically to the Japanese stadium naming rights market. This paper aims to fill this void in the academic literature by documenting the market reaction to naming rights deals for J League football and Nippon Professional Baseball venues. To the authors` knowledge, this is the first paper to focus exclusively on the impact of stadium naming right sponsorship deals on stock prices using Japanese data. While our preliminary empirical evidence indicates naming rights impact stock prices for a select sample of corporate sponsors, on balance, we find little evidence suggesting markets react to the announcement of a naming rights deal for sport venues in Japan from 2003 to 2020.

Literature Review

The academic literature has addressed the merits of naming rights deals for corporate sponsors in North America within the context of an event study. Clark et al. (2002) posit that the market will react positively to naming rights deal announcements because of the potential benefits that accrue to the corporate sponsor. These benefits include but are not limited to increased brand awareness and image enhancement, a less cluttered communication environment, and improved brand positioning. A favorable impression of the corporate sponsor could lead to increased sales and revenue growth, validating the acquisition of naming rights as a worthy net present value positive investment. To date, the empirical evidence on this specific research agenda remains mixed. Mishra et al. (1997) is one of the first studies to address how the stock market assesses the economic worth of sponsorships in sports business. From a sample of 76 sponsor firms, including stadium naming rights acquisitions and sponsorships for sporting events, they find evidence supporting the hypothesis that the market reflects the information contained in a sponsorship announcement. While Mishra et al. (1997) include 30 naming rights deals, they do not discern the impact of naming rights from other forms of sponsorship. In a comprehensive study of some 699 sports sponsorship deals worldwide, Reiser et al. (2012) find that sport sponsorship announcements positively impact stock returns on average. When segmented by geographic region, their analysis reveals that sponsorship announcements are perceived negatively in the Asia Pacific region and claim this is due to the low volume and value of sponsorship deals compared to Europe and North America. However, naming rights deals accounted for just 7% of their sample, making it difficult to draw

specific conclusions on naming rights sponsorship.

Two of the earliest studies on stadium naming rights are Clark et al. (2002) and Becker-Olsen (2003) which examine 49 and 39 deals respectively across the four major US professional team sports, using samples drawn primarily in the 1990s. Both studies provide evidence suggesting a positive impact of news on stock prices. In contrast, Leeds et al. (2007) arrive at a different conclusion and find little evidence the market reflects the news of a naming rights deal on the day of the announcement apart from a few cases. The apparent conflict of their findings with previous research could be partly due to the difference in the samples they investigated. Thirteen deals covered in the Leeds, et al. (2007) study are absent from the Clark et al. (2002) and Becker-Olsen (2003) samples. While the difference in the empirical results can be attributed to the data and methodology used in the respective studies, Leeds et al. (2007) find that if their announcement effects are averaged over the entire data set, they reach similar conclusions to Clark et al. (2002). However, Leeds et al. (2007) further observe that this averaged positive impact on stock prices is due to the disproportional impact of several statistically significant positive cases. This implies that a few large positive abnormal returns could be driving the conclusions drawn by Clark et al. (2002) and Becker-Olsen (2003).

The conflicting findings in the earlier literature call for the use of more recent data to shed light on conclusions drawn. Cao and Trifts (2013) uses an updated data set to provide further empirical evidence negating the impact of naming rights sponsorship on stock prices reinforcing the conclusions reached by Leeds et al. (2007). Goldberg et al. (2019) make use of an extensive data set which includes 122 usable announcements. They find the announcement impacts stock prices on average for naming rights prior to 2001, but document the impact disappears after 2001.

Eisdorfer and Kohl (2017) take an alternative approach that incorporates on-field performance data which could provide a different perspective on the issue. Instead of examining the direct impact of the announcement on stock returns, they tackle the issue by observing how the outcome of NFL matches played in the home stadium impact the stock price of the corporate sponsor of the home stadium naming rights. If fans or the local community identify with the team, it is plausible that a winning home team could drive up the market value of the corporate sponsor (Clark et al., 2002).

We find empirical research examines different subsets of naming rights deals in overlapping years arriving at disparate conclusions on whether the news of naming rights deal is reflected in the market. Due to the lack of consensus in the empirical literature on the US market for stadium naming rights, turning our attention to the Asia Pacific could reveal additional insights into the impact of naming rights on the market value of corporate sponsors.

Method

To test if the market reacts to information on a naming rights deal, we regress daily log relative stock returns of the corporate sponsor on a set of naming rights announcement date dummy variables. This approach is similar in spirit to that of Leeds et al. (2007). Our specification, however, focuses solely on the official announcement date and the two days prior to the announcement date for a window of three days. The model estimated in this paper is consistent with the regression model specification used to examine the impact of match outcomes, wins and losses, on stock

returns for listed football clubs and national teams (Edmans et al., 2007; Dhiba & Takezawa, 2020). The regression model is specified as

$$R_{it} = \beta_{i0} + \alpha_i R_{it-1} + \sum_{\tau=t-1}^{t+1} \beta_{M\tau} R_{M\tau} + \sum_{\tau=-2}^{0} \beta_{D\tau} D_\tau + \varepsilon_{it} \quad (1)$$

where R_i is the return on ith corporate sponsor stock, R_M, is the return on the market index, and ε_{it} is the error term at time t. We expand on the Leeds et al. (2007) specification by including a lagged sponsor company stock return, R_{t-1}, to control for autocorrelation in daily stock return data (Hawawini & Keim, 1995) and a one-day lead and lag for the market index return to accommodate for non-synchronous trading (Dimson, 1979). D is a dummy variable taking on a value of 1 on the announcement day. A statistically significant positive estimate for β_{D0} $(\tau = 0)$ suggests the market reflects the contemporaneous impact of news of the naming rights deal. As the final decision on a naming rights deal is made just prior to the official announcement, we include a second dummy variable one day prior to the announcement date $(\tau = -1)$ and a third dummy variable for two days prior the announcement day $(\tau = -2)$ to control for the possibility of information reaching the market prior to the official announcement date. We do not include post-announcement dummy variables since it is difficult to ascertain whether stock prices are reacting to the naming rights announcement or to the arrival of news other than the naming rights announcement.

The official naming rights announcement dates and related information were collected manually from a database supported by Sportcal, a sport market intelligence company, and an extensive online search for press releases and newspaper articles, resulting in a total of 117 deals. In this study, we restrict our sample to agreed naming rights prices of at least 10 million yen per year as Reiser et al. (2012) suggest low values in sponsorship deals could affect the empirical results. The event study requires that the sponsor company be listed at the time of the event and estimation window. This further narrowed our sample down to 36 naming rights announcements for 31 different stadiums between 2003 and 2020 (Table 1).

The corporate sponsors are based in Japan and from various industries, including food products, utilities, financial services, manufacturing, and retail. Since most of the sport venues are owned and operated by the local government, the corporate sponsors in the sample are usually required to have their headquarters or operations in that municipality or surrounding area. The sponsors are often required to demonstrate a clear commitment to the development of the local community to secure the deal. This poses a substantial challenge for non-local regional or multinational corporations headquartered abroad to qualify as a potential sponsor from the outset. Corporate sponsors will generally echo such sentiments of the importance of establishing and promoting local community relationships in press releases or news media, making this a unique feature of Japanese naming rights deals. This form of regional identification with the sponsor is important for building and fostering relationships with the local community (Cornwell & Maignan, 1998) and fans (Woisetschlager et al., 2014; Gillooly et al, 2020).

Privately held stadiums such as the Sankyo Frontier Kashima Stadium owned by Hitachi and the Yamaha Stadium owned by Yamaha Motor Co. where the naming rights corporate sponsor is the facility owner, are excluded from the sample. Thirty-four of the naming rights deals are for the home stadiums of Nippon Professional Baseball and J League football teams while the two remaining ones are for the home arena of a B League basketball team and a professional Keirin cycling stadium. The average length of a naming rights deal is 4.4 years, with a range between two years and 10 years. In our sample, corporate sponsors paid an average annual price of approximately

113 million Japanese yen per year, ranging from 10 million yen to 500 million yen.

Table 1

Venue Naming Rights Deals

Venue Name	Sponsor Company	Sport League	Year	Length of Deal (Years)	Annual Price (Million Yen)
Ajinomoto Stadium	Ajinomoto	J League	2002	5	240
Home`s Stadium Kobe	Lifull	J League	2003	3	70
Yahoo! BB Stadium	Softbank Group	NPB	2003	2	100
Nissan Stadium	Nissan	J League	2004	5	460
Fukuda Denshi Arena	Fukuda Denshi	J League	2005	3	150
Fullcast Stadium Miyagi	Fullcast Holdings	NPB	2005	3	200
Skymark Stadium	Skymark Airlines	NPB	2005	3	66.667
Yahoo! Japan Dome	Yahoo! Japan	NPB	2005	5	500
Yurtec Stadium Sendai	Yurtec	J League	2006	3	70
Kyocera Dome Osaka	Kyocera	NPB	2006	5	NA
Hotto Motto Field	Plenus	NPB	2007	3	35
ND Soft Stadium Yamagata	ND Soft	J League	2007	3	12
NHK Spring Mitsuzawa Football Stadium	NHK Spring Company	J League	2008	5	80
Mazda Zoom-Zoom Stadium	Mazda	NPB	2008	5	220
Tohoku Denryoku Big Swan Stadium	Tohoku Electric Power	J League	2009	3	120
K`s Denki Stadium Mito	K`s Denki	J League	2009	5	21
Hardoff Echo Stadium Niigata	Hardoff	J League	2009	5	30
Oita Bank Dome	Oita Bank	J League	2010	3	40
Okinawa Cellular Stadium Naha	Okinawa Cellular	NPB	2010	2	12
Yamanashi Chuo Bank Stadium	Yamanashi Chuo Bank	J League	2012	5	10
Edion Stadium Hiroshima	Edion	J League	2012	3	33
Denka Big Swan Stadium	Denka Kagaku Kogyo	J League	2013	2	70
Noevir Stadium Kobe	Noevir	J League	2013	3	65

(next page)

Table 1

Venue Naming Rights Deals (continued)

Venue Name	Sponsor Company	Sport League	Year	Length of Deal (Years)	Annual Price (Million Yen)
Toho Minna no Stadium	Toho Bank	J League	2013	5	10
Rakuten Kobo Stadium Miyagi	Rakuten	NPB	2013	2	20.1
Yamada Green Dome Maebashi	Yamada Denki (2014)	Cycling	2014	5	12
Edion Arena Osaka	Edion	B League	2015	3	21
Transcosmos Stadium Nagasaki	Trancosmos	J League	2016	3	10
Mikuni World Stadium Kitakyushu	Mikuni World Holdings	J League	2016	3	30
ZOZO Marine Stadium	ZOZOTOWN	NPB	2016	10	310
Panasonic Stadium Suita	Panasonic	J League	2017	5	216
Showa Denko Dome Oita	Showa Denko	J League	2018	5	50
Sanga Stadium by Kyocera	Kyocera	J League	2019	10	100
Takebishi Stadium Kyoto	Takebishi	J League	2019	10	40
Best Denki	Yamada Denki (2020)	J League	2020	3	36
EsCon Field Hokkaido	EsCon	NPB	2020	10	500

The descriptive statistics for the daily sponsor company stock returns over each of the sample periods examined in this paper are summarized in Table 2. We employed the TOPIX index, which includes all stocks traded on the first section of the Tokyo stock exchange, as a proxy for the market index. A separate regression is estimated for each sponsor company using ordinary least squares. We apply an estimation window of 60 days prior to and 60 days after the announcement date for a total of 121 observations for each regression (Table 3). A second set of regressions is estimated over a wider window of 241 observations ranging from t = -120 to t = +120 days in order to gauge the robustness of our findings. Lifull was a noted exception as it was only listed a few months prior to the naming rights announcement, and consequently there was insufficient data to estimate the model over for the extended window of 241 observations (Table 4). As an additional check for the robustness of our findings, we repeated the procedure using the Nikkei 225 stock index (Table 5).

Table 2

Descriptive Statistics of Sponsor Company Stock Returns

Sponsor Company	Mean (121 day)	SD (121 day)	Mean (241 day)	SD (241 day)
Ajinomoto	0.024	1.148	-0.046	1.327
Lifull	-0.428	4.461	NA	NA
Softbank Group	0.206	3.463	0.549	4.389
Nissan	-0.03	1.195	-0.025	1.249
Fukuda Denshi	0.079	1.923	0.002	2.217
Fullcast Holdings	0.090	3.146	0.02	3.184
Skymark Airlines	0.493	5.721	0.077	4.637
Yahoo! Japan	-0.01	1.544	0.009	1.866
Plenus	-0.065	1.953	-0.002	1.595
Yurtec	0.032	1.345	-0.021	1.602
Kyocera (2006)	0.1	2.056	0.111	1.855
ND Soft	-0.352	2.431	-0.422	2.477
NHK Spring	-0.097	2.575	-0.209	2.765
Mazda	-0.777	6.194	-0.339	5.279
Tohoku Electric	0.074	1.544	0.031	1.35
K`s Denki	0.213	2.434	0.343	2.665
Hardoff	0.213	1.601	0.116	1.734
Oita Bank	-0.108	1.295	-0.168	1.457
Okinawa Cellular	0.083	1.021	-0.027	1.145
Yamanashi Chuo	0.164	1.689	-0.032	1.841
Edion (2012)	0.057	1.909	0.086	2.249
Denka Kagaku	0.232	1.889	0.038	2.278
Noevir	0.248	1.372	0.242	1.785
Toho Bank	0.042	2.212	0.06	1.719
Rakuten	-0.061	2.789	0.033	2.602
Yamada Denki (2014)	0.16	2.298	0.007	2.226
Edion (2015)	-0.138	1.832	0.064	1.807
Trancosmos	-0.019	0.774	0.004	0.933
Mikuni World	0.293	2.457	0.275	2.662
ZOZOTOWN	0.387	2.468	0.238	2.322
Panasonic	-0.196	1.376	-0.172	1.481
Showa Denko	-0.275	3.285	0.051	3.042

(next page)

Table 2

Descriptive Statistics of Sponsor Company Stock Returns (continued)

Sponsor Company	Mean (121 day)	SD (121 day)	Mean (241 day)	SD (241 day)
Kyocera (2019)	0.033	1.287	0.113	1.315
Takebishi	-0.040	1.572	0.038	1.466
Yamada Denki (2020)	0.003	2.740	0.002	2.321
EsCon	-0.292	2.839	0.084	2.582

Note: daily log relative returns in percentage form: mean and standard deviation (SD) for 121 day (-60 to +60 days) and 241 day (-120 to +120) estimation periods.

Results and Discussion

A summary of estimated coefficients for the three announcement dummy variables and the contemporaneous market beta coefficient from regression model 1 are presented in Tables 3 and 4. The lead-lag market beta coefficients and constant are not reported but available from the authors upon request. We obtained positive estimates for the coefficient on the announcement date dummy variable for more than half of the stadium naming rights (Tables 3 and 4). However, we find only four out of 33 cases exhibit a statistically significant positive announcement impact on stock returns in the t = -60 days to t = +60 days window sample period (Table 3).

Table 3

Regression Model (1) *for -60 days to +60 day Estimation Period*

Sponsor Company	Market Beta	D (τ=0)	D (τ= -1)	D (τ= -2)	R^2	DW
Ajinomoto	0.21 (0.008) [a]	-0.94 (0.311)	0.73 (0.433)	0.45 (0.638)	0.1	1.97
Lifull	1.45 (0.000) [a]	1.36 (0.757)	-2.08 (0.639)	2.5 (0.571)	0.06	1.98
Nissan	0.91 (0.000) [a]	-0.3 (0.746)	-0.57 (0.550)	-0.73 (0.451)	0.38	1.98
Softbank Group	1.46 (0.000) [a]	-5.27 (0.091) [c]	-1.99 (0.518)	-2.32 (0.456)	0.23	1.98
Fukuda Denshi	0.44 (0.05) [b]	0.32 (0.868)	-1.88 (0.331)	-1.12 (0.569)	0.01	2.02
Fullcast Holdings	0.94 (0.013) [b]	-1.85 (0.555)	0.98 (0.756)	1.98 (0.531)	0.02	1.99
Skymark Airlines	0.83 (0.226)	7.34 (0.198)	6.77 (0.232)	7.17 (0.204)	0.07	1.96

(next page)

Table 3

Regression Model (1) *for -60 days to +60 day Estimation Period (continued)*

Sponsor Company	Market Beta	D (τ=0)	D (τ= -1)	D (τ= -2)	R^2	DW
Yahoo! Japan	1.13 (0.000) [a]	-0.7 (0.586)	3.16 (0.013)[b]	0.68 (0.596)	0.36	1.96
Plenus	0.93 (0.000) [a]	-0.58 (0.64)	-0.05(0.97)	0.35 (0.78)	0.59	1.95
Yurtec	0.8 (0.000) [a]	0.04 (0.965)	-0.65 (0.519)	-0.151 (0.882)	0.48	2.01
Kyocera (2006)	1.01 (0.000) [a]	-0.61 (0.711)	-1.13 (0.496)	-0.41 (0.802)	0.38	1.96
ND Soft	0.23 (0.343)	0.55 (0.832)	-1.6 (0.522)	1.27 (0.615)	0.001	2.01
NHK Spring	1.26 (0.000) [a]	-1.47 (0.449)	-2.69 (0.17)	-1.2 (0.547)	0.46	1.97
Mazda	1.39 (0.000) [a]	-1.21 (0.779)	-3.07 (0.48)	4.92 (0.256)	0.53	2.01
Tohoku Electric	0.96 (0.000) [a]	2.78 (0.019)[b]	-0.89 (0.447)	-2.09 (0.079)[c]	0.44	2.02
K`s Denki	0.73 (0.000) [a]	3.27 (0.182)	0.23 (0.924)	0.27 (0.91)	0.08	1.98
Hardoff	0.25 (0.003) [a]	0.71 (0.662)	-0.85 (0.592)	-0.02 (0.989)	0.02	1.99
Oita Bank	0.69 (0.000) [a]	0.72 (0.494)	0.53 (0.617)	1.12 (0.287)	0.36	2.02
Okinawa Cellular	0.2 (0.012) [b]	-0.35 (0.729)	0.25 (0.804)	0.39 (0.705)	0.02	1.99
Yamanashi Chuo	1.12 (0.000) [a]	-0.58 (0.635)	3.86 (0.006) [a]	7.79 (0.000) [a]	0.55	1.98
Edion (2012)	0.93 (0.000) [a]	-0.39 (0.809)	-1.53 (0.354)	-0.76 (0.647)	0.28	1.93
Denka Kagaku	1.06 (0.000) [a]	-0.90 (0.525)	-0.76 (0.593)	-0.94 (0.513)	0.46	1.99
Noevir	0.39 (0.000) [a]	0.06 (0.961)	-1.89 (0.14)	-0.6 (0.643)	0.15	1.97
Toho Bank	0.95 (0.000) [a]	0.61 (0.648)	1.94 (0.152)	2.28 (0.092) [c]	0.65	2.09
Rakuten	0.88 (0.000) [a]	0.32 (0.9)	-0.61 (0.815)	-3.09 (0.24)	0.15	2.05
Yamada Denki (2014)	0.57 (0.000) [a]	0.48 (0.826)	0.63 (0.773)	-1.26 (0.57)	0.07	1.95
Edion (2015)	0.56 (0.000) [a]	1.92 (0.248)	-0.21 (0.896)	-0.004 (0.998)	0.2	1.99
Trancosmos	0.51 (0.000) [a]	0.43 (0.51)	0.78 (0.287)	0.08 (0.912)	0.14	1.97
Mikuni World	1.14 (0.000) [a]	2.16 (0.309)	-2.29 (0.279)	-0.55 (0.794)	0.27	1.98
ZOZOTOWN	0.52 (0.018) [b]	3.83 (0.103)	2.86 (0.234)	-0.77 (0.748)	0.09	1.93
Panasonic	1.44 (0.000)	0.33 (0.72)	-0.46 (0.62)	0.93 (0.31)	0.56	1.99
Showa Denko	1.55 (0.000) [a]	1.31 (0.631)	-0.21 (0.937)	1.12 (0.682)	0.34	2.04
Kyocera (2019)	0.97 (0.000) [a]	-0.95 (0.328)	0.18 (0.85)	1.01 (0.303)	0.44	1.98
Takebishi	1.03 (0.000) [a]	-0.32 (0.79)	1.79 (0.145)	0.73 (0.551)	0.28	1.99
Yamada Denki (2020)	1.005 (0.000)	-0.758 (0.74)	-0.199 (0.93)	-0.628 (0.79)	0.28	2
EsCon	1.45 (0.000) [a]	1.03 (0.546)	-1.03 (0.547)	1.72 (0.316)	0.65	1.97

Note: a: $p< 0.01$, b: $p< 0.05$, c: $p< 0.1$; R^2 is adjusted; DW is Durbin Watson statistic.

Table 4

Regression Model (1) *for -120 days to +120 day Estimation Period*

Sponsor Company	Market Beta	D (τ=0)	D (τ= -1)	D (τ= -2)	R^2	DW
Ajinomoto	0.39 (0.000) [a]	-0.83 (0.407)	0.40 (0.685)	0.61 (0.542)	0.21	2.07
Liful	NA	NA	NA	NA	NA	NA
Softbank Group	1.53 (0.000) [a]	-6.11 (0.115)	-1.62 (0.675)	-3.17 (0.414)	0.23	1.99
Nissan	0.75 (0.000) [a]	-0.29 (0.777)	-0.34 (0.741)	-0.8 (0.439)	0.34	2.00
Fukuda Denshi	0.48 (0.001) [a]	0.1 (0.962)	-2.01 (0.347)	-0.51 (0.811)	0.08	2.04
Fullcast Holdings	1.25 (0.000) [a]	-2.05 (0.503)	1.09 (0.723)	2.308 (0.454)	0.09	1.93
Skymark Airlines	0.68 (0.096) [c]	7.99 (0.079) [c]	7.42 (0.1)[c]	7.25 (0.109)	0.07	1.98
Yahoo! Japan	1.32 (0.000) [a]	-0.54 (0.731)	3.06 (0.049)[b]	0.66 (0.671)	0.31	1.95
Plenus	0.77 (0.000) [a]	-0.89 (0.469)	-0.01 (0.997)	0.11 (0.937)	0.41	2.00
Yurtec	0.82 (0.000) [a]	0.06 (0.961)	-0.7 (0.575)	-0.45 (0.721)	0.41	2.01
Kyocera (2006)	0.97 (0.000) [a]	-0.46 (0.748)	-1.05 (0.46)	-0.42 (0.767)	0.42	1.99
ND Soft	0.44 (0.004) [a]	1.63 (0.515)	-1.42 (0.566)	1.03 (0.677)	0.02	2.00
NHK Spring	1.17 (0.000) [a]	-1.48 (0.472)	-2.69 (0.189)	-1.8 (0.387)	0.45	1.98
Mazda	1.44 (0.000) [a]	-1.30 (0.728)	-3.46 (0.357)	4.68 (0.21)	0.51	2.02
Tohoku Electric	0.87 (0.000) [a]	2.26 (0.036)[b]	-1.68 (0.121)	-1.26 (0.24)	0.38	1.96
K`s Denki	0.59 (0.000) [a]	2.80 (0.275)	0.48 (0.852)	0.07 (0.978)	0.10	1.99
Hardoff	0.3 (0.000) [a]	0.81 (0.61)	-0.85 (0.59)	0.07 (0.96)	0.13	2.01
Oita Bank	0.69 (0.000) [a]	0.71 (0.565)	0.56 (0.635)	1.11 (0.369)	0.29	1.98
Okinawa Cellular	0.13 (0.036) [b]	-0.22 (0.843)	0.44 (0.699)	0.59 (0.605)	0.01	1.99
Yamanashi Chuo	0.93 (0.000) [a]	-0.71 (0.55)	3.33 (0.009) [a]	7.83 (0.000) [a]	0.60	1.99
Edion (2012)	0.85 (0.000) [a]	-0.39 (0.84)	-1.46 (0.456)	-0.51 (0.792)	0.25	1.90
Denka Kagaku	1.14 (0.000) [a]	-0.73 (0.618)	-0.71 (0.632)	-0.91 (0.511)	0.59	2.01
Noevir	0.55 (0.000) [a]	-0.03 (0.985)	-1.86 (0.256)	-0.51 (0.756)	0.17	1.99
Toho Bank	0.86 (0.000) [a]	0.54 (0.621)	2.12 (0.053)[c]	2.23 (0.042) [b]	0.61	2.07
Rakuten	0.87 (0.000) [a]	0.29 (0.9)	-0.43 (0.855)	-2.95 (0.215)	0.18	2.01
Yamada (2014)	0.61 (0.000) [a]	0.52 (0.81)	0.72 (0.738)	-0.93 (0.668)	0.07	2.01
Edion (2015)	0.72 (0.000) [a]	1.71 (0.279)	-0.22 (0.888)	-0.09 (0954)	0.24	1.99
Trancosmos	0.87 (0.000) [a]	0.4 (0.572)	0.8 (0.261)	0.25 (0.73)	0.42	1.94
Mikuni World	1.08 (0.000) [a]	2.27 (0.329)	-2.19 (0.345)	-0.51 (0.825)	0.25	1.99
ZOZOTOWN	0.6 (0.094) [c]	3.73 (0.094)[c]	2.73 (0.217)	-0.72 (0.745)	0.10	1.96
Panasonic	1.23 (0.000) [a]	0.32 (0.77)	-0.47 (0.66)	0.75 (0.48)	0.48	2.01
Showa Denko	1.65 (0.000) [a]	0.76 (0.758)	0.26 (0.916)	1.88 (0.449)	0.35	2.00

(next page)

Table 4
Regression Model (1) *for -120 days to +120 day Estimation Period (continued)*

Sponsor Company	Market Beta	D (τ=0)	D (τ= -1)	D (τ= -2)	R^2	DW
Takebishi	1.07 (0.000) [a]	-0.27 (0.822)	1.76 (0.147)	0.79 (0.509)	0.33	1.99
Kyocera (2019)	0.93 (0.000) [a]	-1.03 (0.268)	0.11 (0.906)	0.97 (0.3)	0.51	2.01
Yamada (2020)	0.97 (0.029)[b]	-1.37 (0.94)	0.81 (0.97)	-1.71 (0.93)	0.23	2.23
EsCon	1.38 (0.000) [a]	0.86 (0.636)	-1.28 (0.484)	1.15 (0.529)	0.51	1.99

Note: a: p< 0.01, b: p< 0.05, c: p< 0.1; R^2 is adjusted; DW is Durbin Watson statistic.

Only Tohoku Electric Power produced a statistically significant positive contemporaneous impact on stock returns across both estimation windows. We also observe positive and statistically significant reactions one to two days prior to the official announcement for Yahoo! Japan, Yamanashi Chuo Bank, and Toho Bank indicating possible information leaks stirring the market prior to the official announcement. On expansion of the sample time domain to 120 days before and after the announcement date (Table 4), we find the impact of the naming rights announcement is also reflected in the stock returns of Skymark Airlines and ZOZO. We only find three cases (Tohoku Electric, Yamanashi Chuo, Toho) where the announcement dummy coefficients are positive and statistically significant across both estimation windows. We obtain qualitatively similar results using the Nikkei index suggesting our findings are robust to the use of a different proxy for the market return (Table 5). Overall, we find limited empirical evidence that naming rights announcements have a positive impact on corporate sponsor stock returns.

Table 5

Announcement Dummy for Regression Model (1) with Nikkei Index

Sponsor	241 Days			121 Days		
	D(τ=0)	D(τ= -1)	D(τ= -2)	D(τ=0)	D(τ= -1)	D(τ= -2)
Ajinomoto	-0.78 (0.43)	0.09 (0.93)	0.83 (0.41)	-0.87 (0.35)	0.48 (0.6)	0.59 (0.53)
Lifull	NA	NA	NA	1.16 (0.73)	-1.46 (0.74)	1.84 (0.68)
Softbank Group	-4.89 (0.2)	-3.05 (0.43)	-2.29 (0.55)	-5.23 (0.1)[c]	-2.6 (0.41)	-1.85 (0.56)
Nissan	-0.58 (0.57)	-0.56 (0.57)	-0.98 (0.33)	-0.65 (0.5)	-0.65 (0.5)	-0.95 (0.34)
Fukuda Denshi	0.1 (0.96)	-1.98 (0.35)	-0.62 (0.77)	0.11 (0.31)	-1.76 (0.31)	-1.39 (0.43)
Fullcast Holdings	-1.69 (0.58)	1.37 (0.65)	2.23 (0.47)	-1.55 (0.62)	1.22 (0.7)	2.01 (0.53)
Skymark Airlines	8.08 (0.08)[c]	7.28 (0.11)	7.38 (0.1) [c]	7.19 (0.2)	6.39 (0.26)	7.21 (0.21)
Yahoo! Japan	-0.65 (0.68)	3.32 (0.03)[b]	0.68 (0.59)	-0.72 (0.54)	3.42 (0.01)[a]	1.09 (0.4)
Plenus	-1.08 (0.41)	-0.01 (0.99)	0.23 (0.86)	-0.72 (0.59)	-0.03 (0.98)	0.54 (0.69)
Yurtec	-0.01 (0.99)	-0.61 (0.64)	-0.73 (0.58)	-0.09 (0.92)	-0.59 (0.57)	-0.42 (0.69)
Kyocera (2006)	-0.25 (0.84)	-0.95 (0.45)	-0.29 (0.81)	-0.48 (0.76)	-1.13 (0.47)	-0.34 (0.83)
ND Soft	1.44 (0.57)	-1.37 (0.58)	1.13 (0.65)	0.6 (0.82)	1.44 (0.57)	1.33 (0.6)
NHK Spring	-0.97 (0.64)	-3.13 (0.13)	-2.19 (0.3)	-0.8 (0.69)	-3.03(0.14)	-1.77 (0.4)
Mazda	-1.95 (0.61)	-2.98 (0.44)	5.12 (0.18)	-1.85 (0.67)	-2.53(0.57)	5.33 (0.22)
Tohoku Electric	2.94 (0.01)[a]	-1.09 (0.33)	-1.94 (0.08)[c]	2.92 (0.02)[b]	-0.82(0.5)	-2.28 (0.07)[c]
K`s Denki	2.84 (0.28)	0.68 (0.79)	0.003 (0.99)	3.18 (0.19)	0.47 (0.84)	0.21 (0.93)
Hardoff	0.86 (0.61)	-0.77 (0.63)	-0.04 (0.98)	0.68 (0.68)	-0.79 (0.62)	-0.09 (0.95)
Oita Bank	0.87 (0.51)	0.58 (0.65)	1.21 (0.35)	0.83 (0.46)	0.48 (0.67)	1.21 (0.28)
Okinawa Cellular	-0.24 (0.83)	0.49 (0.67)	0.53 (0.58)	-0.33 (0.75)	0.31 (0.76)	0.44 (0.67)
Yamanashi Chuo	-0.98 (0.44)	2.38 (0.08)[b]	8.95 (0.00)[a]	-0.79 (0.54)	2.96 (0.05)[b]	8.87 (0.00)[a]
Edion (2012)	-0.61 (0.75)	-1.52 (0.44)	-0.57 (0.77)	-0.61 (0.76)	-1.52 (0.44)	-0.57 (0.77)
Denka Kagaku	-0.97 (0.52)	-0.83 (0.58)	-0.74 (0.63)	-1.09 (0.45)	-0.76 (0.6)	0.65 (0.66)
Noevir	-0.28 (0.86)	-1.58 (0.34)	-0.49 (0.77)	0.29 (0.82)	-1.56 (0.23)	-0.78 (0.55)
Toho Bank	0.09 (0.94)	1.94 (0.1)[c]	2.2 (0.06)[c]	0.12 (0.93)	1.66 (0.25)	2.31 (0.11)
Rakuten	0.03 (0.99)	-0.61 (0.79)	-3.41 (0.16)	0.06 (0.98)	-0.8 (0.76)	-3.46 (0.2)
Yamada (2014)	0.32 (0.88)	0.80 (0.71)	-1.19 (0.71)	0.23 (0.91)	0.67 (0.77)	-1.55 (0.49)
Edion (2015)	1.63 (0.3)	-0.31 (0.84)	-0.01 (0.99)	1.78 (0.29)	-0.31 (0.85)	0.02 (0.98)
Trancosmos	0.35 (0.63)	0.88 (0.23)	-0.27 (0.71)	0.45 (0.54)	0.82 (0.27)	0.09 (0.9)
Mikuni World	2.72 (0.24)	-2.25 (0.33)	-0.51 (0.82)	2.65 (0.21)	-2.4 (0.25)	-0.56 (0.79)

(next page)

Table 5

Announcement Dummy for Regression Model (1) with Nikkei Index (continued)

Sponsor	241 Days			121 Days		
	D(τ=0)	D(τ= -1)	D2(τ= -2)	D(τ=0)	D(τ= -1)	D(τ= -2)
Panasonic	0.56 (0.610)	-0.19 (0.86)	0.36 (0.74)	0.52 (0.58)	-0.18 (0.85)	0.43 (0.65)
ZOZOTOWN	3.61 (0.1)[c]	2.73 (0.22)	-0.55 (0.8)	3.71 (0.12)	2.76 (0.25)	-0.68 (0.78)
Showa Denko	0.76 (0.76)	0.26 (0.91)	1.88 (0.45)	0.92 (0.73)	0.51 (0.85)	1.86 (0.48)
Kyocera (2019)	-0.84 (0.33)	0.05 (0.95)	0.99 (0.25)	-0.79 (0.4)	0.19 (0.84)	0.99 (0.3)
Takebishi	-0.43 (0.73)	1.4 (0.27)	0.65 (0.61)	-0.51 (0.71)	1.35 (0.32)	0.77 (0.57)
Yamada (2020)	-0.42 (0.98)	0.07 (0.99)	-0.39 (0.98)	-0.40(0.87)	-0.37 (0.88)	-0.19 (0.93)
EsCon	0.69 (0.71)	-1.25 (0.51)	1.21 (0.52)	0.88 (0.64)	-1.10 (0.56)	1.62 (0.39)

Note: a: p< 0.01, b: p< 0.05, c: p< 0.1. Lifull data not available for the 241 day estimation period since the company was not listed.

The announcement effect for most cases is not statistically significant and thus consistent with the results documented by Leeds et al. (2007) and Cao & Trifts (2013), and Goldberg et al. (2019) for announcements after 2001. We note that Klein et al. (2009) stress "the importance of publishing empirical papers that do not find statistically significant results" (p. 3288) and the need for replication studies especially in the context of research related to market efficiency and economics at large (Alm & Reed, 2015; Block & Kuckertz, 2018). The key issue is whether the arrival of information on a naming rights sponsorship was unexpected and significant enough for the market to react to. In the presence of confounding effects, we would not expect, a priori, the market to react to the news of a naming rights deal. As a case in point, consider the inaugural naming rights agreement for the Ajinomoto Stadium. While we would anticipate the market to reflect the news of this pathbreaking deal, the process was in reality a long, drawn-out process. Moreover, the acquisition of the naming rights to Tokyo stadium can be positioned within the context of Ajinomoto`s broader sport sponsorship campaign which included Olympic sponsorship and promotion of the sports supplement Amino Vital. It follows that the Ajinomoto naming rights deal announcement was not unexpected news to close observers. For companies such as Kyocera, who acquire naming rights to expand existing sponsorship commitments in other media such as in-stadium billboards, the impact of a naming rights announcement is likewise diluted. The same argument holds for sponsor companies such as Panasonic and Edion which have their company name on the uniforms of the J League teams Gamba Osaka and Sanfrecce Hiroshima, respectively. Anecdotal evidence from Kyocera, Panasonic, Edion, and Ajinomoto`s naming rights, provides support that the market may not react to the announcement if stadium naming rights are embedded in a larger sponsorship campaign.

In professional baseball, Rakuten acquired the naming rights for the home stadium of their own team. We are unable to discern a statistically significant impact for the Rakuten sponsorship for the publicly-owned Miyagi Stadium. The Rakuten deal was structured to award 75% of the proceeds to the stadium owner, the local government, with the balance accruing to the Rakuten Eagles baseball team. In effect, the Rakuten naming rights deal subsidizes the operations of its own

team and may not be perceived as an investment which directly promotes sales. Furthermore, the naming rights for Miyagi Stadium, home to the Rakuten Eagles, changed several times since 2005. Beginning with Fullcast Stadium Miyagi in 2005, renamed to Kleenex Stadium Miyagi three years later in 2008 before becoming Rakuten Kobo Stadium Miyagi. Such frequent changes in names could further dilute the impact and value of the Rakuten naming right to the extent spectators and fans associate the stadium with previous naming rights. This further highlights the effect that confounding factors can have in an event study.

Conclusion

Since the landmark Ajinomoto -Tokyo Stadium partnership, the market for stadium naming rights in Japan has blossomed with the completion of more than 100 such deals, including the recent Vantelin Dome Nagoya, the home to the Chunichi Dragons baseball team. Naming rights are now an integral part of the professional sports landscape in Japan with most Nippon Baseball and J League football teams playing in corporate sponsored stadiums. This paper had the modest of objective of contributing to the literature by documenting whether 36 separate naming rights announcements impact stock prices in Japan in an event study. The recent growth in the market for stadium naming rights in Japan provided us with an opportunity to examine the external validity of the empirical results obtained for the North American market. With the exception of select cases, we do not find evidence to suggest that investors perceive stadium naming rights to be a net present value positive investment for the sponsor company. Our empirical results for the Japanese stadium naming rights market are consistent with the results documented in the US market by Leeds et al. (2007) and Goldberg et al. (2019) for post-2001 announcements. Assessing the market value of stadium naming rights via an announcement effect on stock prices remains a challenge for a myriad of reasons. We note, however, that documenting results which are not statistically significant can be equally as important as presenting statistically significant findings. Given the conflicting empirical evidence in the literature to date, examining whether stadium naming rights announcements impact stock prices across different markets should contribute to our overall understanding of the value created for corporate sponsors.

Future Research and Limitations

As the event study methodology requires the sponsor company be listed on an exchange, we are limited to a sample of 36 deals. The current paper reveals that at most seven naming rights deals out of 36 cases produced statistically significant results. It follows an investigation into the cross-sectional variation of the market value of stadium naming rights is beyond the scope of this paper since a large fraction of the estimated coefficients on the announcement dummy variables are not statistically significantly different from zero. Therefore, future research could focus on the actual naming right deal prices in a cross-section regression (DeSchriver & Jensen, 2003; Gerrard et al., 2007; Popp et al., 2016). This would allow for a greater number of naming rights deals to be included in the sample and could shed light on the institutional features of naming rights deals peculiar to the Japanese market. We note the sponsor-stadium fit could be a key determinant. Nakazawa et al. (2016) examine the sponsor-stadium fit question for a second tier J League team in Japan and find that team identification has a positive effect on not only sponsor-stadium fit but contributes to overall positive sentiments towards the sponsor. Hence, future research should take into account such sentiments as they are documented to translate into a positive impact on purchase intentions for sponsor products or services.

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Is Data Envelopment Analysis the Best Way to Approach Benchmarking of Sportswear E-Retailing?

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Sportswear and sports-inspired apparel are among the fastest-growing segments covering the most significant market share of the sports industry. With the rapid increase in demand for this product category, fueled by the Covid-19 pandemic, sportswear sales through online channels have increased considerably. With millions of online sportswear sellers now facing global competition, it would be helpful to check how they are performing relative to their counterparts. Benchmarking is a powerful tool for businesses to evaluate themselves for continued growth and to implement changes to stay up to date with the trends of their industry. The paper aims to study the benchmarking of sportswear e-retailing by critically evaluating the accumulation of previous studies on benchmarking specific to e-retailing and sportswear. The study first investigates the previous performance benchmarking models and identifies different performance indicators used for the analysis. Data Envelopment Analysis, a famous performance benchmarking model, was considered one of the best ways to benchmark sportswear e-retailing. The result of DEA will help us identify the best-performing units of a particular process relative to the best unit and highlight the underperforming ones.

***Keywords*:** eCommerce, Sports Retailing, Sportswear, DEA, Efficiency

Is Data Envelopment Analysis the Best Way to Approach Benchmarking of Sportswear E-Retailing?

Sports, an ever-growing industry, has a growing demand for products and services. In the past few years, we have seen the purchasing capacity of consumers for sports goods has increased over the internet. The Covid-19 pandemic has only fueled the growth of these processes. According to the Global Sports Market Report (2021 to 2030), the global sports market is expected to reach $599.9 billion in 2025 at a CAGR of 8%. Out of which, sportswear and sports-inspired apparel are among the fastest-growing segments and cover the most significant market share stated in a study conducted by McKinsey in 2021 in cooperation with the World Federation of the Sporting Goods Industry (WFSGI). With these developments, there are millions of e-retailers selling sportswear products. However, to survive and prosper in such a business environment, facing global competition, these businesses must benchmark themselves. Benchmarking will give them an insight into the factors that contribute to their performance and help transform their business for the better. From the perspective of a research topic, benchmarking of sportswear e-retailers is rarely taken as the research target. Funk (2017) highlighted a lack of studies replicated from other disciplines that are extended to fit a sports context.

This study conducted a systematic quantitative literature review of papers on the topics such as Benchmarking, DEA, and Sports e-retailing. "Systematic quantitative literature reviewing is a smart and effective method for undertaking literature reviews, particularly for research students and others exploring new disciplines" (Pickering & Byrne, 2013). Using SQLR we understand that

several benchmarking approaches have been developed to evaluate a business's performance for decades. They are divided into three concepts: Benchmarking, Best practice, and Data Envelopment Analysis (Castro & Frazzon, 2017). Benchmarking and Best practices, to a certain extent, have followed the same process, whereas DEA uses mathematical concepts to understand the efficient units in the dataset. It allows benchmarking professionals to identify the best practices in each set of units. Many of the benchmarking practices adopted in the late 1990s are already out of date (Kuula et al., 2012; Castro & Frazzon, 2017). Due to this, there is an increase in researchers using quantitative methods such as DEA for benchmarking (Castro & Frazzon, 2017). Data envelopment analysis (DEA) was first introduced by Charnes and Cooper (1978) as linear programming (LP)-based methodology allowing multiple measures of inputs and outputs for evaluating the performance of decision-making units within an organization or among organizations in the selected industry (Wen, H. J., Lim, B., & Lisa Huang, H., 2003). Hence, this paper attempts to review previous studies on benchmarking, DEA, and sports e-retailing to understand the best way to evaluate sportswear e-retailing and help answer the following questions.

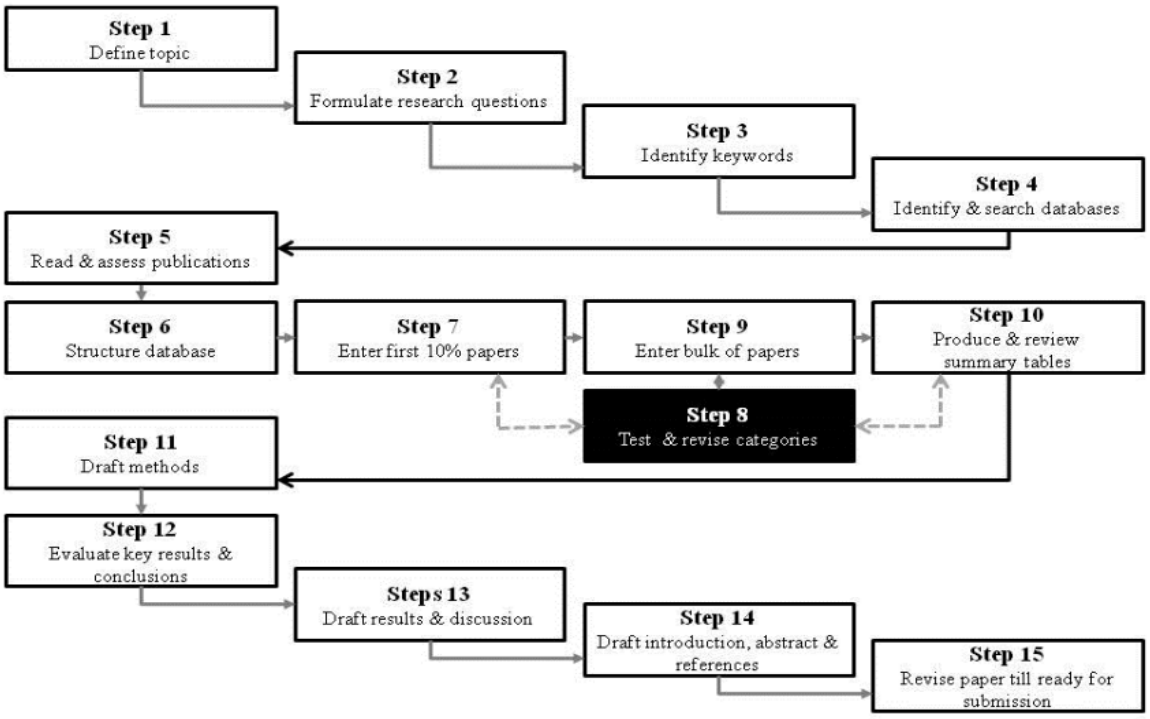
1. Is DEA the best way to benchmark sportswear e-retailing?
2. If so, what input and output factors should be considered?

The remainder of the paper flows as follows. Section 2 presents the methodology used for the review. Section 3 is an assessment of e-retailing in the sports industry, with details about the efficiency of sports e-retailing. Section 4 will mainly look at benchmarking by providing an overview of the classifications and components of the identified issues. Section 5 discusses future research and limitations of the study, and section 6 concludes the study.

Research Methodology

Systematic Quantitative Literature Reviews

Literature reviews are an essential tool for interpreting, classifying, organizing, condensing, and synthesizing a collection of separate publications about a similar topic (Cooper, Hedges, &



Valentine, 2009; Thomson et al., 2019). There are two main types of literature review: narrative literature reviews and systematic literature reviews, each with advantages and disadvantages. Under systematic literature reviews, we have Systematic Quantitative Literature Reviews (SQLR). We went with it as this method allows researchers new to a field to systematically analyze existing academic literature to produce a structured quantitative summary of the field (Pickering & Byrne, 2013). This method is more straightforward and systematic than the traditional 'narrative method' common to many student theses (Pickering & Byrne, 2013). The systematic quantitative literature review has fifteen stages that a researcher undertakes, as shown in Figure 1. This approach is beneficial in the initial exploratory stages of assessing literature, particularly for new fields. It can be used independently or with methods that weigh different studies using specific criteria (Petticrew & Roberts, 2006; Pickering & Byrne, 2013).Figure 1: Fifteen stages in undertaking systematic quantitative literature reviews (SQLR).

Keywords

Based on steps 1 to 3 of the Systematic Quantitative Literature Reviews, we came up with the set of keywords as shown in Figure 2. Firstly, Box A represents the research focus which is efficiency. Secondly, Box B represents the model used to understand the efficiency. And finally, Box C and D are the subjects of the research.

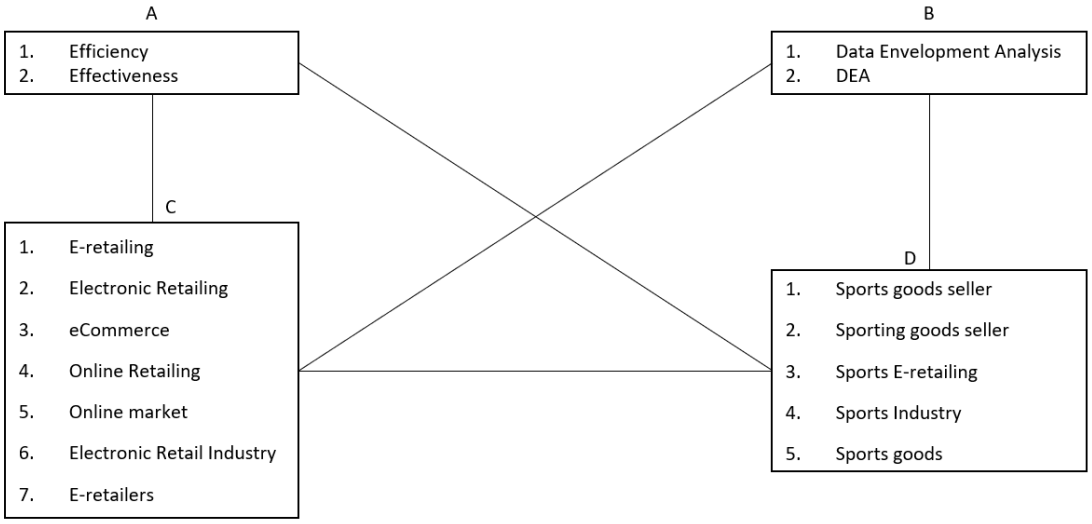


Figure 2. Combination of keywords used for literature review.

Using these keywords, we gathered and reviewed around 100 papers. We realized that the efficiency analysis was part of benchmarking research during the review process. So, we had to review this subject; however, the time was limited. To overcome this challenge, we did a Meta review of literature review papers on benchmarking in chronological order from 2003 to the latest paper published in 2021, as shown in figure 3.

Continuing with the process, based on steps from 4 to 10, as shown in Figure 1, we gathered all the relevant research papers using the keywords mentioned in Figure 2. Three databases such as Google Scholar, Web of Science, and ProQuest, were used to find the papers. The collection was quite systematic, and papers found in these databases were exported into an excel sheet based on the keyword combinations used.

Finally, steps from 11 to 15 were followed to identify key points from each paper, create a summary of those points, and then combine them to generate a draft of the literature review paper and eventually the final review paper you are reading now.

Literature review

E-Retailing in Sports Goods Industry

The Overview

The rapid growth of the internet has led to the phenomenal growth of eCommerce, which has helped the development of sports goods sectors on eCommerce (Chiu et al., 2014). The Australian Sporting Goods Association (2012) reported a rise in online sales of sporting goods, particularly in footwear (11.5%) and apparel (7.6%). And the online sporting goods marketplace in the US grew by 17% in 2013 (Chiu et al., 2014). The internet is becoming one of the most important revenue channels for sporting goods manufacturers and retailers (Hur, Ko, & Claussen, 2012). With the help of the internet, eCommerce enterprises can not only supervise and share the circulation process of the products in the supply chain but also analyze and predict the information of each stage of the supply chain. This significantly improves the rate and ability of reaction of e-commerce to the market and makes e-commerce more developed and promising (Zhang, H.-L., Zhang, H.-J., & Guo, X.-T, 2020). Over many years the sports sector has been quick to adopt the internet for various business activities (Beech, Simon Chadwick, Alan Tapp, 2000; Kahle and Meeske, 1999). Now, sports organizations deliver a vast range of electronic services, including audio and video streaming of games, in-depth information about teams, team members, competitions, and the sale of goods and services (Carlson & O'cass, 2011). Consumers now have easy access to sports and are exposed to its content more than ever. Sports retailers have seen this opportunity and adopted online selling to get more customers and eventually expand their business. As Liberman (2000) noted, online sports stores offer a wider variety of products and categories than physical stores. In Europe, within the 16–24 age group, clothes, and sports goods accounted for 72% of all purchases made online (Happ, E., Scholl-Grissemann, U., Peters, M., & Schnitzer, M., 2021; Eurostat, 2019). Author Zhou (2015) states that eCommerce has played an essential role in promoting the sports market, thus making sporting goods businesses undergo significant changes. However, there are many issues and challenges regarding selling sports goods online. One of many problems indicated by Zhou (2015) is the sports goods business lacks industry-specific eCommerce Applications and websites. Plus, sporting goods business managers' lack of awareness of the eCommerce website negatively impacts enterprises. And he also emphasizes that many sports goods' websites are flashy and cumbersome, reducing the brand image and sales.

The idea of a virtual or physical store in sports retail

Johansson & Kask (2017) identified that in the past few years, the retail sector has come up with new types of combinations of business and marketing strategies that address the issues of the traditional ones (Payne and Frow, 2004; Rodríguez-Díaz and Espino-Rodríguez, 2006; Rosenbloom, 2007; Sharma and Mehrotra, 2007). They also identified that the retail sector had not captured the use of online marketing when transitioning to eCommerce. Johansson & Kask (2017) state that doing the retail business through a virtual or a physical store is of very significant importance as these two require entirely different approaches and skills (Chang et al., 2003). The omnichannel approach creates new commercial opportunities for entrepreneurs effectively. It is another strategy that helps online businesses and offline survive digital disruption (Lakkhongkha, 2020). Combining a virtual or a physical store could be advantageous, as eCommerce and stores can cross-fertilize one another (Rosenbloom, 2007). Still, they could also have additional costs and demands, different competence, and more complex inventory management (Deleersnyder et al.,

2002). With the rise of the omnichannel, the number of potential sources of information expands the number of possible cases of misunderstanding and miscommunication. Also, when heading into omnichannel efforts while relying on partners' promises, not under their direct control, the communication challenges can become unmanageable (Perrigot et al., 2013, Allon & Bassamboo, 2011). For example, Dick's Sporting Goods switched its online order fulfillment from third-party vendors to an in-house model partly because of difficulties with online inventory levels not matching what it had available for its customers (TechRepublic, 2016). The American Marketing Association identified the omnichannel as one of six "Big Problems" of marketing practice featured for the 2016 AMA Summer Educators Conference (Holmes & Brewer, 2020). However, in times of recession, the larger businesses tend to profit over the medium and small businesses. Therefore, the SME entrepreneur needs to be aware of business competitiveness and consumer behavior changes during the economy's recession (Department of Business Development, 2020; Lakkhongkha, 2020).

Handling and shipping fees

Button clicking online is easy but delivering what is ordered is another challenge. Logistics operations have soon become and remain the bottleneck in eCommerce. eCommerce logistics suffers from slow and wrong deliveries, lost packages, damaged goods, and incorrect packing (Huang, G. Q., de Koster, R., & Yu, Y., 2020). According to Borsenberger (2013), whereas efficient and reliable delivery services of goods purchased online are a critical pillar of the trust between sellers and buyers, delivery concerns and high delivery costs seem to be a barrier to the development of eCommerce (Eurobarometer, 2011; European Commission, 2011; Civic Consulting, 2011; Boston Consulting Group, 2012; IMRG, 2012). Therefore, E-Retailers who sell sports goods and bulky goods need to think about a strategy regarding handling and shipping fees. Borsenberger (2013) observed that Dazadi.com, an e-retailer specializing in sports equipment and game rooms (heavy and cumbersome items) on their website, Dazadi argues that they charge the exact price that their carriers charge them so that consumers benefit from their volume discounts. Their handling and shipping fees are based on the product weight, dimensions, origin, destination, and the desired handling and shipping and delivery services. This is a complex process, and e-retailers should carefully choose the right strategy. It is found that discounts and offers are the primary reason for the change in consumer behavior and shift to the online channel. However, e-retail companies cannot afford to sell the products at heavy discounts. It leads to diseconomies of scale where companies incur heavy investment in logistics and technology (Satnalika & Rao, 2015).

Return rates

In Europe, within the 16–24 age group, clothes and sports goods, and sportswear accounted for 72% of all purchases made online (Happ, E., Scholl-Grissemann, U., Peters, M., & Schnitzer, M., 2021; Eurostat, 2019). An empirical study done by Zhou (2015) on consumers who purchased sports goods online found that more than half of the consumers wanted to buy sportswear. However, return rates for e-retail clothing companies (including sportswear) are significantly higher than in-store sales. Twenty to fifty percent of online clothing sales are returned (Pulga, 2015; Cheng, 2015; Shah, 2015). Apparel retailers are haunted by returns based on sizing issues, with $62.4 billion in returns attributed to consumers' poor choices. However, online sales are predicted to double over the next ten years, compounding the problem exponentially (Cheng, 2015). When it comes to returns of sporting goods, one of the most significant factors is the language used by these retailers in sporting policies. It features numerous uses of vague language in both the shipping and return website pages. For example, JC Penney had multiple terms on its shipping pages that are open to

individual interpretation, such as "most," "usually," and "typically" (Holmes & Brewer, 2020). Smaller retailers who do not have the resources for large-scale one- or two-day delivery programs must communicate clearly and deliver orders within the time promised. And these retailers should seek to provide more exact language in stating policies that involve time (Holmes & Brewer, 2020).

Efficiency in sports goods e-retailing

According to a study by McKinsey in cooperation with the World Federation of the Sporting Goods Industry (WFSGI), many customers switched to online purchases in pandemic times, which will not change significantly once the pandemic is over. It also stated that online sales are expected to stabilize at around 25 percent in 2021; this means that the e-commerce sector will become even more central to companies' business models. With these kinds of changes in online sports retailing, there is a need to evaluate the firm's performance constantly. Such developments often approach the e-market performance evaluation problem from four different perspectives: user evaluation, financial evaluation, system evaluation, and efficiency evaluation (Duan, S. X., Deng, H., & Luo, F., 2018). Efficiency could be essential for an e-Retailer that sells sports goods for development and sustainability. An efficient firm is one with few resources – personnel, expenditure, infrastructures, etc. –to obtain high output levels. Empirical research in the efficiency evaluation of sportswear e-retailers is sparse.

Efficiency evaluation of sportswear e-retailers is rarely taken as the research target. However, multiple studies focus on either the efficiency evaluation of e-retailing companies or sports industries. Thus, I took these as the base of the research and explored those papers to find the efficiency factors of e-retailing and try applying them to sports goods e-retailing. Though one may consider that understanding the efficiency of any e-retailers is like that of sports goods e-retailers. Still, there are many different aspects involved in sports goods e-retailing that differ from the others. Customers in each e-retailing sector will have specific preferences regarding online shopping system factors. The e-retailers and their e-service designers must understand those sector-specific factors and design their online service systems to satisfy customers in their sector (Trabold et al., 2006).

Over the years, eCommerce has had a significant impact on the way sports goods companies do business. According to Zhou, eCommerce and production activities, changes in production methods, and production efficiency have extensively promoted the sports market. The combinations of bricks and clicks (offline and online store) have a higher market share and higher marketing efficiency than pure-plays (pure online store). However, it cannot be neglected that the pure online stores are increasing rapidly and gaining more market share. However, such e-retailing businesses often face a thorny dilemma; budgets continue to shrink, yet they are expected to produce positive results. Essentially, their option is to increase efficiency (Lu & Hung, 2011). Wen, H. J., Lim, B., & Lisa Huang, H. (2003) proposed a model for evaluating e-commerce efficiency using the data envelopment analysis (DEA) approach and showed that the DEA model could not only effectively reflect the relative efficiency of e-commerce firms but also identify their potential efficiency problems (Lu & Hung, 2011). As stated before, DEA is one of the benchmarking methods which uses mathematical concepts to understand the efficient units in the dataset; in this case, the units would be the sports-goods e-retailers.

Benchmarking

The Overview

There are many different definitions of benchmarking, but to summarize it, "Benchmarking

is the search for the best industry practices which will lead to exceptional performance through the implementation of these best practices" However, benchmarking is not about copying and imitating the best performers, but rather improving upon their acknowledged best practices (Castro & Frazzon, 2017). The concept of benchmarking first emerged during the 1980s and was accelerated in 1989 after Xerox popularized it. Though they are considered pioneers, Watson (1993) argues that after the second world war, Japanese firms made extensive use of benchmarking as a strategic tool to enable them to rapidly catch up with the world's best firms (Ohinata, 1994; Hong et al., 2012; Castro & Frazzon, 2017). However, an embryonic form of benchmarking could also be found as far back as the nineteenth century (Kyri and Kulmala, 2004; Madsen et al., 2017).

Dattakumar & Jagadeesh, in their review analysis, discovered that papers on benchmarking were maximum in number during the period 1992-1999, after that saw a decline. Because after 2001, many firms redefined the roles of benchmarking; as stated by Hong et al. (2012), "Benchmarking allows firms to adopt the best practices of other firms, but in doing so, they stay behind and do not necessarily move beyond those other firms." However, it picked up its popularity and was a popular concept in management research for over two decades and remained in the top 10 for more than ten years (Madsen et al., 2017). To this date, the benchmarking concept has and is still being applied in most sectors like manufacturing, health services, insurance, financial services, construction, banking, government, etc. Benchmarking is essential for individuals, organizations, and industries to improve their business processes and attain their performance goals (Hong et al., 2012). It is also helpful in identifying the areas of focus and opportunities for progress, as it helps in setting goals and formulating plans and strategies (Purmala & Debora, 2021).

Classifications in benchmarking

To understand the classifications of benchmarking in detail, we need to read in detail about all the models used before. However, there have been hundreds of benchmarking models and multiple papers on the benchmarking concepts over the years, and it isn't easy to read all of them. We decided to review the literature review papers on benchmarking to overcome this challenge. This was achieved by reading the literature review papers on benchmarking in chronological order from 2003 to the latest paper published in 2021. Check figure 3 for more details about the papers.

Year	Authors	Title	Citation count on Google Scholar
2003	Authors Dattakumar & Jagadeesh	A review of literature on benchmarking.	391
2008	Anand, G., & Kodali, R.	Benchmarking the benchmarking models	471
2012	Hong, P., Hong, S. W., Roh, J. J., & Park, K.	Evolving benchmarking practices: A review for research perspectives	123
2017	Ferreira de Castro, V., Frazzon, E. M.	Benchmarking of best practices: An overview of the academic literature.	41
2021	Purmala, Y., & Debora, F.	A Systematic Literature Review of Benchmarking Implementation in various Industries.	0

Figure 3: Literature review papers for review analysis on benchmarking

Each of the authors has classified the benchmarking based on their perspective. Authors like Dattakumar & Jagadeesh (2003) did a comprehensive review of 382 publications organizing 170 publications to general aspects or fundamentals of benchmarking, 164 papers pertain to specific

applications/case studies in benchmarking, 27 publications come under innovations/extensions/new approaches in benchmarking, and finally, 21 publications fall under the category of benchmarking applicable to the education sector. Anand, G., & Kodali, R. (2008) identified many different classifications such as internal benchmarking, competitive benchmarking, functional benchmarking, best-in-class/generic benchmarking, external benchmarking, strategic benchmarking, operational benchmarking, business-management benchmarking, consultant study benchmarking, reverse engineering/product benchmarking, process benchmarking, relationship benchmarking, performance benchmarking/result benchmarking, diagnostic benchmarking, hooded benchmarking, open benchmarking, etc. Author Hong et al. (2012) states that the scope of benchmarking is the extent of the selected subject, such as strategies, functions, processes, products, services, performance, culture, practices, etc. Organizations need to define the scope due to limited capacity and resources. Authors also describe the diverse aspects of benchmarking, such as "Organizational strategy-driven benchmarking, Operational effectiveness-based benchmarking, Technical efficiency-based benchmarking, Macro-level benchmarking." Ferreira de Castro et al. (2017) did a comprehensive review of up-to-date literature papers on benchmarking, providing updated information on the recent theories used in this field. They used Hammer Nails Project to do a bibliometric analysis to identify essential authors and journals in the dataset, then used VOSViewer to do a co-citation analysis. They used this method on 674 articles, divided into 6 clusters, and further grouped into two relevant clusters, considering them as two different primary areas of benchmarking best practices. Clusters 1 and 3 approach the benchmarking concept from the managerial perspective. In contrast, clusters 2, 4, and 6 used mathematical modeling to identify the most efficient units in optimizing inputs and outputs, mainly applying the DEA theory. Later the authors selected 45 articles for a deeper analysis, covering them in three aspects: concepts, methods for benchmarking, and notes and remarks.

According to the authors, there were three concepts: Benchmarking, Best practice, and Data Envelopment Analysis. Benchmarking and Best practices, to a certain extent, have followed the same process. DEA uses mathematical concepts for the efficient units in the dataset. DEA allows benchmarking professionals to identify the best practices in each set of units. Purmala & Debora (2021) reviewed around 60 articles from 2015 to 2020. Authors define benchmarking in three ways, performance benchmarking -comparing the performance indicators, method benchmarking - comparing the methods; strategic benchmarking -as it says, comparing the strategies. All three ways are compared to something, which could be anything. However, the authors have divided it into four types - Internal benchmarking, Competitive benchmarking, Industrial benchmarking, and Generic benchmarking.

Issues in benchmarking

After a comprehensive review of papers done by Dattakumar & Jagadeesh (2003), they identified specific issues about benchmarking, which are regarded as inadequacies. Such as lack of establishment on the overall cost incurred in a benchmarking exercise. Knowing this information would enable decision-makers to decide upon financial commitment before any benchmarking exercise. Another issue is the lack of guidelines regarding the timeframe for conducting benchmarking. They state that if a method is described, it will enable decision-makers to set targets and deadlines. The next issue framed by the author is the allocation of human resources, and their role needs to be discussed in detail for better teamwork. Finally is the lack of information on some

of the best performing units in the industry. These best-performing units may not be willing to disclose their business practices; hence could be a significant obstacle in the benchmarking process.

Anand & Kodali (2008) state that benchmarking was done at the output stage of an organization, which resulted in a low adoption rate of the best practices. To counter this, the authors suggest a new concept called "Lead Benchmarking," which does the process at the input stage. Another problem identified by the authors was the number of steps involved in the benchmarking process ranging from 5 steps to over 33 steps. The famous xerox benchmarking model had 10 steps.

In his review, Hong et al. (2012) find that not all benchmarking efforts are successful due to specific barriers in the benchmarking process. Szulanski and Winter (2002) define them as 'Uncooperative sources, Strained personal relationships, Internal competition, Overemphasis on innovation, and Cranky copiers.' Ferreira de Castro, V., Frazzon, E. M, highlighted certain drawbacks of the benchmarking, which is that the "benchmarking process represents a significant challenge because of the difficulty of making sufficiently precise comparisons" (Delbridge et al. 1995; Castro & Frazzon, 2017) or the observation of longitudinal studies affect depending on when the practices were released or that there is a lifecycle for the practices used in companies – many of the practices adopted in the late 1990s are already out of date (Kuula et al. 2012; Castro & Frazzon, 2017). Also, most of the benchmarking analysis used historical data, assuming the best practices of the past would work in the future. Due to this, there is an increase in researchers using quantitative methods such as DEA for benchmarking. However, DEA is a new concept in benchmarking and therefore has a lot of drawbacks. Such as, little attention is given to the selected measures or do the selected measures properly reflect the process of the subject that is studied. "DEA models allow some indicators to be assigned a zero weight, which means that some factors can be ignored in the performance assessment" (Morais and Camanho 2011). Or in DEA, it is assumed that each unit does similar activities, producing comparable products, using the same resource, and operating in similar environments (Cook et al., 2018). Or "DEA is sensitive to random noise, heterogeneity of units and differences in their operating environment." (Dai and Kuosmanen 2014). Purmala, Y., & Debora, F. (2021), identified some limitations in the various industry around the world that use benchmarking, which are "Lack of recognition of relevant benchmarking partners, Lack of comparability of data, Lack of resources, lack of help for employees, Lack of confidentiality, Lack of internal benchmarking expertise, Advantage is smaller than the cost involved, Time consuming, Lack of awareness of the principle of benchmarking." And due to pandemics, the process of benchmarking has become difficult. Some of the steps in the process may have to be removed to overcome this problem. A new research gap identified by the author that needs more research is how to benchmark during a pandemic or avoid the lack of benchmarking implementation during a pandemic situation.

Data Envelopment Analysis

Introduction to DEA

Data envelopment analysis (DEA) was first introduced by Charnes and Cooper (1978) as linear programming (LP)-based methodology for performing a breakdown of how efficiently various units within a company operate as well as for comparing the efficiency of several competing companies within an industry. It is a popular approach for appropriately assessing the efficiency of individual e-markets due to its capability of effectively handling multiple inputs and outputs simultaneously in each situation (Barua et al., 2004; Serrano-Cinca et al., 2005; Ho, 2010; Cao and Yang, 2011). It has also been widely used for evaluating the efficiency of e-markets. For

example, Barua et al. (2004) applied a DEA model for comparing the efficiency of e-markets that make physical products and those that produce digital products. Lu & Hung (2011) developed a DEA model for investigating the source of inefficiency of e-markets using a sample of 30 global e-markets. Lo-Storto (2013) applies DEA to assess the efficiency of e-markets from the users' perspective. This shows that the DEA model is quite flexible in accessing the efficiency of e-markets. In the case of the current research paper, the DEA model will be used to understand the efficiency of an individual e-retailing business that solely focuses on sports goods. Of all the research papers, I found none used the DEA model to understand the efficiency of the sports e-Retailing business. Therefore this paper would be an excellent foundation for exploring the subject matter. On an important note, according to Duan et al., 2018, DEA has been evolving over the years where researchers now use DEA-based hybrid model approaches for optimizing efficiency evaluation. Existing studies on DEA analysis provide insightful information about the review of e-markets, but there is none for sports goods e-retailing. Thus, in this paper, we will use the DEA model to understand the efficiency of sports goods e-retailing, and in the future, we will extend this study to utilize a hybrid model. The findings of this study would contribute to the development of efficiency analysis, DEA modeling, and sports goods e-retailing.

CCR (Charnes–Cooper–Rhodes) and BCC (Banker–Charnes–Cooper) are the basic models of DEA. The CCR model identifies the overall inefficiency, while the BCC model differentiates between technical efficiency and scale efficiency, as discussed in (Donthu, N., & Yoo, B. 1998; Pestana Barros, C. 2006; Perrigot, R., & Barros, C. P. 2008; Chia-Nan, W., Dang, T.-T., Nguyen, N.-A.-T., & Thi-Thu-Hong, L. 2020). According to Charnes, Cooper, and Rhodes (1978), a measure of the efficiency of any DMU is obtained as the maximum of a ratio of weighted outputs to weighted inputs subject to the condition that the similar ratios for every DMU be less than or equal to unity. Several approaches have been developed for evaluating the performance of individual e-markets, including ratio analysis, statistical analysis, and data envelopment analysis (DEA) (Charnes et al., 1978). The ratio analysis approach evaluates the financial performance of individual e-markets concerning specific financial ratios. The statistical approach is related to analyzing available data to understand the operations of individual e-markets. However, such approaches are inadequate for characterizing the overall efficiency of individual e-markets while simultaneously considering multiple inputs and outputs of such e-markets (Wen, H. J., Lim, B., & Lisa Huang, H., 2003; Duan et al., 2018). Some other methodologies that are widely used for the evaluation of e-commerce impact on business efficiency include the model of cost efficiency, the regression model, the analytical hierarchy process (AHP), and the technique for order of preference by similarity to ideal solution (TOPSIS) and/or under fuzzy conditions(Chia-Nan, W., Dang, T.-T., Nguyen, N.-A.-T., & Thi-Thu-Hong, L. 2020). However, as stated, DEA is a popular approach for appropriately assessing the efficiency of individual e-markets due to its capability of effectively handling multiple inputs and outputs. DEA is sensibly used for evaluating the efficiency of individual e-markets concerning their overall efficiency, technical efficiency, and scale efficiency, leading to the identification of the efficient e-markets and their underlying sources of inefficiency (Duan, S. X., Deng, H., & Luo, F., 2018). The success of applying DEA for assessing the efficiency of DMUs relies on the appropriate selection of specific inputs and outputs for formulating specific performance evaluation models in each situation (Cook and Seiford, 2009).

Data Selection for DEA model

DEA model uses multiple input and output factors to calculate the efficiency of a given entity. Entities such as education, banking, aviation, and energy sustainability, to name just a few. It has also been used in eCommerce efficiency evaluation. Like, Lu, W.-M., & Hung, S.-W., 2011 adopted a production transformation process to measure the performance of e-retailing companies using four inputs and four outputs. In another case, Chia-Nan, W., Dang, T.-T., Nguyen, N.-A.-T., & Thi-Thu-Hong, L. 2020 considered the inputs and outputs of the top 10 e-commerce companies in the US market based on their influence on the model approach. They considered input variables such as assets, liabilities, and equity. Revenue and gross profit were considered as output variables. In the case of Duan, S. X., Deng, H., & Luo, F., 2018, they explored the efficiency-based critical drivers using common factors identified from several dimensions based on a comprehensive review of the e-market performance evaluation problem. The factors included head office location, years in operation, product specialization, service coverage, ownership, transaction mechanism, and social media engagement (Duan et al., 2018). In other studies, authors like Zhang, 2015, take 'Main business cost' and 'Total Assets' as input indicators and 'Basic earnings share' 'Income from main business' 'Net Margin' 'Net assets income rate' as output indicators to calculate the Total Factor Productivity (TFP) of sports industry development of China. And Si, 2014, selected added value of the sports industry as an output indicator; the input indicator includes labor, capital, and technology of the sports industry (Technology is measured by the number of patents in the sports industry). He used these factors to calculate the performance of China's sports industry.

Result

The objective of this study was to find the best way to benchmark sportswear e-retailing. As mentioned in previous sections, most of the benchmarking techniques used in the past are outdated, and most researchers these days are using quantitative methods. Based on previous studies, DEA is quite popular among researchers. So, to answer the following question, is DEA the best way to benchmark sportswear e-retailing? Yes, given the increasing usage in the context of sport-related studies and the nature of the model itself. However, when you do choose this model, please consider the following:

Process – Right from the beginning, a proper process needs to be selected to implement DEA. Instead of analyzing the entire online sportswear retailing business, a particular function like the SEO implementation on their website, the delivery time of their products, or anything else. This helps to focus on a specific process, making it reasonably achievable to implement the DEA approach and benchmark the entities.

Purpose – Understanding the purpose of the DEA exercise is fundamental. For example, let's say that we are trying to evaluate the SEO implementation of sportswear brands on their website. SEO factors can be considered input, and the output can be associated with a specific outcome when implementing those factors. Now, since the purpose here is to check how effectively the inputs have influenced the output, and SEO is a quantitative dataset, DEA seems logical to analyze this process.

Orientation – DEA is about analyzing the correlation of input and output of a process the right way. So, the idea of orientation is to make sure we know the focus of the analysis. The focus can be either the input or the output, and to figure this out, we need to know the desirable goals of the process. Now, let's assume that one of the desired goals of a sportswear brand is to increase customer stay time on their website, resulting in more sales. So, this is an output expansion process; in other words, the output would increase if there were an increase in the input. Therefore, BCC

output-oriented DEA model would best suit this study.

The number of Input and Output factors, DMUs – In the DEA approach, a large number of input and output relative to DMUs may diminish the discriminatory power of DMUs (Cook et al., 2018). While capturing all the relevant factors to analyze the process is excellent, keeping it closer to the number of DMUs is ideal. On the other hand, Banker states that DMUs should be at least three times the combined inputs and outputs. Though this is not statistically proven, many use it for convenience. A great way to understand this is from the following formula:

$$D \geq \text{Max}\ \{3(I+O),\ I \times O\}$$

D = DMUs
I = Input
O = Output

Once all the points are considered, the next step is to identify the input and output factors needed for benchmarking sportswear e-retailing. However, these factors depend on the process selected. Let's assume that we want to benchmark the overall efficiency of the sportswear e-retailing entities; we can consider the business inputs such as Employees, Capital, Location, etc., and the business outcome such as Net sales, Monthly traffic, etc. A detailed list is shown in figure 4. However, assuming this time, if the process changes, we try to figure out which sportswear websites have an excellent customer stay time relative to the SEO factors implemented on the website. Then we can consider the SEO factors as the input and customer stay time as the output; a detailed list is shown in figure 4.

Process	Overall Efficiency		SEO Implementation	
	Input	Output	Input	Output
Variables	Keywords Rating Employees Capital Years in operations Location	Net sales Monthly traffic Best Selling Rate	Total Visits Page Size The load time JapanSeoRank Top visited pages Pages per visit Backlink count	Average stay time Unique visitors Bounce rate

Figure 4: The Input/ Output variables for calculating different processes of sportswear e-retailing.

Discussion

Future research

Building upon the findings of this paper, I would like to do further research on benchmarking sports e-retailing by using the data envelopment analysis model on specific target subjects. The subjects could be Amazon e-retailers that focus on sports products or specific sportswear products, independent retailers with an omnichannel presence, or franchises. I would also like to research the sports department at universities that sell sportswear products through online channels to their students. Selecting different subjects is to address the various benchmarking issues and implement the DEA model on many other processes and compare them. Solving them will depend on the subject chosen due to barriers such as 'Uncooperative sources, Strained personal relationships, Internal competition, Overemphasis on innovation, etc.

Conclusion

The evidence is clear: sports is a growing industry where sportswear retailing is one of the most significant contributors. With online sales increasing yearly, so does the global competition. To survive and prosper in such a business environment, these businesses must benchmark themselves. Benchmarking concept first emerged in the 1980s is still quite popular among management researchers. There are many different benchmarking techniques and models with their challenges; however, most of the ones used in the early years are outdated. To overcome those challenges, many researchers have started using Data Envelopment Analysis. DEA model uses multiple input and output factors to calculate the efficiency of a given process of an entity. Before we proceed with the benchmarking process, some of the issues mentioned in this paper need to be addressed. Problems include the overall cost incurred, allocation of resources, identifying the best performing units, the number of steps involved, and many more. Benchmarking of sportswear e-retailing is rarely taken as the research target. Thus, this study identified that DEA could be considered one of the best ways to benchmark the number of processes of the sportswear e-retailing entity.

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Textual Analysis of Visual Communication in Sports Events - A Case Study of Roland Barthes' Semiotics

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The study uses a literature review to apply Barthes' way of analyzing the construction of signs to the analysis of sport communication texts in Mythology, the logo of the Olympics, the intro video of the 2020 Tokyo Olympics and the logo of National Intercollege Athletic Games in Taiwan. The purpose of the study is to serve as a reference for sport communicators when they are analyzing the signs in sport communication texts and also for them to apply Barthes' way of thinking in the analysis. When sport communicators are communicating with the audiences through visualized communication texts, Barthes' semiotics method helps to build the meaning of the texts. To be decoded by the audience all right, sport communicators might use the way Barthes' thought and decide what sign should be added to the text. The text should be able to interact with the audience's personal background and their own experience to leave an impression in the audience's mind. Furthermore, the texts might influence the cognition, attitude, and behavior of the audiences. From traditional media, such as newspapers and magazines to the more current media, such as a smartphone or social media, the ways of communication have been ever-changing. They become more and more visualized gradually and might continue to alter in the future. Deconstructing and analyzing the signs allow sport communicators to learn from them, which serves as a reference for sport communicators and positively helps the sport communicators to conduct visualized communication in sport-related events.

***Keywords*:** Visualized sport communication, Mythology, Olympics, National University and College Athletic Games, Signs

Introduction

In today's society, sports is considered a popular and successful business due to the development of professional sports, the increasing demand for leisure and entertainment, and advancements in technology. Through the content of material, culture, and physical activity, sports have become a result of commercial activities, which is the current state of sports commercialization (Hung, 2020). The process of sports commercialization requires the help of media, and media has become a mutually reinforcing presence. With the development of different types of media, the sports industry uses various media channels to communicate information to audiences or consumers, from traditional media such as newspapers and magazines to social media in now days (Sanderson, 2022).

There are many types of content that can be communicated, including text, sound, images, video, or an action. Any text that can be perceived by the senses and elicits a response is considered a form of communication (Fiske, 2010). Visual content, mainly in the form of images and videos, is more memorable and can easily evoke emotions and change attitudes, further, leading to responses (Yen, 2020). Research on visual communication in the sports industry in Taiwan has also shown that aesthetics have a significant impact on repurchase intention for sports products (Chang, Wang,

& Chen, 2019). In sports events, the use of various visual media such as outdoor and print media, electronic media, and online promotion can promote the events, increase public recognition, and become symbols of the city. Therefore, visual communication has become a norm for sports communication (Huang, 2017).

According to Nicholson (2015), sports communication is not only limited to printed materials but can also include books, films, images, and sounds that present the content of sports to the audience. Any content related to sports, such as a sportsman using deodorant, broadcasting of rugby, or a popular song sung by a footballer's wife, can be considered a form of sports communication. The visual communication of the sports industry has evolved from roadside billboards, newspapers, and television to today's internet media and social networks, where the content of each medium is different (McLuhan, 2001). The marketing of the sports industry often relies on visual communication on electronic media such as the internet, which is essential and crucial for the current sports experience (Silva & Las Casas, 2017). With the widespread availability of the internet and the development of smartphones, the cost of mobile communication has decreased, and images have become an increasingly popular trend in interpersonal communication, advertising, and marketing, replacing lengthy text (Chen, 2017). For example, Under Armour and Adidas use well-known celebrities to endorse their products and advertise through social media platforms such as Facebook, Instagram, and Youtube to increase brand awareness. Compared to other forms of communication, visual content can more effectively stimulate consumers' senses and leave a lasting impression (Lai, Chen, Ho, & Tsai, 2018; Månsson & Wiberg, 2019). Roland Barthes' analysis of the first and second levels of symbolic meaning is useful for analyzing the effectiveness of advertising (Chen & Wang, 2017).

When sports communicators encounter effective and successful communication cases, what method can they use to analyze their content as a reference? Or when sports communicators engage in communication, what ways can they think about their content? Therefore, this study uses Roland Barthes' analysis method of the first and second levels of symbolic meaning to analyze the Olympic logo, Tokyo Olympic introduction video, and the logo of the 2021 and 2022 National Intercollege Athletic Games in Taiwan, integrating existing differences in the visual communication content of the sports industry on different media, as well as organizing the text content behind the message it hopes to convey, and summarizing how these texts are constructed, providing practical suggestions for sports industry and community media visual communication text content.

Method: Roland Barthes' Semiotics

Literature review

This study utilizes Roland Barthes' semiotics as an analytical tool for visual communication texts, and presents the application and logic of Barthes' semiotics through a literature review approach. A literature review involves providing an impartial and comprehensive overview of the existing research and non-research literature related to the subject under investigation, while also offering a critical evaluation of the materials (Hart, 1988).

There are two main types of literature review, narrative literature review and systematic literature review. The study uses narrative literature review as a method to demonstrate the application of Barthes' semiotics on visualized sport communication. Narrative literature review refers to a method of summarizing the research development and current knowledge of a specific field by systematically searching, selecting, evaluating, synthesizing, and interpreting literature. When conducting a narrative literature review, researchers select a series of relevant research literature and then integrate and analyze these literatures according to their research objectives and questions, and write a summary literature review (Cronin, Ryan and Coughlan, 2008).

Visualized communication, Texts and Signs

In visual communication, anything can be perceived by our eyes and interpreted to create meaning and evoke reactions is considered a symbol (Chen, 2020). Regarding the term symbol, Roland Barthes proposed that a symbol has two levels of meaning. The first level is the denotation, which refers to the intuitive image and surface appearance of the symbol itself. Denotation is the easy-to-understand image and appearance and the combination of signifiers and signified (Chen and Tao, 2017). As for the second level of symbol meaning, Connotation, the symbol of sports often implies positive and healthy meanings such as success and positivity, but it is possible that the dominant implications behind it are related to gender and other unconscious contents conveyed by the encoder. The connotation involves the interaction of cultural values, and the interpretation of the text is more on the social level, which requires the help of cultural traditions. The acceptance of the symbol by the audience also depends on their social context and different contexts, which together create meaning (Wang et al., 2022).

Sports communication texts presented in a visual way usually contain positive meanings such as youthfulness, health, adventure, and success, or negative meanings such as doping, injuries, and danger (The WHO Regional Office for Europe, 2012). However, the producer (encoder) and gatekeeper of any text can decide what information they want to convey to the receiver, so gatekeepers can decide what symbols to include in the text to give it different connotations. The audience and the recipients of symbols can decode the text or symbol based on their own experiences, which is why the understanding and decoding of each individual towards the same symbol may vary (Xiao, 2021).

Roland Barthes' First and Second Levels of Signification

In Saussure's Cours de linguistique Générale (Course in General Linguistics), published in 1916, language is considered a system of signs, where a sign consists of a signifier and a signified. The signifier is the physical form of the sign that can be perceived by the senses, while the signified is the meaning of the sign that goes beyond its physical properties and social context (Wu, 2021). A signified can have countless signifiers, and a concept or idea can be expressed in numerous ways. The more signifiers a signified has, the less ambiguous its meaning, and the context of the present moment can limit the range of its significance (Huang, 2008).

As mentioned earlier, the first level of signification refers to the explicit meaning of a sign, which is generally known as common sense. The denotative meaning is the easily understandable image or representation that combines the signifier and the signified (Chen & Tao, 2017). Roland Barthes, however, proposed three ways of constructing the second level of signification: Connotation, Myth, and Symbolism. According to Barthes in his book "Mythologies" (1957), "Connotation" explains the interaction between the cultural values of the user and the sign, which is influenced by the interpreter and the sign itself. Textual interpretation is more social, and requires cultural traditions to aid in understanding. It emphasizes that the meaning of a sign is created collectively by the receiver, decoder, and behavior of the audience. "Myth" is a way of thinking about culture that is influenced by changes in cultural values. "Myth" emphasizes those meanings that existed in culture before the text was established and "naturalizes" history. It is a universal decoding method (Fiske, 1990). "Symbolism" is a conventional way of using traditional customs, in which one thing replaces the meaning of another thing.

Analysis of Sports Communication in "Mythologies"

Regarding these two layers of symbolic meaning, Roland Barthes used the Tour de France bicycle race in 1955 as an example in "Mythologies". In the first layer of explicit meaning, the Tour de France bicycle race is an annual event held in the summer, consisting of 23 days of bicycle racing that circles around France. In the second layer of "implicit meaning", when the riders cross the rugged and barren mountains, it implies that humans can challenge or overcome nature. The final ranking of the race signifies a Greek-style tragedy, where someone winning means someone else losing, and the losers ultimately sacrifice themselves.

"Mythologies" also discusses wrestling as a sport. In the first layer of symbolic meaning in wrestling, it is a "performance" composed of different characters, where two or more people attack each other and create an entertaining spectacle. The second layer of symbolic meaning in wrestling has its own myth, which is the existence of punishment and revenge. The sport attacks the symbol of the despicable participant and allows the honest person to have a heroic ending. The body and physique of the participating characters also have different "symbols". For example, a pale and sunken body symbolizes a villain who is despicable and repulsive, while a body that is not muscular or dark represents a symbol of despicability, villainy, and repulsion.

Examples of Symbolic Analysis in Modern Sports Communication

Logo of Olympics and the introduction video of Olympics game

The Olympic Games are one of the largest international sporting events, with a global audience, and have a varying degree of influence on viewers worldwide through visual communication (Liu and Li, 2018).

Using the Olympics as an example, the five rings of the Olympic symbol represent five colors of rings, as shown in Figure 1. From left to right, they are blue, yellow, black, green, and red, and they intersect with each other. Blue, black, and red are on the top, representing the quadrennial world sports event (International Olympic Committee, 2020). However, the Olympic rings have more implicit meanings when interacting with the cultural values of the symbol users, including the value of universal participation that can be shared by people of all genders, ages, and incomes. The concept of "participation is more important than winning" and the fearless sportsmanship exhibited by athletes on the field are also generated by the interaction of the Olympic symbol with different people and cultures (Jiang, Hsu, & Chiang, 2017).

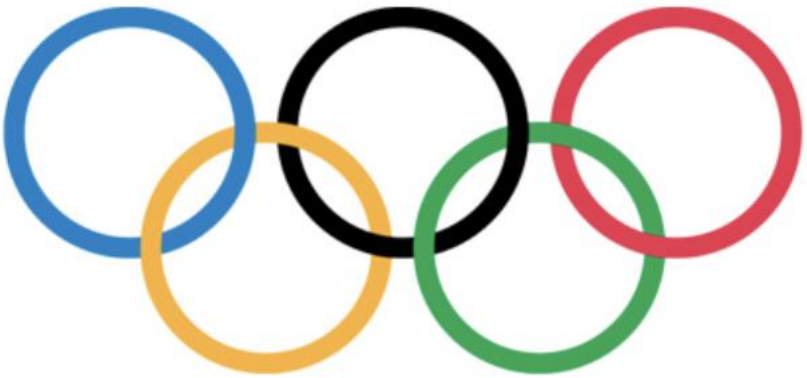

Figure 1. the five rings of the Olympic

After the end of the 2016 Rio Olympics, the official Olympic broadcast introduced the 2020 Tokyo Olympics with a video that included not only footage of various sports but also many anime characters, such as Tsubasa from Captain Tsubasa at 0:34 and 1:09, a sprite at 0:38, Doraemon at 0:42 and 1:30, Hello Kitty at 0:48 and 1:06, and Mario at 1:26 (data compiled by the author). These anime (anime or manga) characters that appeared in the introduction video can be analyzed according to Roland Barthes' first-level signification, which means they are widely known and have a considerable weight in their field, and consumers mostly perceive them as "cool" or "cute" (McGray, 2002). According to Roland Barthes' second-level signification, the appearance of Japanese anime characters in the Olympic introduction video represents the diversity of Japanese culture, different character roles, the idea that characters do not always win, and the need for hard work and perseverance. It also reflects the characteristics of Japanese culture to a considerable extent (Wang, 2013). The appearance of these anime symbols in such an important event as the Olympics also symbolizes the success of Japan's "soft power" policy (Guo, 2015). Using anime characters' symbols in Olympic promotion not only resonates with young people and spreads widely but also combines Japanese pop culture with sports, increasing the visibility of Japanese culture and the Olympics (Vázquez, 2021).

Logo of National Intercollege Athletic Games in Taiwan

The National Intercollegiate Athletic Games, commonly known as the "National Games," is one of the largest campus sports events in Taiwan and one of the largest sports events in the country. It provides an opportunity for people across Taiwan to witness and share the joy of sports and health. Moreover, it serves as an important channel for cultivating national athletes. Its logo is also an important part of visual communication, appearing on trophies and medals (Lin, 2020).

In the National Intercollege Athletic Games in Taiwan (abbreviated as "NIAG") held in 2021, many symbols were used in the main visual and mascot, which can be analyzed using Roland Barthes' first level of symbolic meaning - denotation. The logo of this event, as shown in Figure 2, is composed of five intersecting red lines and five colored lines, which can be intuitively understood as representing ribbons or running tracks. Using Roland Barthes' second level of symbolic meaning - connotation, the five red lines on the left symbolize wisdom and represent the power of universities and academia in the NIAG, while the five colored ribbons on the right represent passion. As this event is hosted by Cheng Kung University, the red ribbon of Cheng Kung University leads the way, blending wisdom and passion. The lines also express speed and futurism, conveying the spirit of unity among the athletes on the sports field, while also demonstrating a spirit of inclusiveness and diversity (Ministry of Education, 2021).

Figure 2. the Logo of National Intercollege Athletic Games in Taiwan in 2021

Unlike the five colors used in 2021, using Roland Barthes' first level of symbolic meaning - denotation to analyze the logo of the NIAG in 2022, shown in Figure 3, the logo uses two shades of blue as the main colors and purple as the tone for the event name and the host school name. Compared with the logo of the NIAG in 2021, this logo has no specific reference and consists simply of two arcs and a solid circle. However, using Roland Barthes' second level of symbolic meaning - connotation to understand, this logo is formed by a simple shape, which shows a jumping rabbit on the left and an athlete on the right, demonstrating the spirit of athletes pursuing higher, faster, and stronger goals in sports competitions. The deep blue color symbolizes perseverance and determination, while the light green color symbolizes youthful passion, and the purple color symbolizes the light of victory. Unlike in the past, this design is not composed of high saturation pure colors, but is expected to draw attention back to the athletes (Ministry of Education, 2022).

Figure 3. the Logo of National Intercollege Athletic Games in Taiwan in 2022

Conclusion

The receivers of texts and symbols have the agency to decode them based on their own experiences. Therefore, when conducting visual communication, sports communicators can think from the perspective of symbol receivers according to Roland Barthes' first and second levels of symbolic meaning. They should consider what symbols to include in the message and text to ensure that they can be decoded smoothly by the audience. While the interpretation of the first level of symbolic meaning may not differ significantly among receivers, there can be ambiguity in the second level of implied meaning.

To leave a lasting impression on the receiver and change their cognition, attitude, and behavior, the content of communication must interact with the receiver's experiences and social context. Therefore, sports communicators should pay attention to what symbols can provide different implied meanings to the entire communication text, interact with the receiver's own experiences and value context to achieve their communication goals as well.

After sports became commercialized, selling sports products or services became the ultimate goal. Marketing of products and services has become increasingly important, and visual communication has become the main communication mode, from newspapers and magazines in the past to today's smartphones and social media. Although the media for communication will continue to update, the content of communication text is an essential part of communication. The meaning behind these textual symbols must be emphasized and constructed appropriately. Therefore, Roland Barthes' first and second level of symbolic analysis and construction model have become a tool that can help sports communication practitioners achieve their communication goals.

If sports communicators find successful sports visual communication cases, they can also analyze the symbols involved and identify which symbols bring different implied meanings to the successful case and allow the audience to decode them smoothly. For example, as the author analyzed the introduction video of the Tokyo Olympics, it can be understood what factors may contribute to its success. In the future, when engaging in sports visual communication, one can refer to this case.

It is worth exploring not only the first layer of symbol meaning but also the deeper implied

meaning, and how they are constructed. Therefore, the visual communication text symbol is not only about aesthetics, colors, or product design, but also includes more profound connotative meanings, which is already a common practice for major brands nowadays. Deconstructing and analyzing the symbols of these brands and replicating their patterns can help sports communication professionals to have a basis for reference, analysis, and content construction when engaging in sports visual communication for sports events, services, or products.

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