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QUALITY OF A MOBILE SPORT WEBSITE: DEVELOPMENT AND PSYCHOMETRIC EVALUATION OF A SCALE

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ABSTRACT

With the prevalence of mobile Internet usage among sport fans, providing quality service in a mobile setting has become an essential part of sport management. Given some unique characteristics of the mobile-accessed Internet over traditional PC-accessed Internet, the current research aimed to develop a psychometrically sound measurement of the Quality for Mobile Sport Website Scale (QMSWS). In Study 1, the content validity of the scale was established through a comprehensive review of literature and expert review, initial psychometric properties of the scale with college students (n=257). In Study 2, the factor structure of the scale was cross-validated from a general population (n=242) and its predictive validity was established. Overall, the results indicated that the QMSWS would be a valid and reliable scale to assess mobile website quality as perceived by sport fans.

Keywords: Mobile sport consumption; Mobile sport website quality; Sport fans; Psychometric Scale development.

INTRODUCTION

Since the inception of the smartphone, people can easily access the Internet via smartphones and the number of mobile-only Internet users finally exceeded the number of desktop-only Internet users in March of 2015 (Lella, 2015). The growing number of mobile Internet users allows them to access tremendous amounts of information and products/services available on the Internet, anywhere and anytime. Due to this fact, mobile commerce (m-commerce), defined as "content delivery and transaction on mobile devices" (Leung & Antypas, 2001:12), has significantly grown. According to Goldman Sachs forecasts, the total size of m-commerce market will jump from $204 billion in 2014 to $626 billion in 2018 and its market is expected to account for 46.6% of overall electronic commerce (e-commerce) revenues by 2018 (Siwicki, 2014).

With the ever-increasing popularity and growth of mobile-accessed Internet usage, sport fans are also able to engage in various activities using mobile devices, such as searching for their favourite teams' information (game schedules, scores, rosters), purchasing merchandise and tickets, watching game highlights, and interacting with other fans or sport organisations. In fact,

Kang *et al*. (2015:272) argued that "a mobile device has become a way to communicate with other fans, obtain sports news and information, and support sport fan's favourite teams." With that in mind, a plethora of sports teams, leagues, and even athletes have begun to aggressively "invest significant financial resources into mobile marketing for smartphones and mobile applications in order to generate a high level of fan engagement" (Ha *et al*., 2015:163). For instance, numerous sporting venues are attempting to build massive wireless infrastructures to meet the crushing demands of mobile fans, resulting in unprecedented change of sport fans' expectations and engagement at sporting events (Robbins, 2014).

To meet the needs of diverse sport fan behaviours in a mobile setting, it is crucially important to give the best experience possible on a mobile device. In other words, a poor mobile sport web experience may negatively shape the perceptions of sport fans of a mobile website and make it difficult for them to engage in the website (Robbins, 2014). Accordingly, it is critical for sport managers to ensure developing and/or maintaining a high quality mobile sport website.

Quality, in general, refers to the ability of products/services to be used for their intended purpose (Juran & Gryna, 1998), "which has been reflected when defining a website quality – a website reaches high quality levels and satisfies its users if it is sought for the intended purpose it was designed and visited for" (Kincl & Štrach, 2012:648). Based on this, a substantial amount of efforts have been made to examine the quality of traditional websites (computer-based websites) both in a sport context (Hur *et al*., 2011; Carlson & O'Cass, 2012; Suh *et al*., 2013) and outside of the context (Loiacono *et al*., 2002; Zeithaml *et al*., 2002; Ho & Lee, 2007). However, several limitations were observed in prior work.

First, the majority of prior studies attempted to cover both information-seeking and transactional activities without distinguishing the two activities. Of course, sport fans can participate in both activities on mobile devices, particularly browsing an online sport retail store. For instance, they initially search information about sporting goods on their mobile phones and then make transactions to purchase them. However, most people tend to hesitate making transactions on mobile devices because of security and privacy issues, screen size, network performance, typing difficulties, and interface design (Lin & Wang, 2006). Furthermore, in comparison with PC-accessed Internet users, smartphone users, particularly in a spectator sport context, are typically inclined to seek only concise and quick information (searching game scores). Therefore, the quality of a mobile sport website needs to emphasise information-seeking behaviours by distinguishing them from transactional behaviours.

Second, many of the previous studies, even those conducted in a sport setting (Hur *et al*., 2011; Suh *et al*., 2013) did not reflect unique characteristics of a sport and its fans (emotional attachment, social interaction and uncertainty). For instance, since sport fans are emotionally attached to their favourite teams, they would like to customise and personalise information on mobile phones by receiving only information they care about. In addition, because sports represent an institution that offers a collective social experience via social interaction (Warner *et al*., 2013), sport fans tend to actively interact with others on mobile devices. Although social interaction can also occur in PC context, a mobile phone's portability and shortcuts provide more convenient ways to do so.

Lastly, the scales measuring PC-accessed website quality is not applicable when measuring mobile-accessed website quality due to several attributes that differentiate the latter from the former, such as ubiquity, convenience, localisation, instant connectivity and personalisation (Clarke III, 2001; Hyman, 2012).

To date, no effort has been made to understand perceptions of sport fans regarding mobile sport website quality in spite of the rapid growth and availability of the mobile-accessed Internet in a sport consumption setting. In addition, it can be argued that a sport-specific mobile website is different from other mobile websites due to the inherent characteristics of sport and its fans. In other words, sports have information-oriented, subjective, unpredictable and socialising characteristics compared to others (Fairley *et al*., 2012). To better understand the perceptions of mobile sport website quality among sport fans, it is necessary to develop a scale to measure the perceived quality of the website from the experience of the consumer. Given that research on mobile website quality in a sport context is in its infancy (Ha *et al*., 2014), developing a valid and reliable measurement is needed to help both sport researchers and practitioners better understand various behaviours of sport fans using mobile phones. Hence, the purpose of the current study is to develop a sound (valid and reliable) measurement scale of mobile sport website quality.

REVIEW OF LITERATURE

It should be noted that sport fans' behaviours with mobile devices typically occur through the following two primary mechanisms (Ha *et al*., 2014): (a) a mobile website (m.espn.go.com) that is optimally designed to be viewed by a mobile phone and (b) a mobile application (ESPN ScoreCenter). The marketing goal of an organisation is the primary factor when it comes to deciding whether a sport organisation builds a mobile website or an application. For instance, if the goal is primarily related to offering mobile-friendly contents to the widest spectrum of possible fans, developing a mobile website would be the practical first step in the mobile outreach strategy of an organisation (Summerfield, n.d.). This is because a mobile website has several inherent advantages over a mobile application (Buettner & Simmons, 2011; Angeles, 2014; Summerfield, n.d.).

Firstly, a mobile website can be cross-platform compatible. In other words, individuals using mobile websites have online contents and information consistently available regardless of types of mobile devices and operating systems (OS). However, mobile applications are not compatible across the devices and OS. For example, once sport organisations develop sport-related applications, the applications would be managed and controlled by the mobile OS marketplace, not by the application developer/or provider. This may lead to restricting the number of potential application users. Indeed, while some sport applications are only available on Application Store (iOS), others are only available on Play Store (Android).

Secondly, while mobile websites can cache personal preferences for searching information, search is not optimised for mobile applications (Buettner & Simmons, 2011). Thirdly, a mobile website is much more dynamic than an application in terms of pure flexibility to update contents. If a sport organisation wishes to change the design or content of a mobile website, the organisation simply publishes the edit once and the changes are immediately visible. Updating

an application on the other hand requires the updates to be pushed to users, which then must be downloaded in order to update the application.

Lastly, a mobile website is much more time- and cost-effective than a mobile application in terms of its development and maintenance. In other words, because a mobile application is not compatible across many types of mobile devices, multiple applications need to be developed depending on the types of the devices and OSs. Based on the above advantages of mobile websites, the current study focuses on a mobile sport website rather than a mobile sport-related application.

WEBSITE QUALITY FACTORS

In the offline context, customer service quality is referred to as "a global judgment or attitude related to the superiority of a service" (Parasuraman *et al*., 1988:16). Numerous studies have investigated customers' perceptions of service quality in the offline context (Parasuraman *et al*., 1988; Dabholkar *et al*., 1996) and extended it into e-service context by adding unique attributes/dimensions of e-service (Ahmad *et al*., 2016; Jeon & Jeong, 2016; Sun *et al*., 2016). Despite a substantial amount of research on service quality provided by a PC-accessed website, previous research shows that there is confusion in interpreting and defining the meaning of service quality of websites (Yang *et al*., 2005). According to Ellahi and Bokhari (2013:121), this is mainly due to the fact that "different service quality factors exist based on the type of website" (information, search engine, company website, retail store, social networking).

To extend the experience of service quality to the online sport consumption context, several studies have recently attempted to examine how sport fans perceive service quality provided by PC-accessed sport websites (Hur *et al*., 2011; Carlson & O'Cass, 2012; Suh *et al*., 2013). For instance, Fassnacht and Koese (2006) and Carlson and O'Cass (2012) conceptualised PC-accessed sport website quality in a hierarchical framework with three primary dimensions: (a) environment quality; (b) delivery quality; and (c) outcome quality. Under these three dimensions, there are nine additional sub-dimensions: environmental quality (graphic quality and clarity of layout); delivery quality (attractiveness of selection, information quality, ease-of-use, technical quality); and outcome quality (reliability, functional benefit and emotional benefit). In the study, they found that the overall sport website quality significantly affected fans' trust and loyalty to the website. Similarly, Hur *et a*l. (2011) and Suh *et al*. (2013) examined the following quality factors of websites: ease of use, security, information, reliability, appearance, system, design, among others. However, previous measures for PC-accessed sport website quality may not be appropriate for measuring a mobile sport website quality due to unique characteristics of mobile-accessed Internet (ubiquity, convenience, localisation, instant connectivity and customisation) as mentioned previously.

UNIQUE CHARACTERISTICS OF MOBILE-ACCESSED INTERNET

According to Clarke III (2001) and Hyman (2012), the attractiveness of activities in a mobile context can be appreciated by comparing the relative advantages of mobile technologies (mobile-accessed internet) over traditional electronic technologies (PC-accessed Internet).

Firstly, mobile-accessed Internet offers the ability to complete information-seeking and transactional activity by identifying a user's context and location. Smartphones can be readily accessed in most settings, allowing for more diverse contexts compared to the PC, which is mostly used in predetermined environments (Lee *et al*., 2005). Thus, the use of the smartphone is facilitated more by contextual cues, such as entering a particular environment and facing a particular time (Oulasvirta *et al*., 2011). For example, it is very common that sport fans check game information via a mobile sport website while attending a sporting event or watching a game on TV (Sun & May, 2009; Ha *et al*., 2015).

Furthermore, to meet sport fans' context-specific needs, some mobile sport websites can be accessed only by those who attend a particular sporting venue or event, while providing real-time statistics, live streaming video or instant replay (Law360, 2012). The value of information in sport context depreciates very quickly because the sport product (a game) is simultaneously produced and consumed (Mullin *et al*., 2014). Because of such a unique characteristic of the sport product, a mobile-accessed Internet makes possible contextual marketing, which is defined as the providence of relevant information in the right context and in real-time (Lee & Jun, 2007). As such, context-specific and real-time marketing communication through a mobile device may enhance the perceived usefulness of the mobile website of fans, leading to their satisfaction with and loyalty to a sport organisation.

Secondly, while the PC limits a consumer's accessibility to the Internet in terms of time and place, smartphones allow consumers to access online services instantly, almost anywhere and anytime (Chae *et al*., 2002). In addition, smartphones are designed to be highly portable and fit into a pocket. Due to this feature, sport fans with smartphones can instantly obtain sport information using touch function without access restriction while on the move. Thus, these instant connectivity and portability functions generate advantages of mobile-accessed Internet over PC-accessed Internet (Ha *et al*., 2015; Kang *et al*., 2015).

Thirdly, mobile phones enable users to personalise information and content based on their needs (Gao *et al*., 2012). For instance, users differentiate their smartphones from those of their friends and colleagues by personalising/customising their phones with unique content, apps, wallpapers and ringtones (Gao *et al*., 2012). Even though people can personalise their PCs, the degree of personalisation may not be as high as that of mobile phones because of their convenience (Ha *et al*., 2015). In a sport context, smartphones allow sport fans to access customised sport-related information by using either a mobile sport website or a sport application, meaning that they have the ability to only receive information about the teams, players or leagues in which they are interested (Sun & May, 2009; Ha *et al*., 2015; Kang *et al*., 2015). According to Troshani and Rao (2007), content that personalises a user's mobile interaction has proved to be an incredibly successful category for mobile business growth. Furthermore, providing customised content and service in the mobile website can enhance consumer satisfaction, trust and eventually loyalty (Choi *et al*., 2011). Thus, the customisation feature is an essential element to be considered when developing or designing a mobile sport website in order to meet the various needs of sport fans.

Despite such unique characteristics of mobile-accessed Internet, there has been no attempt to explore a mobile website quality in a sport consumption setting. Furthermore, measures employed in the previous research to assess mobile service quality may be inappropriate to

measure for a mobile sport website quality because of inherent characteristics of sport (particularly a sport event), such as being information-oriented, uncertain, subjective, socially interactive and emotionally attached (Fairley *et al*., 2012). Therefore, this study seeks to develop and validate a Quality for Mobile Sport Website Scale (QMSWS). The following section presents specific procedures employed to develop the QMSWS.

SCALE DEVELOPMENT APPROACH

Before explaining specific procedures of the scale development, it should be noted that the current study attempted to measure quality of a mobile sport news websites (m.espn.go/; m.cbssport.com/; sport.yahoo.com/) because there were few sport organisations (teams) providing a mobile version of their website at the time this study was conducted. Unlike sport teams' websites, almost all sport news websites are providing a mobile version of the website that is optimised for the smartphone's small screen.

Following the procedures by Kim *et al*. (2011) for developing relationship quality constructs in a sport context, the QMSWS was developed through two separate studies by following four steps. The specific four steps were as follow: (1) generation of potential items and domains; (2) establishment of content validity; (3) initial investigation of psychometric properties (reliability, validity and factor structure); and (4) cross-validation of the confirmed factor structure. All of the four steps were based on an exploratory mixed methods design that involved, at first, qualitative data collection and then quantitative data collection (Creswell, 2007). More specifically, in Study 1, potential items and domains of the QMSWS were generated through a review of relevant literatures (qualitative data collection). Then, the content validity of the generated items was established by experts in the field of sport management (qualitative data collection). At the end of Study 1, the psychometric properties of the scale were preliminarily investigated (quantitative data collection). In Study 2, the confirmed factor structure of the QMSWS elicited in Study 1 (quantitative data collection) were cross-validated.

STUDY 1

Domain and item generation

Following a review of relevant literatures (offline service quality, e-service quality, website quality, sport website quality, mobile service quality), six constructs that captured the essential facets of a mobile sport website quality were identified. These constructs were related to sport fans' information-seeking behaviour, not their transactional activity because the current study focused on a spectator sport context where concise and quick information (searching game scores) are typically inclined to consume.

The six constructs included in the current study are as follows: (a) information; (b) personalisation; (c) design; (d) system; (e) fulfilment; and (f) interaction. It is important to note that these identified constructs were based mostly on inherent characteristics of sport, such as information-seeking (information), subjectivity and emotional attachment (personalisation), and social affiliation (interaction). In addition, according to Hur *et al*. (2011), sport fans are more likely to seek hedonic values (fun and entertainment) in online sport context than

utilitarian values, so fulfilment was also included in the constructs of measuring quality of a mobile sport website. Furthermore, due to the fact that website quality has traditionally been studied from a usability perspective (Palmer, 2002), design and system were also included. Specifically, website usability refers to the ease of navigation, visual appeal and performance of the website. Operational definitions of the six constructs were evaluated by a three-judge panel of scholars who had expertise in the field of online sport consumption behaviour (Table 1). Based on the operational definitions of six dimensions, a large pool of potential items were generated.

Table 1. **OPERATIONAL DEFINITIONS OF SIX CONSTRUCTS OF MOBILE SPORT WEBSITE QUALITY**

Dimension	Definition	Source
Information	Information quality refers to the degree to which the mobile sport website incorporates useful, accurate, up-to-date and comprehensive information.	Zeithaml *et al*. (2002); Yang *et al*. (2005); Ho & Lee (2007).
Personalisation/ Customisation	Personalisation quality refers to the degree to which the mobile website provides sport fans with suitable content and services based on their preferences and needs.	Ho & Lee (2007); Liang *et al*. (2007); Kang *et al*. (in review).
Design	Design quality refers to the extent to which the mobile website is easy to navigate and to operate in terms of its layout and structure, as well as attractiveness.	Yang *et al*. (2005); Loiacono *et al*. (2002); Hur *et al*. (2011).
System	System quality represents a mobile website's consistency of performance, as well as its perceived risks of personal and financial information being used.	Zeithaml *et al*. (2002); Fassnacht & Koese (2006); Hur *et al*. (2011).
Fulfilment	Fulfilment quality refers to a website users' perceived hedonic outcomes in terms of playfulness and enjoyment.	Jarvenpass & Todd (1997); Yang *et al*. (2005).
Interaction	Interaction quality refers to the extent to which the mobile website facilitates sport fans to interact with the service provider (website managers), as well as with other fans.	Loiacono *et al*. (2002); Yang *et al*. (2005); Hur *et al*. (2011).

Items in the QMSWS were generated following Netemeyer *et al*. (2003:95), who stated that items for a new scale could be generated "from [either] the extant literature or by the scale authors". We initially adapted seventeen items from a review of relevant literature with the operational definitions of the dimensions in Table 1. Specifically, 4 items for information (Yang *et al*., 2005; Hur *et al*., 2011; Carlson & O'Cass, 2012), 4 items for design (Loiacono *et al*., 2002; Hur *et al*., 2011; Hyman, 2012), 3 items for system (Loiacono *et al*., 2002; Hur *et al*., 2011; Hyman, 2012), 3 items for fulfilment (Loiacono *et al*., 2002; Hur *et al*., 2011; Carlson & O'Cass, 2012), and 3 items for interaction (Loiacono *et al*., 2002; Yang *et al*., 2005; Hur *et al*., 2011) were selected from the extant literature. These items were the modified via the expert assessment to fit into the current study context. Ten additional items were then newly developed from the authors of the current study through a focus group discussion: 2 items for information, 3 items for design, 1 item for fulfillment and 4 items for personalisation. In particular, the four newly developed items for personalisation are important because one of the unique characteristics that differentiate a mobile phone from a PC is personalisation/customisation (Hymn, 2012).

Item evaluation

The primary purpose of item evaluation was to ensure the content validity of generated items in the previous stage. In the current study, the evaluation of generated items consisted of two phases. In the first phase, the items were reviewed and discussed by ten doctoral students majoring in sport management from two universities in the United States. This was done to ensure item redundancy, understanding, vagueness and appropriateness. The participants were provided with the purpose of this study and definitions of the six constructs. Then, they identified ambiguous items, recommended rewording some items, and suggested some additional items. Then, the items were revised based on their input.

In the second phase, a four-person panel of scholars, who had expertise in sport consumer behaviour, examined the revised items from the first phase of the item evaluation. The expert panel suggested that the dimension of system quality may need to include items measuring responsiveness of the website ("the mobile sport website responds to my input and clicks consistently and quickly"). As such, three items measuring responsiveness of the mobile website were added based on a review of the literature (Loiacono *et al*., 2002; Hyman, 2012). The initial QMSWS was ultimately composed of 30 items representing six constructs (Table 2): information (6 items), personalisation (4 items), design (7 items), system (6 items), fulfilment (4 items) and interaction (3 items).

Table 2. **INITIAL QMSWS MEASURES**

Factors	Items	Sources
Information (*INF*)	*INF 1*. The mobile sport news website is a very useful source of information.	Literature
	INF 2. Information contained on the mobile sport news website is complete and rich in detail.	Literature
	INF 3. Information contained on the mobile sport news website provides wide ranges of information.	Literature
	INF 4. The mobile sport news website provides up-to-date information.	Newly developed
	INF 5. Information in the mobile sport news website is accurate.	Newly developed
	INF 6. Information in the mobile sport news website is concise.	Newly developed
Personalisation (*PER*)	*PER 1*. The mobile sport news website allows me to obtain customised sport information by setting a certain function.	Newly developed
	PER 2. The mobile sport news website recognises me when returning and my search preferences are remembered.	Newly developed
	PER 3. I can find my preferred information on the mobile sport news website.	Newly developed
	PER 4. The mobile sport news website provides personalised information based on my preferences.	Newly developed
Design (*DES*)	*DES 1*. It is easy to navigate around and find what I want at the mobile sport news website.	Literature
	DES 2. Learning to operate the mobile sport news website is easy for me.	Newly developed
	DES 3. The layout of the mobile sport news website enables the user to find important information on first sight.	Literature
	DES 4. The layout of the mobile sport news website provides a clear structure.	Literature
	DES 5. The mobile sport news website is visually appealing.	Literature
	DES 6. The mobile sport news website is comfortable to look at.	Newly developed
	DES 7. The mobile sport news website is easy to access.	Newly developed
System (*SYS*)	*SYS 1*. The mobile sport news website presents few errors.	Literature
	SYS 2. I feel like my privacy is protected at the mobile news website.	Literature
	SYS 3. I feel like the mobile website will not misuse my personal information.	Literature
	SYS 4. The mobile sport news website responds to my input and clicks quickly.	Expert panel
	SYS 5. When I use the mobile sport news website, there is very little waiting time between my actions and the website's response.	Expert panel
	SYS 6. The mobile sport news website takes long to load.	Expert panel
Fulfilment (*FUL*)	*FUL 1*. I feel happy when I visit the mobile sport news website.	Literature
	FUL 2. The mobile sport news website helps improve my knowledge of sport in general.	Literature
	FUL 3. It is fun to visit the mobile sport news website.	Literature
	FUL 4. When using the mobile sport news website I am playful.	Newly developed
Interaction (*INT*)	*INT 1*. I can learn something valuable by interacting with other fans in the mobile sport news website.	Literature
	INT 2. The mobile news website allows me to interact with it to receive tailored information.	Literature
	INT 3. I can interact with the mobile news website in order to get information tailored to my specific needs.	Literature

Preliminary analysis of items

To initially analyse reliability and validity of the generated items, data were collected from students enrolled in sport management classes at two universities in the United States: one is a large university in the South-central area (n=210) and the other is a mid-size university in the Midwestern area (n=169). Students enrolled sport management classes are often regarded as highly involved sports fans and thus are more likely to search sport-related information via a mobile phone (compared to students taking other classes (Kang *et al*., 2015). Furthermore, collecting data from sport management students at the two universities may improve external validity.

A mixed-mode survey (online and paper surveys) was employed at both universities. Of 379 respondents from online (n=190) and paper and pencil (n=189) questionnaires, those who had not used any mobile sport news websites before were excluded along with incomplete surveys, resulting in a total of 257 respondents (University 1: n=134, University 2: n=123; online: n=126; pencil and paper: n=131). All items for the QMSWS were answered on a 7-point Likert-type scale, ranging from *Strongly Disagree* (1) to *Strongly Agree* (7).

In terms of the respondent demographics, 150 were male (58.4%) and 107 were female (41.6%), with a mean age of 23.89 years (ranged from 18 to 52 years). Of the various mobile sport news websites, ESPN (m.espn.go.com) was the most popular (43.5%), followed by Yahoo! Sports (16.7%), Fox Sports (8.4%), CBS Sports (8.0%), and others.

A confirmatory factor analysis (CFA) was conducted to initially examine factor structure and psychometric properties of the QMSWS using AMOS 22.0. This analysis is appropriate since the six constructs identified in the current study have already been proposed in a mobile service context. Using Maximum Likelihood Estimation (MLE), the results of CFA revealed that the six-factor (30-item) measurement model did not fit the data well (x^2/df=3.129; RMSEA(Root Mean Square Error of Approximation)=0.09; CFI (Comparative Fit Index)=0.87; TLI (Tucker-Lewis Index)=0.86, SRMR (Standardised Root Mean Square Residual)=0.05). In addition, while all Cronbach's alpha values (0.77–0.94) were above the suggested value of 0.70 (Nunnally & Berstein, 1994), some Average Variance Extracted (AVE) values (system) were lower than the benchmark of 0.50. Accordingly, there was a need for model re-specification.

During the re-specification phase, the authors decided to delete five items (items *SYS* 6, *DES* 6, *SYS* 5, *DES* 7, *SYS* 4) based on the assessment of psychometric properties (factor loading, MI [Modification Index], residuals) and theoretical relevance of the items. A detailed description on the deletion of the items is available upon request from the first author. After the removal of the five items, another CFA was conducted with 25 items under six factors (information: 6 items; personalisation: 4 items; design: 5 items; system: 3 items; fulfilment: 4 items; interaction: 3 items). The results indicated that the model showed an adequate fit to the data (x^2/df=2.364; RMSEA=0.07 [CI Confidence Interval: 0.06–0.08]; CFI=0.93, TLI=0.92, SRMR=0.05).

With the final confirmed model, reliability and validity of the QMSWS were established. All factor loadings were significant in the predicted direction ($p<0.01$; loadings ranging from 0.55

to 0.97; Table 3). All Cronbach's alpha coefficients were larger than 0.70, ranging from 0.79 to 0.94 and all of the AVE values were greater than 0.50 ranging from 0.57 to 0.75 (Table 3), demonstrating good convergent validity and reliability. AVE values for all factors were larger than the corresponding squared inter-construct correlations, providing support for discriminant validity. In the whole, the results indicated that the QMSWS possessed adequate psychometric properties. Factor loadings, Cronbach Alpha coefficients and AVE values of the final measurement model in Study 1 are displayed in Table 3.

***Table 3*. FINAL MEASUREMENT MODEL IN STUDY 1**

Factors	Items	Factor loading	AVE	β
Information (*INF*)	*INF* 1	0.86	0.70	0.93
	INF 2	0.82		
	INF 3	0.79		
	INF 4	0.89		
	INF 5	0.86		
	INF 6	0.79		
Personalisation (*PER*)	*PER* 1	0.81	0.71	0.91
	PER 2	0.79		
	PER 3	0.90		
	PER 4	0.87		
Design (*DES*)	*DES* 1	0.86	0.75	0.94
	DES 2	0.87		
	DES 3	0.88		
	DES 4	0.90		
	DES 6	0.81		
System (*SYS*)	*SYS* 1	0.63	0.66	0.84
	SYS 2	0.91		
	SYS 3	0.87		
Fulfilment (*FUL*)	*FUL* 1	0.83	0.61	0.86
	FUL 2	0.81		
	FUL 3	0.82		
	FUL 4	0.66		
Interaction (*INT*)	*INT* 1	0.57	0.57	0.79
	INT 2	0.82		
	INT 3	0.84		

AVE= Average Variance Extracted β=Beta (standardised regression coefficient)

STUDY 2

Participants

The sample in Study 1 consisted of students who were affiliated with the two universities. To evaluate the generalisability of the results for the QMSWS from Study 1, the confirmed factor

structure of the scale elicited in Study 1 were cross-validated with a sample representing a broader range of populations.

Procedures

Data were collected from Amazon's Mechanical Turk (MTurk), which was launched in 2005 for online data collection. According to Buhrmester *et al*. (2011), MTurk participants for social science research are more demographically diverse than standard online samples and typical American college samples. To obtain participants who had actually used a mobile sport news website, a screening question was employed: "Have you ever used a mobile sport news website?" A total of 276 participants responded to the QMSWS scale. After deleting 34 incomplete surveys, 242 useable surveys were finally used for data analysis. It is important to note that participants were asked to refer to the most frequently used sport news website when responding to the QMSWS scale. The refined 25 items (Study 1) for the scale were answered on a 7-point Likert-type scale, ranging from *Strongly Disagree* (1) to *Strongly Agree* (7). An analysis of demographic variables indicates 33.9% (n=82) were females and 66.1% (n=160) males with age ranging from 19-67 years (Mean=30.50 years). Similar to Study 1, the most popular mobile sport news website was ESPN (37.8%) followed by Yahoo! Sports (29.8%).

RESULTS

Results of the CFA indicated that the measurement model with 25 items under six factors demonstrates a reasonable fit to the data (x^2/df=628.224/260=2.416; RMSEA=0.072 [CI: 0.066–0.084], CFI=0.91, TLI=0.92, SRMR=0.059). Cronbach's alpha coefficients ranged from 0.75 for System to 0.84 for Personality and the identified factors were internally consistent (Nunnally & Bernstein, 1994). All factor loadings (Table 4) of items on latent factors were statistically significant ($p<0.01$). The loadings ranged from 0.58 for *INT* 1 to 0.86 to *INT* 2.

The AVE values ranged from 0.51 for Information to 0.58 for Personalisation. Furthermore, the AVE values for all factors were larger than the corresponding squared inter-construct correlations, providing support for discriminant validity. All Cronbach's alpha coefficients, factor loadings, and AVE values for the QMSWS are shown in Table 4.

Lastly, a multiple regression was conducted to evaluate criterion validity (predictive validity) for the QMSWS with the outcome variable: satisfaction with a mobile sport news website. According to Hur *et al*. (2011), PC-accessed sport website quality was positively related to its satisfaction and was measured by three items ("I am satisfied with my decision to use the mobile sport website"). The results of the multiple regression demonstrates that the regression model was significantly related to its satisfaction (5.58±0.95; $F_{6, 235}$=49.96; R^2=0.56; $p<0.001$). With regard to the specific influences, all QMSWS dimensions were significant predictors of satisfaction, with the exception of interaction (Table 5).

Table 4. **MEASUREMENT MODEL IN STUDY 2**

Factors (M±SD)	**Items**	**Factor loading**	**AVE**	**β**
Information (*INF*) (5.68±0.76)	*INF* 1	0.71	0.51	0.83
	INF 2	0.74		
	INF 3	0.69		
	INF 4	0.68		
	INF 5	0.73		
	INF 6	0.72		
Personalisation (*PER*) (5.38±0.94)	*PER* 1	0.78	0.58	0.84
	PER 2	0.72		
	PER 3	0.80		
	PER 4	0.72		
Design (*DES*) (5.55±0.87)	*DES* 1	0.76	0.52	0.84
	DES 2	0.73		
	DES 3	0.68		
	DES 4	0.75		
	DES 6	0.70		
System (*SYS*) (5.10±0.95)	*SYS* 1	0.60	0.52	0.75
	SYS 2	0.80		
	SYS 3	0.74		
Fulfilment (*FUL*) (5.38±0.91)	*FUL* 1	0.70	0.52	0.80
	FUL 2	0.76		
	FUL 3	0.79		
	FUL 4	0.63		
Interaction (*FUL*) (5.28±0.99)	*INT* 1	0.58	0.56	0.78
	INT 2	0.89		
	INT 3	0.74		

AVE=Average Variance Extracted β=Beta (standardised regression coefficient)

Table 5. **RELATIONSHIP BETWEEN QMSWS DIMENSIONS AND SATISFACTION**

Dimensions	**B**	**SE**	**β**	**t**	**p**
Information	0.337	0.083	0.270	40.07	***
Personalisation	0.244	0.062	0.242	30.93	***
Design	0.165	0.071	0.151	20.33	*
System	0.134	0.049	0.134	20.74	**
Fulfilment	0.131	0.065	0.126	20.01	*
Interaction	0.016	0.051	0.017	0.32	

B=Unstandardised regression coefficient SE=Standard Error t=t-score
β=Beta(standardised regression coeff.) p=Significance * $p<0.05$ ** $p<0.01$ *** $p<0.001$

DISCUSSION

With the rapid increase of mobile Internet usage through smartphones among sport fans, providing quality service is an essential part of mobile sport consumption context. Thus, the primary purpose of the study was to develop a reliable and valid measure for the quality of a mobile sport website. This purpose was achieved through two studies in developing the QMSWS. In Study 1, after content validity was established through a comprehensive review of literature and expert review, initial psychometric properties of the scale were investigated. In Study 2, the QMSWS was cross-validated using a different sample and its predictive validity was established. Overall, the findings across the two studies indicated that the 25-item, six-dimension scale is parsimonious and demonstrates good internal consistency, construct validity, and predictive validity.

While some studies focused on sport website quality or e-service quality in an online sport consumption context (Hur *et al*., 2011; Carlson & O'Cass, 2012; Suh *et al*., 2013), there is a lack of research into understanding how sport fans perceive the quality of a mobile-accessed sport website. Therefore, the QMSWS scale was developed to fill the void and evaluate mobile website quality. Particularly, the developed scale would provide insight for sport management researchers to better understand the website quality perceptions of sport fans, as the scale was developed by reflecting unique characteristics of mobile-accessed Internet, such as its context-based service, personalisation, convenience, and ubiquity. In addition, the developed scale provides a critical tool for researchers to further examine the sequential relationships between mobile website quality and its outcome variables, including mobile trust, mobile satisfaction, and mobile loyalty. Indeed, in recent years, it has been argued that all six dimensions in the QMSWS would be significant antecedents of online sport consumption via smartphones (Ha *et al*., 2015; Kang *et al*., 2015)

The findings also demonstrated that the most significant two dimensions affecting mobile-accessed sport website satisfaction were information (β=0.270, $p<0.001$) and personalisation (β=0.242, $p<0.001$). With the sport industry being an information-oriented business, it appears that sport fans evaluate mobile sport website quality mainly on the basis of information quality. That is, it is critical to provide useful, accurate, up-to-date and comprehensive sport-related information to satisfy the needs of sport fans. This finding coincides with a recent study demonstrating that information is one of the most significant motivators for sport fans to use sport-related mobile applications (Kang *et al*., 2015). In addition, the results of this study found that personalisation is another focal element ensuring the quality of the mobile sport website and eventually influencing satisfaction of sport fans with the website. This is consistent with an argument by Ha *et al*. (2015) that states that sport fans are likely to receive customised sport information via smartphone. Of course, receiving customised information can occur with a PC-accessed website, but the degree of customisation in a mobile setting is more evident than its counterpart (Ha *et al*., 2015). Therefore, the QMSWS scale extends the scope of the conventional PC-accessed sport website quality by adopting personalisation.

Although most dimensions of the QMSWS were found to be significant predictors of satisfaction with a mobile sport website, the interaction dimension was not significant (β=0.017, $p>0.05$). This finding contrasts with a previous study that found interactivity to be one of the most crucial factors positively influencing attitudes toward a PC-accessed sport website (Ahn *et al*., 2014). One plausible explanation for this result is that sport fans use other programmes to satisfy their needs for interaction, including social networking sites (Facebook and Twitter), while they use a mobile sport website mainly for information.

PRACTICAL IMPLICATIONS

In addition to the theoretical implications, the QMSWS can be adopted for several purposes in sport management practices. Firstly, the scale may serve as a management tool to the extent that sport organisations can evaluate the quality of their mobile websites and initiate proper practices aimed at improving its quality. In other words, the scale of mobile sport website quality can help management to map the performance of specific quality dimensions more precisely and to propose corresponding improvement actions more effectively. For instance, the key attributes of information quality, such as frequent updates, accuracy, usefulness, and conciseness, should be incorporated in the design and enhancement of the mobile web pages. For personalisation quality, sport organisations should provide more customised information to sport fans based on their preferences. Furthermore, for sport fans seeking to have a reliable and consistent performance of a mobile website, much more attention should be focused on system quality.

Secondly, the QMSWS can make sport organisations assess sport fan's perceived level of a mobile website quality and thereafter develop proper marketing strategies. For example, sport organisations can use the scale in classifying their fans into multiple perceived mobile website quality segments based on the individual QMSWS scores. Specifically, the sport organisations are able to analyse certain demographic and psychographic characteristics of these segments and then examine why the individuals in each segment reported the different levels of mobile website quality (low, medium, and high). With that information, the organisations can develop and implement proper marketing strategies for each segment.

Thirdly, as indicated in the results from predictive validity of the scale, most dimensions of the scale were significantly related to satisfaction with a mobile sport website. From a practical standpoint with these findings, sport organisations can build stronger and longer-lasting connections with fans by understanding how the mobile website quality affects outcomes. Then, the sport organisations can leverage them to enhance emotional attachment and engagement of sport fans to the mobile website.

Overall, from the perspective of the sport organisation, the appropriate mix of mobile website quality dimensions is essential when developing and maintaining a mobile website. Typically, sport fans may tend to compare the quality of a mobile sport website they currently use with that of others. If they are not satisfied with the current one, they are likely to terminate further visits. Accordingly, it is essential for sport organisations to ensure the quality of the website in terms of information, personalisation, system, fulfilment, design and interaction.

LIMITATIONS, CONCLUSIONS AND FUTURE RESEARCH

Some limitations of this study should be acknowledged and directions for future studies should also be suggested. Since the developed QMSWS scale in the current study is based on a mobile sport news website, the findings may not be generalisable to different types of mobile sport websites, such as websites for professional teams, intercollegiate teams, sporting goods companies and non-profit sport organisations. Although in a PC-accessed sport website, it has been suggested that "online sport consumers may show different perceptions of website quality" (Hur *et al*., 2011:470). For instance, while people using a team's website may be more concerned with its information and fulfilment (entertainment) quality, those using a sporting goods company's website may care more about its system quality (security and privacy). Accordingly, examining different types of mobile sport websites is needed to further strengthen and validate the QMSWS.

There are many different types of mobile devices, such as smartphones and tablets. When the participants in the current study filled out the QMSWS, they were only asked to refer to a mobile sport website on a smartphone, not other devices, such as a tablets. This might be an issue with the external validity of the findings, suggesting that the findings of the study may not be applicable to other types of mobile devices.

Even though an effort was made to develop a comprehensive inventory of mobile-accessed sport website quality, it is not reasonable to state that the dimensions included in the QMSWS are exhaustive to all possible components of mobile sport website quality. Thus, future research may be needed to explore further other possible quality dimensions. Lastly, as mentioned, an in-depth analysis of the impact of each QMSWS dimension is recommended to fully understand how a mobile sport website quality influences its related outcome variables, such as trust, loyalty and frequency of actual use for a mobile website. This would in turn contribute to strengthening a body of knowledge in the field of online sport consumption behaviour.

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