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Perceptions of Service Quality and Satisfaction among the Spectators in a Mega-Sport Event:

PyeongChang 2018 Olympic Winter Games

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Thesis is Dedicated to My Late Grandmother

Parimalam Rajaratnam (1929 – 2007)

Best Thesis Award is Dedicated to My Motivator

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Abstract

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Service quality in sports is highly expected by the clients and organizers to highlight it as a mega-sport event. Many sport management scholars have dealt with numerous issues of qualities in various types of sport services. It is essential to identify the determinants of spectators' satisfaction based on their experience in a mega-sport event to enhance service quality for future events.

The XXIII Olympic Winter Games was hosted by Pyeongchang, South Korea in February 2018. Therefore, this study was significant to

develop a basis promptly to assess the service qualities of the Game based on spectators' perception, experience, and satisfaction. Even though plenty of studies have been developed related to service quality, it is scarce to find a research related to spectators' perception of service quality in the Olympic Winter Games. The purpose of this research was to examine the relationship between service qualities and spectators' satisfaction in a mega-sport event as a case of the PyeongChang 2018 Olympic Winter Games.

A self-administrated questionnaire was prepared to collect the data from the spectators during the Pyeongchang 2018 Olympic Winter Games. The questionnaire was developed based on seven dimensions: access quality, transportation quality, accommodation quality, venue quality, game quality, augmented service quality, and interaction quality. The findings of the study were based on the analysis of a sample of 214 responses who have attended the PyeongChang 2018. Descriptive statistic results showed that male and female spectators' ratio was 1:1, most of the winter mega-sport tourists were from the USA, Canada, and Europe. Most of their age ranged from 18 to 75, and 80% of them have at least one degree. The collected data were analyzed using a multivariate statistical procedure of Confirmatory Factor Analysis (CFA) and a technique of Structural Equation Modelling (SEM). The CFA confirmed that the CFA measurement model fit good (CMIN/DF =1.459,

RMSEA = 0.046, TLI = 0.958, CFI = 0.963). The structural model also was a good fit for the data (CMIN/DF = 2.003, RMSEA = 0.069, TLI = 0.908, CFI = 0.917). Since this was the very first measurement model for winter mega-sport event, it was named “Win-SERVQUAL” model. Further, the results revealed that augmented service is the most influencing service quality while transportation, game, and interaction qualities contribute averagely to the spectators’ satisfaction.

This study is limited to the sample being restricted to a single mega Winter Games. This study finally provided a measurement tool which can be used in the future to find out the most important winter mega-sport event quality from the spectators’ perception. This measurement scale can be used by the sport managers to ensure the quality of service being provided to the spectators. Moreover, the recommendations would suggest some further needs, ideas, and knowledge to the mega-sport event organizing committees in order to enhance mega-sport event service qualities.

Keywords: Service Quality, Spectator Sports, Mega-Sport Event, PyeongChang 2018, Winter Olympics

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Chapter 1. Introduction

1.1 Background

Sport management is defined as a field concerned with the coordination of limited human and material resources, relevant technologies and situational contingencies for the efficient production and exchange of sport service (Chelladurai, 2014). The sports industry is rapidly growing with numerous opportunities in many areas such as sports marketing and sponsorship, sports media and social media, sports facilities, and sport education institutions. Hence, the quality of the sport service is highly influenced by the success of a mega-sport event. Therefore, it is necessary to measure the quality of service and satisfaction of the stakeholders involved in such mega-sports event in order to enhance the overall quality of an event in the future.

Olympics is one of mega spectator sport events in the globe and in contrast with the Olympic Games of antiquity, each edition of the modern Games takes place in principle in a different city and country in every other year with many aspirations (The Olympic Museum, 2012). Major spectator sports constitute a large, expanding, and competitive industry (Ko, 2011). A large number of tourists visit the Olympics from all over the world with different anticipations and purposes. Nowadays people around the world

travel to see other continents and countries, modern cities and the ruins of ancient towns; they travel to enjoy picturesque places, or just for a change of scenery to relax or do business (Gozalova, Shchikanov, Vernigor, & Bagdasarian, 2014).

Since South Korea hosted the XXIII Winter Olympic and Winter Paralympic Games during February and March of 2018, it was worthwhile in doing this study on time to assess the service quality and satisfaction of the Games and events from the spectators' perception in order to enhance the service qualities in the forthcoming Olympic Games.

Considering the next two consecutive Olympics, to be staged in Asia - Tokyo 2020 Summer Olympic Games and Beijing 2022 Olympic Winter Games, it would be useful in reading this research. At the third inter-Korean summit on September 2018, North and South Korea released a joint statement agreeing to pursue a bid to co-host the 2032 Summer Olympic Games. Therefore, it will be worth establishing this study to enhance the service qualities provided by Korea in the mega-sport events. In particular, the recommendations of this study suggested the needs and better knowledge to the organising committees to enhance sports service qualities to the spectators.

PyeongChang 2018 Olympic Winter Games

The very first Olympic Winter Games of South Korea, PyeongChang 2018 is officially known as the XXIII Olympic Winter Games, and it has been proven as a successful and peaceful Games, promoting regional development and prospects for Korean unification, said Lee Hee-beom, the president of the PyeongChang Organizing Committee for the 2018 Olympic and Paralympic Winter Games (POCOG). The PyeongChang 2018 ran from February 9 – 25, 2018. South Korea had previously hosted the Games of the XXIV Olympiad three decades ago, Seoul 1988 Summer Olympics. At that time, Seoul 1988 was also considered to be a very successful Olympics in the history (Woong, 1997).

The host cities of PyeongChang 2018, Pyeongchang-gun, Gangneung-si, and Jeongseon-gun are located in the northeast of the center of South Korea. Pyeongchang is a small town of some 30,000 people located in a mostly rural area of Gangwon province, where the total population is a little more than 1.5 million. For comparison, Seoul, which is located roughly ninety-five miles east of Pyeongchang, is a city of roughly ten million as of 2013.

In the lead up to the Games, North Korea launched missiles over the Pacific Ocean which threatened not only South Korea but also the globe in

taking part in the Olympic Games. Some countries expressed concern in attending the 2018 Games. Suddenly, a month before the Olympics, everything fell into place. North and South Korea marched together in the opening ceremony under a Unified Korean flag. Players from both nations played in a joint women's ice hockey team which gave great credit to the Olympics. Therefore, the president of the Republic of Korea described the PyeongChang 2018 as 'Peace Olympics'. Later, the president of the POCOG also mentioned the PyeongChang 2018 the safest Olympics ever in history.

For the first time, the Games featured more than a hundred events (102) in fifteen sports and approximately three thousand athletes from ninety-two National Olympic Committees (NOCs) participated. PyeongChang 2018 facts and figures stated that POCOG operated cultural and live sites at the PyeongChang Olympic Plaza, Gangneung Olympic Park, and beyond with a great success bringing Olympism to a wider audience. A total of 1,400,000 people visited the PyeongChang Olympic Plaza and Gangneung Olympic Park to watch 1200 different events including concerts, performances, exhibitions, and experience during the Games. The statistics also show that 230,000 visitors appeared at the cultural and Information and Computer Technology (ICT) pavilion (International Olympic Committee, 2018).

The updated version of the PyeongChang 2018 Facts and Figures stated that the total number of spectators who have visited the PyeongChang 2018 Olympic Winter Games had surpassed one million just before the closing ceremony of the Olympics. Apart from South Korea, most of the sports tourists that visited the Games were from the United States of America, Canada, and Europe where the winter sports are quite popular. The PyeongChang 2018 experienced record-breaking coverage across digital platforms, including websites, social media and mobile applications. The number of page viewers of www.olympic.org increased by 245-plus percent; Olympic Channel users from website and mobile application grew 541.49% from February 1st to 21st relative to January in 2018.

Definition of Service Quality

The term 'service quality' has been defined in different ways by many scholars in various fields. Although the term has been broadly discussed in marketing research since the 1980s, substantial attention to it has risen recently within the sports industry (Tsitskari, Tsiotras, & Tsiotras, 2006). Crosby (1984) and Deming (1986) have defined it as conformance to specified requirements. It has been defined as a source of satisfaction or delight for the customer, satisfying or exceeding customer expectations (Goetsch & Davis, 1994; Zeithaml et al., 1990). British Standards Institution

(1991) defined the term service quality as the features of a product or service that satisfy stated or implied needs. Lastly, Juran (2007) said service quality could be defined as fitness for use, meaning that the product meets customer needs and is free of deficiencies.

The last definition underscores spectator expectations as the basis for judgment of quality (Chelladurai, 2014). When spectators go to a mega game, they generally have some expectations of the services they will receive. For instance, they may expect the transportation modes will be easy or comfortable and the venues and accommodation be cheap. Expectation that the climate and temperature during the game will be comfortable; officials, volunteers, athletes, and other spectators behaviors will make them happy; and their own countries meals will be available. If the spectators' expectations in those matters are not met, they will be disappointed and judge the service to be poor quality.

Therefore, the perception of service quality and satisfaction of an event are every individual's assessment. It varies from an organization's quality assessment. The service quality assessment from the spectators' perception assists the organization to improve its quality of service for next time.

1.2 Problem Identification

PyeongChang 2018 is not only the first ever Winter Olympics in South Korea, but it is also the first winter mega-sport event. Therefore, PyeongChang 2018 faced a lot of problems and challenges from the inception of this idea and were trying to host the Games for more than a decade. South Korea planned to host the Games in 2010 and 2014. Unfortunately, both of them were unsuccessful bids and defeated by Vancouver 2010 and Sochi 2014 by just three and four votes, respectively. Finally, PyeongChang 2018 won the bid with the highest number of votes ever in Olympic voting history. Before starting the Games, there were several problems identified which were highlighted by many international and local media. They are listed in the following sections.

Security Issues and Threatens

North Korea made significant progress with their nuclear weapons programs six months before the start of the Olympics. Despite international condemnation, they had been continuously testing missiles and conducting a huge underground nuclear bomb test which threatened the forthcoming tourists to PyeongChang 2018. Sim Jae-kook, the mayor of Pyeongchang county noted that officials need to be prepared not only for North Korea but also for terrorist groups such as the Islamic State and disasters both natural

and artificial (Adam, 2017). Due to all these threatens and panic situation, ticket sales for the Games were remarkably low up until the end of January 2018.

Coldest Olympics in History

Adverse weather during the Games always delays sporting events while snow and ice-covered surface streets and highways which may impede the access to the venues by the athletes and spectators as well (Horel, et al., 2002). Before the start of the Games, it was forecasted that PyeongChang 2018 would be the coldest Olympics ever in history. As per the prediction, freezing cold and wind significantly affected some of the competitions, causing some athletes to be blown sideways while flipping and twisting twenty plus feet in the air. In consideration of the athletes' safety, some of the outdoor events such as Nordic combined, biathlon and Alpine skiing were postponed, rescheduled, or delayed due to the adverse extreme weather conditions.

It was too late to build a roof on the main stadium, which was to be used only four times, in the opening and closing ceremonies for both the Winter Games and Paralympic Games. It was also too expensive to install central heat. Therefore, it became another threat that venues would be brutally cold in PyeongChang 2018. Six people were treated for hypothermia while

others huddled in the bathrooms to get a break from the cold in a concert held before the start of the Olympics at the PyeongChang Olympic Stadium.

Difficulties in Booking Accommodation

In 2011, the International Olympic Committee's (IOC) evaluation of the bid described 'a total of 76,000 existing rooms within a fifty-kilometer radius of PyeongChang,' which was deemed 'sufficient' for accommodating the IOC, media, and all other client groups as well as spectators and visitors. Gordon (2017) mentioned that PyeongChang 2018 was promised to be a compact game, but many media highly spoke accommodation issue, and many people also thought that a lack of accommodations might force fans to stay far from the venues. The owners used their website for the advertisement, written in Korean, making it challenging to find nearby accommodations by foreigners. Rooms were scarce, and their prices skyrocketed during the Olympic period. This issue might also be one of the reasons that affected ticket sales which had been lukewarm before the start of the Games.

Transportation Problems

The Gangwon province is quite far from the capital of South Korea – Seoul and is a remote area with less population (1.565 million, 2016). This is why there was not proper transportation or high-speed railway facilities

from major cities such as Seoul and Incheon, where the international airport is. Because of the Olympics, a new transportation system, the Korea Train eXpress (KTX) was constructed, however, the construction was completed only a few months before the Olympics began. South Korea's Lunar New Year also fell during the Olympics. Since many local passengers had already purchased the tickets, international passengers who came for the Olympics faced problems in purchasing train tickets. The highways were also blocked many times with bumper-to-bumper traffic. "We have thoroughly prepared the transport system, but it is true that there are some problems as we are operating them and implementing the plans on site and I would like to apologize," the in-charge for the transportations, Kang said (Chakraborty, 2018).

Western Culture versus Korean Customs and Traditions

Winter Olympic Games is a mega event through which white supremacy and western cultural hegemony are continuously reinforced (Lee, 2018). Most of the international sport tourists to the PyeongChang 2018 Olympics were western or English/ French/ Spanish speaking people. Gangwon province was a quickly developed city, especially for the Olympics. The local people's English proficiency is very low compared to the people living in Seoul. Therefore, there was a question about how the local people

and businesspeople in the province treated international tourists during their stay. Many Korean traditional and cultural performance were staged. It would be a question of how the western younger generation would have entertained those traditional cultural activities. Many of the restaurants near the venues and hotels were Korean cuisine which are entirely different from western foods. Therefore, it would be interesting to check whether the western or non-Korean people enjoyed the Korean foods.

1.3 Research Purpose and Research Questions

Even though plenty of research has been developed related to service quality in the Summer Olympic Games, there is no research found to be related to the Winter Olympic Games from the spectators' perception of service quality. Therefore, the author deemed to study this research.

On the other hand, plenty of research has been developed to find out the relationship between the service quality and satisfaction on volunteers or athletes or spectators basis perceptions. Ko et al. (2011) have researched about the service quality at major spectator sports events by developing a conceptual framework and measurement scale specifically designed for assessment of spectators' perceptions of event quality. This research captured spectators' perception directly on seven dimensions of primary service qualities in a winter mega-sport event.

Therefore, the purpose of this research was to examine the relationship between service qualities and spectators' satisfaction in a mega-sport event as in the case of the PyeongChang 2018 Olympic Winter Games.

Research Questions

Customers and clients may evaluate a service based on several factors. One of the significant interests in service quality researches is learning, what are the influencing factors and how do they enhance or detract from the service experience (Chelladurai, 2014). Therefore, the objectives of the research are defined to evaluate how satisfied the spectators were by the services provided by the POCOG at the PyeongChang 2018. Based on the purpose of the study and background of PyeongChang 2018, the following research questions were developed.

The first research question was to identify the underlying factors of perceived service quality for a winter mega-sport event.

RQ_1. What are the underlying factors of perceived service quality for a winter mega-sport event?

The second research question was developed using the underlying factors obtained from the RQ_1 to identify the relationship between perceived service quality factors and satisfaction.

RQ_2. What are the relationships between perceived service quality factors and satisfaction for a winter mega-sport event?

1.4 Significance of the Study

Firstly, this study compiled the facts of PyeongChang 2018 from many resources. Many articles regarding the problems and challenges faced by the PyeongChang 2018 and its spectators during and before the start of the Olympic Games were collected and compiled in chapter 1. Several pieces of literature related to service qualities in spectator mega-sport events are discussed in this research. The literature serves as a table of service quality frameworks for spectator sport events which is presented chronologically in Table 1.

Even though numerous types of research were developed based on mega-sport events; this study is the very first research based on winter mega-sport event or Olympic Winter Games. The study is developed mainly using seven primary dimensions, which is a high number of dimensions compared to other researches, to examine the relationship between service qualities and satisfaction. The findings of the research have brought the crucial factors which relatively influence spectators' satisfaction.

This research presents a measurement model and a structural model which would be helpful to scholars to compare with their models or further their studies. The study will also help the scholars are studying topics related to sport management, event management, service quality, consumer behaviour, sport tourism, and sport marketing. The presented models can also be applied by sport managers to develop and ensure a high quality of service to spectators in a mega-sport event in the future.

1.5 Overview of the Study

Chapter 1 begins with an introduction of the PyeongChang 2018 Olympic Winter Games and the definition of service quality. Then, spectators' perspectives of service quality issues are identified in the case of PyeongChang 2018. Specifically, how accessibility, transportation, accommodation, venue, game, augmented service, and interaction affected spectator perception of service quality at PyeongChang 2018. The whole study consists of six chapters in order to meet the objectives of this research. It outlines the relationships between service quality and satisfaction from the spectators' perception. The first chapter includes background of the study, problem identification, purposes of the study, and significance of the research.

Chapter 2 provides a review of relevant literature regarding the service quality related to satisfaction and spectator sporting event. Under the service

quality factors for a mega-sport event, seven primary dimensions: access quality, transportation quality, accommodation quality, venue quality, game quality, augmented service quality, and interaction quality are separately studied in detail. In the end, service quality frameworks for spectator sports events from different researches are compiled and presented in Table 1 as an overview.

Chapter 3 proposes a measurement model and a structural model of service quality in a winter mega-sport event. Based on the twofold purposes of the study, the above two models were developed.

Chapter 4 explains the research methodology in detail. It consists of research design, instrument which was used to collect the data, data collection, and the data analytical methods. Chapter 5 presents the results of the statistical analyses. Firstly, the demographic characteristics were explicated through descriptive statistics. Based on the proposed models in chapter 3 and the research questions in chapter 1, the results are presented. Finally, the newly developed CFA measurement model and structural model are presented in the figures. The fit indices of the models are also presented in tables.

Finally, the last chapter of this study, chapter 6, offers discussion, limitations and future directions, and conclusion based on the results

presented in chapter 5. This chapter includes academic and managerial implications as well.

At the end of this thesis, the details of the cited articles are added in the bibliography section. The questionnaire and its covering letter, and some of the statistical outputs have also been attached in appendices.

Chapter 2. Literature Review

Sport and tourism are the most popular leisure activities entertained by many people around the world. However, Sport is now regarded as the world's leading social phenomenon, whereas tourism industry has established itself as the biggest industry in the globe (Sebata, 2016). According to Weed and Bull (2004) sport tourism also involves Olympics as it is a multi-mega-sport event. This chapter introduces a brief literature on sport tourism. Then, it outlines some relevant literature regarding sport service quality, its measurements, and relationship with spectators' satisfaction, spectator sports event, and the service quality factors influencing in the mega-sport event. Literature of each service quality, used in this research, is also reviewed in this chapter. In the end, a table (See Table 1) is presented to have an overview of a comparison of selected service quality frameworks for spectator based mega-sport events.

The notion of people traveling to participate and watch sports dates back to the ancient Olympic Games and the practice of stimulating tourism through sport has existed for over a century (Delpy, 1998). In today's competitive world, there is an increasing need for enhancing the quality of services in and out of the events and Games to satisfy the sport-related travellers and urge them to travel again for future events. Therefore, it was

mandatory to compile the previous studies and compare to the present situation to forecast for future mega-sport events. Delpy (1998) divided sports tourism into five main categories: attractions, resorts, cruises, tours, and events and outlined the benefits and reasons for the growth of sports tourism by providing many examples of the scope and opportunities within the sports tourism field. Deply suggested some ways to maximize potential by understanding all elements integral to sports tourism.

"Event Sport Tourism" refers to tourists who travel to watch sporting events (Gibson, 1998). Gibson (1998) has mentioned that Event Sport Tourism may include events such as the Olympic Games, the World Cup, Professional Golf Association tournaments and events related to professional sport teams or the top United States college basketball and football teams.

2.1 Service Quality and Satisfaction

Generally, service providing experts have played a significant role in a successful business. Products can be bought elsewhere, but if a customer feels important and the quality of service is high only, he will return (Mattsson, 2009). Agbor's (2011) findings resulted that not only the service quality leads to customer satisfaction, but it is important to consider service quality dimensions in different service sectors. Therefore, it is mandatory to take into account related service quality dimensions in a mega-sport event.

There are many academic definitions for service quality in sports, already discussed in chapter 1. Many scholars have previously undertaken many studies related to service quality by proposing various types of dimensions. Parasuraman, Zeithaml, and Berry (1988) defined the term service quality as an overall judgment similar to attitude towards the service and generally accepted as an antecedent of overall customer satisfaction.

According to Kandampully (2002), quality initiatives date back to the 1920s when manufacturers began to focus on controlling the physical production of goods and the internal measurements of the production process. Service quality as a concept has aroused great interest in the literature (Wisniewski, 2001). Also, it is one of the key elements in mega-sport events to achieve competitive advantage. Quality and value of services depend on two dimensions – technical and functional (Salla, 2015). Therefore, it is necessary to maintain both dimensions efficiently to achieve the target or success of an event.

According to Zeithaml, Bitner, Gremier, and Wilson (2008), service quality is a focused evaluation that reflects the customer's perception of specific dimensions of service namely reliability, responsiveness, assurance, empathy, and tangibles. Based on the assessment of service quality provided to the customers, business operators are able to identify the problem quickly,

to improve their service and better assess client expectation. Moreover, Zeithaml and Bitner (1996) mentioned that high-quality customer service is not just for the customer service department, but all levels of management and staffs need to accept and have a state of mind regarding customer care. It is therefore very important for them to know how customers evaluate service quality and what they can do to measure and improve service quality (Ramseook-Munhurrun, Lukea-Bhiwajee, & Naidoo, 2010).

2.2 Service Quality and Spectator Sport Event

Parasuraman et al. (1988) have outlined the major changes in the conceptualization and measurement of service quality that have primarily occurred as a result of a large amount of discussion and debate surrounding the SERVQUAL measurement scale. After the SERVQUAL pattern was identified, many scholars attempted to modify the dimensions or develop the scales in various sport industries (Chang & Chelladurai, 2003; Ko & Pastore, 2005). There are also plenty of studies already undertaken to measure service quality in spectator sports as well (Bitner, 1992; McDonald, Sutton, & Milne, 1995; Wakefield, Blodgett, & Sloan, 1996; Kelley & Turley, 2001; Westerbeek & Shilbury, 2003).

McDonald et al. (1995) developed a five-dimensional TEAMQUAL in professional team sports, consisting of 39 items measuring the performance of ticket takers, ticket ushers, merchandisers, concessionaires, and customer representatives. SPORTSERV, a 22-item scale (Theodorakis, Kambitsis, & Laios, 2001) was later designed to measure spectators' perceptions of service quality in a professional sport. SPORTSERV quality model was measured based on five major dimensions; such as access, reliability, responsiveness, tangible, and security.

Bitner (1992) highlighted environmental dimensions, called *servicescape*, which included ambient conditions, space or functions, and signs, symbols and artifacts. Wakefield et al. (1996) examined more about the facilities and named it *sportscape*, consisting of facility parking, facility aesthetics, scoreboards, seat comfort, layout accessibility, space allocation, and signage. Later, Westerbeek and Shilbury (2003), in their qualitative research on a spectator sport, also included the *servicescape* feature, but that was under the *sportscape* feature.

Chelladurai, Scott, and Haywood-Farmer (1987) developed a model for fitness services. They distinguished the services into two major categories: a) primary and b) secondary services. The primary segments included the aspects directly related to fitness such as instructors, equipment, reservation

system, and courts. The secondary segments included the goods inside the fitness club but not directly related to fitness such as food and beverages, and parking.

Later, Chang and Chelladurai (2003) described the service quality dimensions to the above fitness club by a newly developed input-throughput-output view of a system. The input stage was composed of management actions, and throughput included employee-client interactions and with other clients and their behaviors. They explained client perception of service quality as the only one dimension of output.

Shonk (2006) studied research based on four primary service qualities, access quality, accommodation quality, venue quality, and contest quality in a professional All-Star soccer sporting event in Columbus, Ohio. Shonk assumed that the above four dimensions account for the overall quality of sport tourism which leads to satisfaction with the visit to the event. The result found that there is an overall perception of sport tourism quality which significantly contributes to a tourist's perceptions of satisfaction.

Ko and Pastore (2005) developed a Scale of Service Quality in Recreational Sports - SSQRS to assess participants' perceptions of quality in recreational sport programs by measuring four dimensions a) program quality, b) interaction quality, c) outcome quality, and d) physical environment quality.

Later, Ko et al. (2011) proposed an event quality for spectator sports - MEQSS consisted of certain higher-order quality constructs, game, augmented services, interaction, outcome, and physical environment, each of which was defined by two or more sub-dimensions. In a very recent study, Byon, Zhang, and Baker (2013) distinguished the core service and peripheral service factors which affect the service quality on spectators' intention. They subdivided each main factor into many sub-dimensions. Core service factors include a) the home team and its win or loss record, reputation, and league standard, b) the opposition team and its overall performance, reputation, quality of players or team and exciting player, c) economic considerations such as ticket price, affordability, and discounts, d) game promotions including advertisements and sales promotions, and e) schedule convenience, including the game time of the day and whether the games are on weekdays or weekends or in the mornings or evenings. He included a) game amenities such as pregame, half-time, and postgame entertainments, cheerleading activities and concourse activities, b) ticket services, c) venue quality including arena cleanliness, ease of entrance and security as peripheral services.

Finally, a study of the determinants influencing participation intention to Pyeongchang 2018, mainly focused on residents and native tourism users

results that significant differences between them on the principal factors such as impacts on tourism industries and perceived importance of tourism service quality that influence participation-intention to the Olympics (Kwon, 2015). Further, Kwon's research results that the higher degree of economic and social-cultural influences of tourism business is, the more positive participation-intention to the Olympic the groups have.

2.3 Service Quality Factors for a Mega-Sport Event

Access Quality

Accessibility is one of the essential service qualities, broadly discussed by many scholars (Kelley & Turley, 2001; Theodorakis et al., 2001; Wakefield et al., 1996). Access quality is generally indicated by three sub-dimensions: access to venues, access to amenities and access to seating (Collins, 2005). However, Shonk (2006) subdivided into two: access to destination and access to a sport venue. Weed and Bull (2003) also described that accessibility is an important element in sport events.

Wakefield et al. (1996) studied the relationship between a sport spectator's perception of a stadium and desires to spend time in the stadium. They suggested that customers may not enter the sporting venue in cases where they have trouble finding a parking space or anticipate problems with exiting the parking lot. Moreover, the findings from the study indicate that

one of the most significant factors affecting a spectator's pleasure with the *sportscape* is dependent upon whether they feel crowded or cramped due to limited access and space in the stadium. Collins (2005) also concluded that accessibility positively affected the physical environment quality.

Transportation Quality

Proximity from the hotel to the sporting venue is an important factor for many travellers (Bernthal & Sawyer, 2004). If the accommodation is far from the venues, transportation facilities should be smooth enough to enable the spectators to enjoy the events. The proximity to modes of transportation may reduce time, cost and distance constraints that result in altered spatial travel patterns and desired visitor experiences (Hinch & Higham, 2004). Some destinations are more accessible than others because a wide variety of airlines provide transportation services into the regional area (Yeoman, Robertson, Ali-Knight, Drummond, & McMahon-Beattie, 2004).

Travel time, the frequency of transport, accessibility, and quality of the buses were identified as necessary by the athletes who participated in the London 2012 Paralympic Games (Bamford & Dehe, 2016).

Accommodation Quality

Usually, sport tourists star the accommodation based on the environment around the hotel or motel, value, distance from the sport venue, climate, other inner facilities and prefer to interact with various activities (Chang & Chelladurai, 2003). Murphy (1997) has mentioned in his book that accommodation usually refers to hotels within urban areas. However, it can refer to a wide variety of other accommodations, such as motels, cabins, lodges, resorts and so forth. Since PyeongChang 2018 was a very cold Olympics, some of the spectators preferred to stay in Jjimjilbang, similar to a sauna, but a large, gender-segregated public bathhouse in Korea.

In the case of mega-sport events, sport-tourists book or reserve rooms in advance (Silvers, 2004). Therefore, the tourists face challenges in booking hotels nearby the sport venues. Shonk (2006) indicated accommodation quality by three sub-dimensions: hotel and motel employee interaction, environment, and its value. Unfortunately, Shonk had to exclude accommodation quality from the research due to the lack of responses in the data.

A recent study (Khairullina, 2014) on volunteer tourism at mega-sport events results show that better accommodation is one of the factors motivating the volunteers. One of the qualitative results in the Sochi 2014

Olympic Winter Games revealed that accommodation and food were very poor quality.

Venue Quality

Spectators' highest expectation is all about the best quality of the venue where the games and events such as the opening and closing, and awarding ceremonies are staged. Wakefield et al. (1996) suggested that the stadium environment may have a significant effect on the extent to which a spectator desires to stay and return to the venue. They further found that the primary determinant of perceived *servicescape* quality was the aesthetic appeal of the facility architecture and décor.

Greenwell, Fink, and Pastore (2002) have studied the quality of sporting venues, and they have mentioned that facility factors and personal factors have been shown in more than one study to be significantly related to customer behavior. Shonk (2006) proposed three sub-dimensions of venue qualities: interactions, environment, and value. Salient factors of the physical environment may include cleanliness of the restroom, seating, sound system, parking, stadium signage, facility layout, facility design and a wide variety of other factors germane to the tangible aspect of the service provision.

Game Quality

Game quality and atmosphere are unable to be controlled, and they directly influence maintaining attendance in a mega-sport event (Kennett & Sneath, 2001). Kennett et al. have used the term 'game quality' (Collins, 2005) but some researchers referred it to as contest quality (Shonk, 2006) or event quality (Ko, 2011).

The scoreboard was included as one of the key factors by Wakefield et al. (1996). They mentioned that scoreboards are not only used for information dissemination (scores, time, rosters), but also as orchestrated entertainment (instant replays, programmed animatics, sports news). The result revealed that scoreboard quality directly influences consumers' pleasure. Collapsing scoreboards was criticized as one of the failures in the 2010 Commonwealth Games held in Delhi, India. (Gilmour, 2018). Game performance is identified as one of the sub-dimensions of overall event quality, which develops customers' overall impression of the game (Ko, 2011). Moreover, Denaux, Denaux, and Yalcin (2011) found that a team's performance has a strong influence on game attendance.

Collins (2005) has studied about game quality as one of the sub-dimensions under the outcome quality, consisting of four items which are the flow of a game, the fairness of officials, number of tries per game, and speed

of the game. Collins (2005) found that the sub-dimensions of game quality positively affected the outcome quality.

Augmented Service Quality

The dimension of augmented service quality refers to perceptions of the quality of secondary products offered in conjunction with events, such as foods, souvenirs, cultural performances, etc. Many scholars referred to it as peripheral quality (Kelley and Turley, 2001; Byon et al., 2013). Byon et al. (2013) have included pregame, half-time, and postgame entertainment, cheerleading activities, and concourse as peripheral service factors in their professional sports studies.

Sport England set up national benchmarking services for sport and leisure services to evaluate performance. They evaluated many peripheral service qualities, such as the availability of daycare and nursery, quality and value of food and drink, cleanliness of locker rooms, and café or bar.

Ko and Pastore (2005) have included augmented service quality as one of the dimensions in their five-order MEQSS model. Augmented service quality was subdivided into two sub-dimensions: entertainment and concessions. Regarding spectators' perceptions, they defined one item under each sub-dimension: a) in-game promotion, events, and activities and b) availability of a wide range of food choices, respectively. Interestingly, the

San Jose Giants baseball team used high-quality foods and drinks as an essential promotional tool (Ko et al., 2011). Zhang, Pease, Hui, and Michaud (1995) described music is often used to entertain members of the audience and enhance the game experience.

On the contrary, Kelley and Turley (2001) concluded that concession workers, food, and location as well as the ushers are less important for sports fans in the evaluation of the level of service quality associated with their entertainment experience. Sport tourists generally buy souvenirs as tangible memorabilia or to gift to their friends. Matthew and Laura (2008) considered souvenirs as one of the five dimensions in their research. They found that relative to male participants, female participants would generally be more concerned with souvenirs and merchandise.

Interaction Quality

More than three decades ago, Surprenant and Solomon (1987) stated that service encounters are human interactions. Getz (2005) argues human factors are important at sporting events, where staff and volunteers form a crucial part of the customer experience. Clients are integral to the production of service. Chelladurai (2014) studied client-employee interaction and inter-client interaction. The result revealed that the interaction between clients and the service provider is significant. Hartline and Ferrell (1996) also validated

that the employee-customer interface was the most important determinant of customers' perceptions of service quality.

Service quality in all service encounters is thus intrinsically affected by the perspectives of both the service provider and the service receiver (Ramseook-Munhurrun, 2010; Czepiel, 1990). However, most researches on the service quality construct have been restricted to one perspective: that is service receiver (Parasuraman et al., 1988; Guerrier, 1988). Shonk (2006) used interaction as a sub-dimension under accommodation and venue qualities. Shonk (2006) argued that hotel personnel could directly influence the quality of the visitor's experience. For instance, other guests can be a source of dissatisfaction when a crying baby or a loud television from a neighboring room prevents a guest from sleeping.

Interactions are intangible service encounters with stadium employees or even other spectators (Shonk, 2006). In an integrated hierarchical model developed by Brady and Cronin (2001), interaction quality was identified as the prime service quality and it was subdivided into attitude, behavior, and expertise.

There were plenty of models developed to assess the qualities under various domains of service, event, and *sportscape* (facility). The most recent models are tabled below in chronological order.

Table 1. A Comparison of Selected Service Quality Frameworks for Spectator Sports Events

Author/s	Context	Instrument and Analysis	Domain	Dimension	Sub-dimension
Ribeiro, Correia, Biscaia, and Figueiredo (2018)	2016 Rio de Janeiro Olympic Games	CFA, SEM	Service quality	Technical quality Functional quality Aesthetic quality Access Quality Accommodation Quality Complementary events	-
Ko et al. (2011)	Major League Baseball, US	SEQSS CFA, SEM (MEQSS)	Event quality	Game	Skill performance Operating time information
				Augmented services	Entertainment Concessions
				Interaction	Employee Fans
				Outcome	Sociability Valence
				Physical environment	Ambience Design Signage
Matthew and Laura (2008)	US Tennis Sectional Championships	EFA	Event quality	Play Souvenirs Hotel Tournament destination Concessions	-
Shonk (2006)	Major League Soccer All-Star Game	CFA, SEM	Service quality	Access	Destination Sport venue Hotel

				Accommodation	Environment Interactions Value
				Venue	Environment Interactions Value
				Contest	Process Product
Ko and Pastore (2005)	Recreational sport	SSQRS SEM	Service quality	Program	Range of program Operating time Information
				Interaction	Client–employee interaction Inter-client interaction
				Outcome	Physical change Valence Sociability
				Physical environment	Ambience Design Equipment
Westerbeek and Shilbury (2003)	Spectator sport	Qualitative	Service quality	Core sport product	Sporting contest Religious/fanatical follower Hedonist/uncertain outcome

				Service coproduction	SERVQUAL Personal attention Safe atmosphere TEAMQUAL
				Sportscape feature	*Servicescape* feature Safe atmosphere Hospitality Tangibles Servuction inanimate
Brady and Cronin (2001)	Professional sport	SERVQUAL (Integrated Hierarchical Model)	Service quality	Interaction	Attitude Behavior Expertise
				Physical environment quality	Ambient conditions Design Social factors
				Outcome quality	Waiting time Tangibles Valence
Kelley and Turley (2001)	Spectator sports Basketball	EFA	Service quality	Employees Price Facility access Concessions Fan comfort Game experience Showtime Convenience Smoking	-

Theodorakis, Kambitsis, & Laios (2001)	Professional basketball	SPORTSERV Regression Analysis	Service quality	Tangibles Responsiveness Access Security Reliability	-
Wakefield, Blodgett, and Sloan (1996)	Major college football games	(Hypothesized *Sportscape* Model) CFA	*Sportscape* (Facility)	Stadium access Facility aesthetics Scoreboard quality Seat comfort	-
				Layout accessibility	Space allocation Signage

Chapter 3. Research Model

3.1 Measurement Model

There are numerous popular models proposed by many experts for the last three decades. Some of the most popular models are discussed in this section, but the detailed discussion was already delivered in chapter 2.

Parasuraman, Zeithaml, and Berry (1985) proposed a model of service quality dimensions that comprises five factors: reliability, assurance, tangible, empathy, and responsiveness, dubbed SERVQUAL. Bitner (1992) labeled television, newspapers and coffee for passing the time as *servicescape*. Wakefield, Blodgett, and Sloan (1996) extended this emphasis on physical surroundings to sport stadia and arenas and labeled them as *sportscape*. Recently, Shonk and Chelladurai (2008) studied quality in sport tourism, and they identified access quality, accommodation quality, venue quality, and contest quality as the four major dimensions.

Since the Olympic is a mass-sport event and it has been considered to be both spectators' sports as well as tourism of sports. Groote (2005) also stated that the relationship between the Olympics and tourism is obvious. Therefore, the proposed model of this study is comprised of seven primary dimensions (Figure 1), which are developed based on the issues identified before the start of the PyeongChang 2018. The primary dimensions of this

study are access quality, transportation quality, accommodation quality, venue quality, games quality, augmented service quality, and interaction quality. The proposed research model for service quality in mega-sport events (Figure 2) suggested that a spectator attending the Olympic Game is satisfied when that spectator perceives high-quality service within the contexts of,

a. access to sporting venues and amenities such as toilets, shops, and smoking areas;
b. transportation especially the shuttle bus services in Gangwon Province and their facilities;
c. the accommodation during the stay in the Gangwon Province;
d. the venues where the sports events, shows, and award ceremonies are held;
e. the Olympic Games and the entertainment;
f. peripheral and entertainment events; and
g. interaction between the service providers such as officials, volunteers, athletes, and the spectators and inter-client interactions.

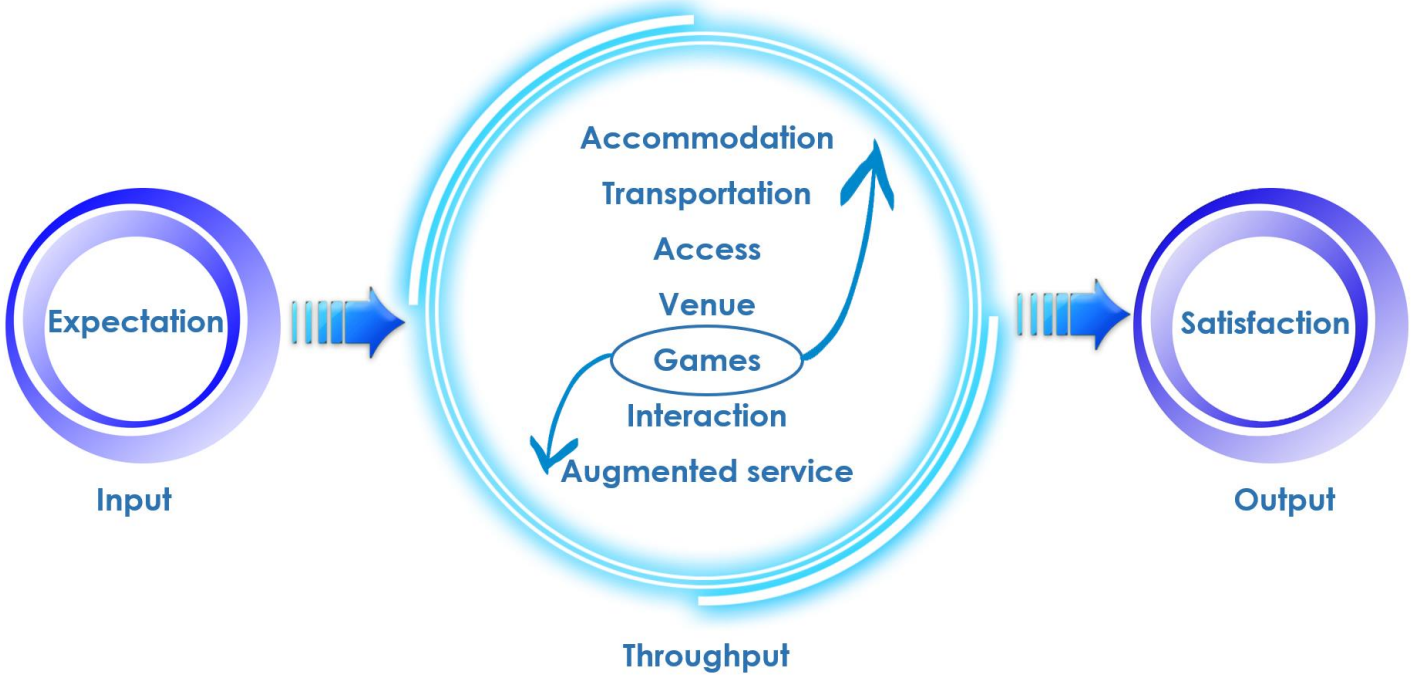

Figure 1. Dimensions of Winter Mega-Sport Event

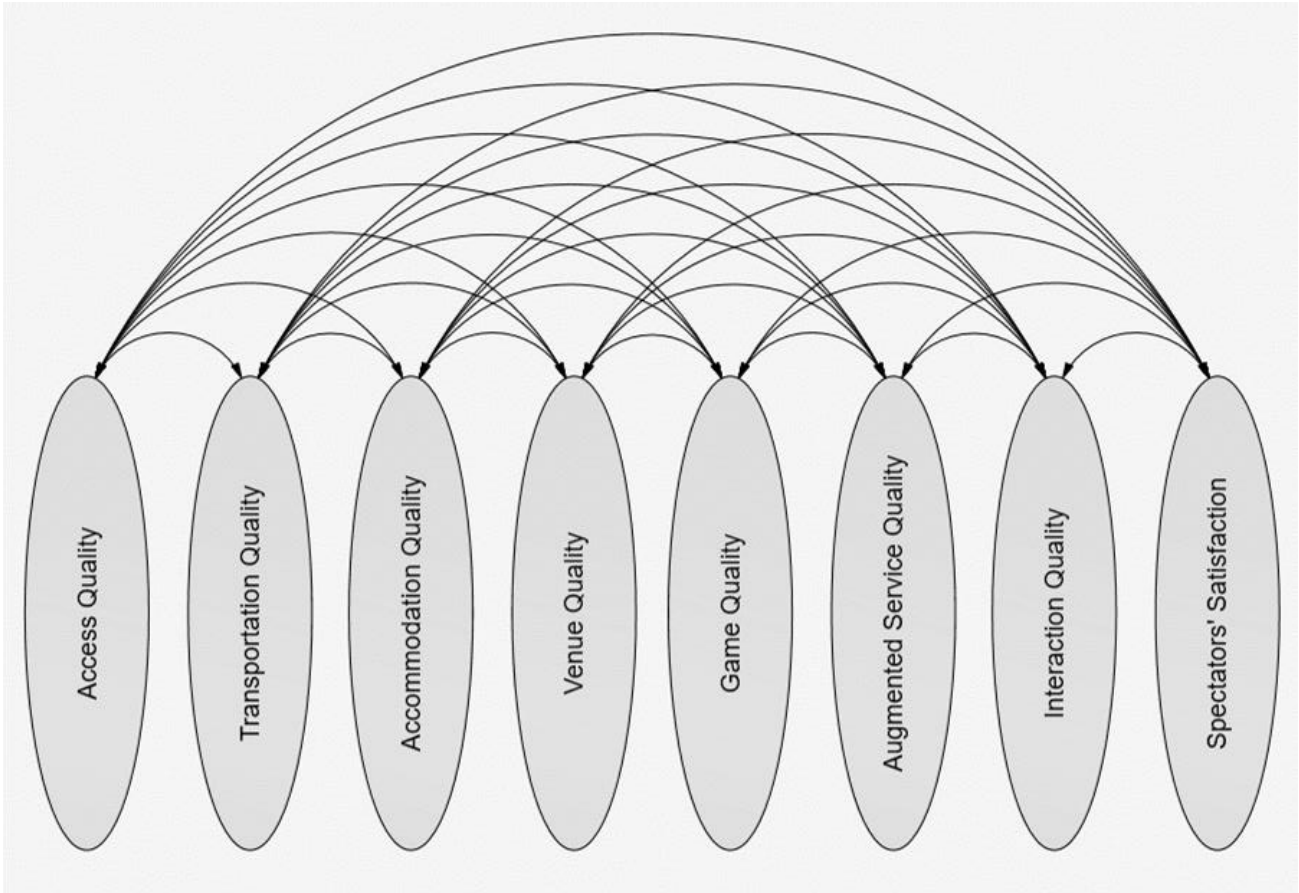

Figure 2. The Proposed Measurement Model of Service Quality in a Winter Mega-Sport Event

3.2 Structural Model

Based on the second research question, there were seven hypotheses developed below to test each service quality separately.

$H_{2.1}$. The access quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.2}$. The transportation quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.3}$. The accommodation quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.4}$. The venue quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.5}$. The game quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.6}$. The augmented service quality influences the spectators' satisfaction in a winter mega-sport event.

$H_{2.7}$. The interaction quality influences the spectators' satisfaction in a winter mega-sport event.

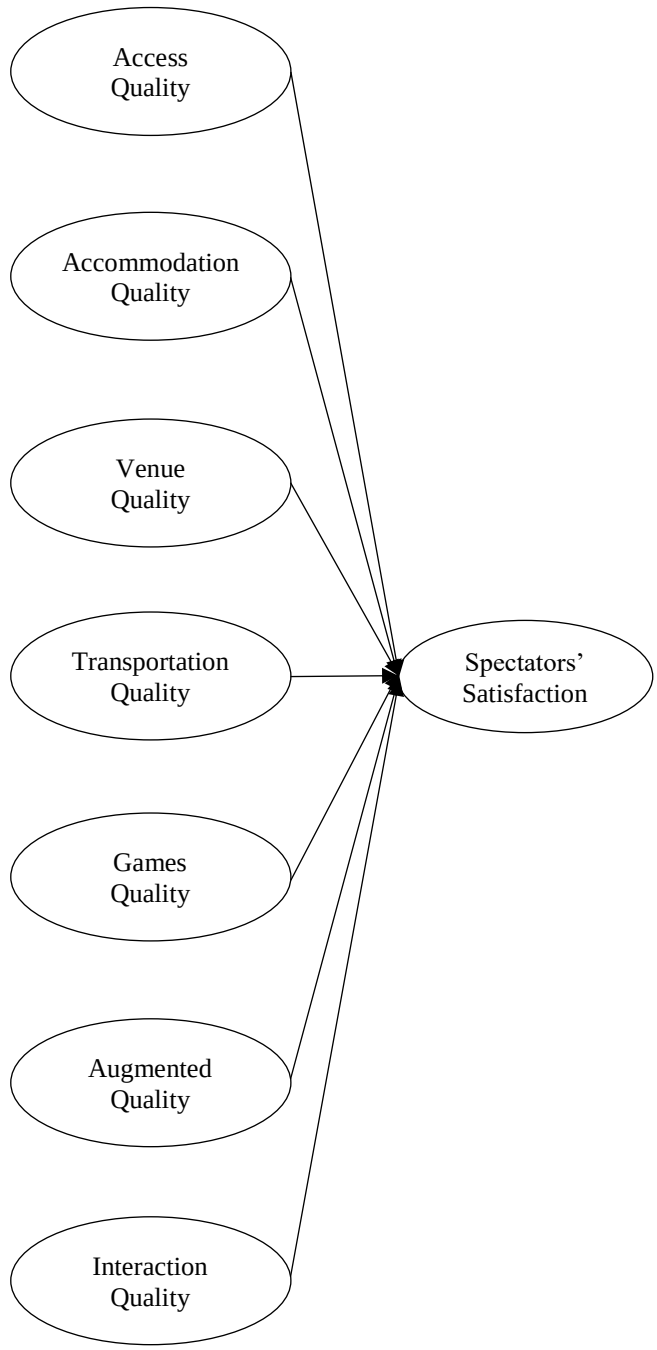

Figure 3. The Proposed Structural Model of Service Quality in a Winter Mega-Sport Event

Chapter 4. Methodology

The purpose of chapter 4 is to describe the research design and the methodological procedures for conducting this study. The discussion in this section describes the type of research to be conducted, subject description and sampling method, design and layout of the survey instrument - questionnaire, data collection, and data analysis techniques and methods.

4.1 Research Design

Research Type

There are two types of researches: quantitative and qualitative, based on the study. This study focused on doing a quantitative research. According to the quantitative criteria, a self-administrative questionnaire was developed, and the collected data were analyzed using appropriate statistical techniques and tools. The self-administrative questionnaire included several sections to meet the purposes of the study.

Subject Description

Subjects of the study were the spectators who attended the PyeongChang 2018 Olympic Winter Games taken place in Gangneung and Pyeongchang in the Gangwon Province. According to the PyeongChang 2018 Facts and Figures (2018), over one million sport and ceremony tickets were

sold out. However, the total number of tourists-attendees to the Olympics could not be found in any of the articles. Nevertheless, tourists are defined as spectators visiting the destination specifically to attend the sporting event and traveling 50 miles or more from the sport stadium (Shonk, 2006). Since accommodation was one of the dimensions of this research, the data collection was focused on the spectators who satisfied the below four criteria:

a. The spectator should have stayed in a hotel or motel in Gangwon Province at least one day or night.
b. The spectator should have watched at least one event in the PyeongChang 2018 Olympic Winter Games.
c. The spectator should be 18 years of age or older.
d. The spectator should be a foreigner (not Korean).

4.2 Instrument

Generally, independent variables are the variables which are not influenced by another variable/s. However, a dependent variable is always influenced by another variable in a model. Therefore, this research model included a) access quality, b) transportation quality, c) accommodation quality, d) venue quality, e) game quality, f) augmented service quality, and g) interaction quality as independent variables and spectators' satisfaction as the dependent variable.

The questionnaire (Appendix II) was originally compiled by the author from the literature review, studied in chapter 2. A covering letter (Appendix I) was also attached to the front of the questionnaire. The questionnaire consisted of two major parts. The first part (Part - I) consisted of eight sections including the above seven service qualities and spectators' satisfaction. Demographic and behavioral questions were added in Part - II. The questionnaire consisted of 91 items where 75 items were related to service quality and satisfaction, the rest of the 16 items were related to demographic and behavioral questions.

Regarding the Likert scale, Byon, Zhang, and Baker (2013) were not satisfied with the results in their research, and they suspected that might have happened due to the 5-point Likert scale (i.e., 1 = unsatisfied to 5 = very satisfied). They recommended the 7-point Likert scale (i.e., 1 = strongly disagree to 7 = strongly agree) to measure service quality (Cronin & Taylor, 1992). Therefore, the scales for all the items were set to 7-point Likert scale, ranging from strongly disagree = 1 to strongly agree = 7 and respondents were instructed to indicate the extent of their agreement with each item. Each section is explained in detail below.

Questionnaire: Part - I

Seventy-five items related to access quality, transportation quality, accommodation quality, venue quality, game quality, augmented service quality, interaction quality, and spectator's satisfaction were included in the Part - I of the questionnaire. The spectators were asked to rate the items in each scale on the 7-point Likert scale which ranges from strongly disagree (= 1) to strongly agree (= 7). Each item is coded in a bracket, in which 'V' means variable, and a number follows it in chronological order. The variables of each dimension are explained below.

Section I: Access Quality:

Shonk (2006) indicated the access quality by two sub-dimensions: a) access to the destination and b) access to sport venue. However, the researcher proposed them separately as there were many problems identified in transportation which is already discussed in chapter 1.

Under section I, access-quality-based nine items were included to scale which are the independent variables and measured the spectators' subjective perceptions of the quality of access to the venues. This section mainly focused on how easily the spectators were able to access the sport venues and amenities such as toilets, cafeterias, etc. In the end, spectator's overall satisfaction with the access quality was asked to scale in the section.

1. Web information made it easy to find the venues. (V1)
2. I faced communication problems with the staff to access the venues. (V2)
3. There was an uncontrollable crowd. (V3)
4. Venue layout was easily accessible. (V4)
5. Security checking was very smooth at the venues. (V5)
6. Venue designs allowed quick access to amenities, such as toilets, cafeterias and so on. (V6)
7. Signages to the amenities were easy to understand. (V7)
8. Facility lighting was good in the surroundings. (V8)
9. It was safe to walk from and to the venue. (V9)
10. I am satisfied with the overall accessibility. (V10)

Section II: Transportation Quality

Under section II, transportation-quality-based five independent items were included to scale. Transportation quality was defined as how the spectators' subjective perceptions of ease in getting to the destination from their accommodations to the venues and vice versa using shuttle buses. This section mainly focused on traffic congestion, timing, and adequacy of the buses. In the end, spectators' overall satisfaction about the transportation quality was also asked to scale.

1. I got delayed due to traffic congestion. (V11)
2. Transportation was convenient. (V12)
3. I had to wait for a long time for the shuttle bus. (V13)
4. The transportation to the venues was on time. (V14)
5. There was adequate transportation to the venues. (V15)
6. Overall, I am satisfied with the transportation service quality. (V16)

Section III: Accommodation Quality

Under Section III, the following eleven independent variables related to accommodation quality were included to scale and defined as the spectators' subjective perception of accommodation quality. This section mainly focused on two major subdimensions of reservation and environment. Reservation consisted of value and ease of booking. The second subdimension, environment, consisted of facilities and cleanliness of the accommodation. In the end, spectators' overall satisfaction with the accommodation quality was asked to scale.

1. It was easy to reserve accommodations. (V17)
2. Accommodations close to the venues were available. (V18)
3. Pricing for accommodations was reasonable. (V19)
4. Receptionists were polite. (V20)
5. My room was very comfortable. (V21)

6. Wi-Fi connection was good. (V22)
7. The place surrounding the accommodation was quiet. (V23)
8. Room temperature was comfortable. (V24)
9. The room was clean. (V25)
10. The smell inside the accommodation was good. (V26)
11. TV, magazines, and newspapers were available. (V27)
12. I am satisfied with the overall accommodation quality. (V28)

Section IV: Venue Quality

Section IV included thirteen independent items related to venue quality which was defined as the spectators' subjective perception of the physical environment of the venues. The section consisted of comfortability, cleanliness, and toilet facilities in the sporting venues. In the end, spectators' overall satisfaction about the venue quality was also asked to scale.

1. I felt very comfortable to watch games at the venues. (V29)
2. The venues were clean. (V30)
3. The temperature at the venues was comfortable. (V31)
4. Seating was comfortable. (V32)
5. The venues were visually appealing. (V33)
6. It was comfortable to walk around at the facility. (V34)
7. The interior décor was attractive. (V35)

8. It was noisy. (V36)
9. Venue staff were helpful. (V37)
10. Food and beverage service was good. (V38)
11. The toilets in the venues were clean. (V39)
12. There were adequate numbers of toilets. (V40)
13. I had enough space around me at the venue. (V41)
14. I am satisfied with the overall quality of the venues. (V42)

Section V: Game Quality

Section V included eight game quality related items and was defined as the spectators' subjective perceptions of the game quality. Game quality was developed based on two major subdimensions, process and product (Shonk, 2006). Process consisted of clarity and facilities to a game and product consisted of the game excitement and fairness. In the end, spectators were asked to scale on their overall satisfaction of the game quality.

1. Scoreboards were easy to read. (V43)
2. Games started on time. (V44)
3. Sound systems were of high quality. (V45)
4. Announcements were clear. (V46)
5. I could see replays clearly on widescreens. (V47)
6. Officiates at the games were fair. (V48)

7. The games were exciting. (V49)
8. Players showed good sportsmanship. (V50)
9. I am satisfied with the overall game quality. (V51)

Section VI: Augmented Service Quality

Section VI included eight augmented service quality related items and was defined as the spectators' subjective perception of other facilities apart from the games. Section VI mainly focused on food, souvenirs, and entertainment activities which are independent variables. In the end, spectators were asked to rate their overall satisfaction with the augmented service quality.

1. The venues offered quality entertainment. (e.g., Korean-pop) (V52)
2. I am satisfied with the information provided by the official media of PyeongChang 2018. (V53)
3. Korean cultural activities were awesome. (V54)
4. Quality of souvenirs and merchandises were good. (V55)
5. Street decorations were very attractive. (V56)
6. Information technology centers were informative. (V57)
7. Olympic exhibition centers were informative. (V58)
8. I could find the foods I liked. (V59)
9. I'm satisfied with overall quality of entertainments and concessions. (V60)

Section VII: Interaction Quality

In section VII, there were ten items added related to the interaction quality and was defined as spectator's subjective perceptions of the various interactions encountered during service delivery at the sport venue (Shonk, 2006). The interaction quality was designed based on spectator-volunteer, spectator-spectator interaction as the independent variables. In the end, the overall satisfaction of spectators was also asked to scale in the section.

1. Security staff controlled disorderly behavior. (V61)
2. Customer service at the ticket office was good. (V62)
3. Volunteers were helpful. (V63)
4. I did not have communication problems with the staff in the accommodation. (V64)
5. Venue employees controlled the crowd well. (V65)
6. I can count on the employees to be friendly. (V66)
7. Other spectators did not affect my enjoyment. (V67)
8. Athletes acknowledged the spectators after the game. (V68)
9. Restaurant workers provided great service. (V69)
10. Weather forecasts were accurate. (V70)
11. Overall, I am satisfied with the quality of interactions with other spectators and employees involved in the PyeongChang 2018. (V71)

Section VIII: Spectator's Satisfaction

In section VIII, subjects were asked to scale their overall satisfaction of the PyeongChang 2018 in various ways as follow to measure the spectators' overall outcome of the Olympics.

1. Overall, I am satisfied with my experience at the PyeongChang 2018 Olympic Winter Games. (V72)
2. Overall, the experiences in the PyeongChang Olympics met my expectations. (V73)
3. Overall, I am pleased with my experience at the PyeongChang 2018 Olympic Winter Games. (V74)
4. Considering my whole PyeongChang 2018 experience, I would consider this Olympic was worth the money I spent. (V75)

Questionnaire Part – II

The last section of the questionnaire contained behavioral and demographic questions. The questions were based on spectators' previous experience in winter sports, number of previous Olympic attendance, and the sporting events which they have watched during the PyeongChang 2018. Three long answer questions were also included to measure the most impressed and disappointed items at PyeongChang 2018. The spectators were asked to suggest their opinions to improve the service quality for future

Winter mega-sport events. Moreover, previous visits to South Korea, number of night stays in Gangwon Province during the PyeongChang 2018 were asked in section IX in the questionnaire. Lastly, spectators' nationality, sex, birth year, and education qualification were also questioned.

Item Purification

Panel of Experts

When a questionnaire is compiled or modified, the instrument should be tested or reviewed by experts in order to identify ambiguities, misunderstandings or other inadequacies (Ary, 2010). To establish validity, the researcher asked three experts in the field of service quality from three different universities around the globe to review and comment on the questionnaire, and it was revised more than ten times. Ko (2005) from the University of Florida in the United States firstly revised several times. Secondly, Chelladurai (2014) was asked to comment on the questionnaire based on its wording, clarity, layout, ease of filling out, and total time to complete (Shonk, 2006). Later, the questionnaire was finalized by the advisor of this research, Joon-ho Kang with some wording changes.

Pre-Test

Even though the questionnaire was reviewed by the experts in the field several times, it was necessary to conduct a pre-test to assess the reliability and validity of the questionnaire as the questionnaire was developed specifically for this research. The final version of the questionnaire was distributed to a class, consisting of 22 Dream Together Global Sport Management master's degree graduates from Seoul National University to fill out. Their comments were asked based on wordings, clarity and time, and whether they were unable to answer any items. Based on the feedback obtained from the class participants, the average time for completing the questionnaire was eight minutes. Some of the wordings were modified as per their comments, and the final version of the questionnaire is attached in Appendix II.

4.3 Data Collection

The author directly visited the sporting venues, restaurants, hotels and motels, buses, and surrounding areas where the foreign spectators were able to fill out the questionnaire comfortably without disturbing their Olympic entertainments. They were first asked whether they stayed in Gangwon Province, to meet the criteria mentioned under research design in chapter 3 (p.43). Also, the data were collected only from the spectators who were

willing to complete the administrated questionnaire and were above 18 years old. The author used hardcopy and online Google forms to collect the data. Only six respondents preferred to answer on paper. The rest of the sample subjects preferred to fill online as it was user-friendly. Since many of the spectators had to stay more days to watch the Games, the author collected their email addresses and then sent them the online version of the questionnaire. Once the Olympics finished, the author sent another reminder email to them. Finally, 214 responses were collected. Since all the scaled items were set to mandatory in the online version, no datum was missed.

Participants

Among the collected sample of 214 responses, the male and female ratio was approximately one to one and most of the visitors' age ranged between 18 to 45 Years. Most of the respondents travelled from the USA and Canada. More than 80% of the respondents had minimum a bachelor's degree. 78% of the respondents mentioned that PyeongChang 2018 was the very first Winter Olympics. More than half of the total respondents have attended or participated or watched at least one winter game in any level of competition. Seventy-two tourists came to South Korea for the first time only for this Olympic Games, and half of the respondents stayed in Gangwon province for

five or fewer nights. Additional interpretation of the descriptive statistics is discussed in detail and presented in Table 2 and Table 3 in chapter 5.

4.4 Data Analysis

Data Analysis Techniques

The collected data were analyzed using the latest version of the Statistical Package for the Social Sciences (SPSS 25.0) which was used as a tool to store and code the data and to run descriptive statistics. In order to address the research questions, Confirmatory Factor Analysis (CFA) was used to determine the underlying factors and to test the proposed measurement model. Structural modeling was used to measure the structural relationships. The latest version of the Analysis of Moment Structure (AMOS 25.0) was used for CFA and structural model, as it was a user-friendly software.

Statistical Assumptions

Factor analysis is an independent technique, whose primary purpose is to define the underlying structure among the variables in the analysis (Hair, Black, Babin, & Anderson, 2010). There are two types of factor analysis: Exploratory Factor Analysis (EFA) and CFA. The main difference between them is EFA attempts to discover the nature of the constructs influencing a

set of responses and CFA tests whether a specified set of constructs is influencing responses in a predicted way. That means CFA is used to provide a confirmatory test of the measurement theory. Instead of allowing the statistical method to determine the number of factors and loadings as in the EFA, CFA statistics tell us how well our theoretical specification of the factors matches reality (the actual data). In a sense, CFA is a tool that enables us to either "confirm" or "reject" our preconceived theory (Hair et al., 2010). Therefore, CFA was adopted for the use of this study.

Regardless of the type of factor analysis methods being used, there are a number of conceptual and statistical assumptions underlying factor analysis related to the set of variable selected and the sample collected (Hair et al., 2010). Moreover, factor analysis relies on the statistical assumptions of normality, homoscedasticity, and linearity to the extent that they diminish the observed correlation. Therefore, Hair et al. (2010) have suggested several approaches to determine whether the correlations of the data matrix are sufficient to proceed factor analysis.

Correlation Matrix

A researcher should ensure that the data matrix has a sufficient correlation to justify the application of factor analysis (Hair et al., 2010). Stewart (1981) suggested that low correlations throughout the correlation

matrix would not be appropriate to proceed factor analysis. Therefore, Hair et al. (2010) mentioned that visual inspection should reveal a substantial number of correlations greater than 0.30.

Anti-Image Correlation Matrix

The anti-image correlation matrix is the negative value of the partial correlations among the variables. It provides the statistical significance that the correlation matrix has significant correlations among the least some of the variables (Hair et al., 2010). That means the larger values indicate that the variables are independent. Therefore, if the anti-image matrix has many non-zero off-diagonal entries, the correlation matrix is not appropriate for factoring (Stewart, 1981). Moreover, if all elements on the diagonal of this matrix should be greater than 0.5 if the sample is adequate (Field, 2000).

Bartlett's Test of Sphericity

Another method of determining the appropriateness of factor analysis examines the entire correlation matrix: Bartlett's Test of Sphericity, a statistical test for the presence of correlation among the variables (Hair et al., 2010). The following formula computes it.

$$\text{Bartlett's Test of Sphericity } (\chi^2) = -\left[n - 1 - \frac{2P+5}{6}\right] \times \ln|R|$$

; where, n – sample size, P – number of variables, and

$|R|$ – determinant of the correlation matrix

If the hypothesis, the correlation matrix from a population of variables are independent, is rejected the data are appropriate for factor analysis (Stewart, 1981).

Measure of Sampling Adequacy

The third measure to quantify the degree of intercorrelations among the variables and the appropriateness of factor analysis is the measure of sampling adequacy (Hair et al., 2010). The Kaiser-Meyer-Olkin measure is generally used by researchers to measure the sampling adequacy.

$MSA = \frac{\sum\sum_{j \neq k} r_{jk}^2}{\sum\sum_{j \neq k} r_{jk}^2 + \sum\sum_{j \neq k} q_{jk}^2}$; where, q_{jk}^2 - square of the off-diagonal elements of the anti-image correlation matrix and r_{jk}^2 - square of the off-diagonal elements of the original correlations.

The index ranges from 0 to 1. The measures can be interpreted with the following guidelines: 0.90 or above, marvelous; 0.80 or above, meritorious; 0.70 or above, middling; 0.60 or above, mediocre; 0.50 or above, miserable; and below 0.50, unacceptable (Kaiser & Rice, 1974).

Assessing the Validity and Reliability of a Measurement Model

It is required to assess the validity and reliability of the measurement model in SEM whether they achieve their required levels. This section involved in assessing the degree of generalizability of the results to the population and the potential influence of respondents on the overall results. Therefore, the content validity, dimensionality, and reliability of the scales should also be assessed (Hair et al., 2010). According to Fornell & Larcker (1981) criterion, the convergent validity of the measurement model can be assessed by the average variance extracted and construct reliability.

Content Validity

This form of validity subjectively assesses the correspondence between the individual items and the concept through rating by experts which has been already discussed under item purification in chapter 4 (p.53).

Dimensionality

Factor analysis plays a pivotal role in making an empirical assessment of the dimensionality of a set of items by determining the number of factors and loadings of each variable on the factor(s). The standardized loading estimates should be 0.50 or higher and ideally 0.70 or higher (Hair et al., 2010).

Reliability

Reliability is the extent of how reliable the said measurement model is measuring the intended latent constructs. Three reliability assessments for a measurement model: internal reliability, construct reliability, and average variance extracted are addressed below.

Internal Reliability: Internal reliability is an assessment of the degree of consistency between multiple measurements of a variable. To assess the internal consistency of the entire scale, Cronbach's coefficient alpha is the most widely used measure and it has a positive relationship to the number of items in the scale. The internal reliability is achieved when the Cronbach's alpha is 0.70 or higher (Hair et al., 2010)

Construct Reliability (CR): The measure of reliability and internal consistency of the measured variables representing a latent construct. In order to achieve the construct reliability, a value of CR 0.7 or higher is required.

Average Variance Extracted (AVE): AVE is the average percentage of variation explained by the items in a construct. An AVE is required to be 0.5 or higher. Even if the AVE is less than 0.5, but the CR is higher than 0.6, the convergent validity of the construct is still adequate (Fornell & Larcker, 1981). Therefore, the value of AVE greater than 0.4 could also be accepted.

Assessing Goodness of Fit

There are several fitness indices in SEM that reflect how the models fit to the data. The most popular fit statistics used and recommended cut-off values that indicate the model good fit are given below.

Chi-squared Test: The most fundamental absolute fit index is the Chi-square statistic, denoted by χ^2. Since the low value of Chi-square supports the model fit, the researchers always look at a minimum value of Chi-square, named CMIN (Hair et al., 2010). Moreover, Kline (1998) recommended that if the parsimonious fit - CMIN/DF value is less than 3.0 the model is acceptable fit between the hypothetical model and sample data, and if it is less than 5.0 the model is a reasonable fit.

Root Mean Square Error of Approximation and Standard Root Mean Residual: The Root Mean Square Error of Approximation (RMSEA) is also another absolute fit index which tells how well the model is, with unknown but optimally chosen parameter estimates, would fit the population's covariance matrix (Byrne, 1998). Standard Root Mean Residual (SRMR) is the square root of the difference between the residuals of the sample covariance matrix and the hypothesized covariance. Both RMSEA and SRMR range from 0 to 1. In general, RMSEA threshold values between 0.08 and 0.10 give a mediocre fit and below 0.08 shows a good fit (MacCallum,

Browne, & Sugawara, 1996). Byrne (1998) recommended 0.05 as the SRMR cutoff value for a well fit model. However, the values as high as 0.08 are deemed acceptable.

Incremental Fit Indices: Incremental fit indices differ from absolute fit indices, and they access how well the estimated model fits relative to some alternative baseline model. In that case, Normed Fit Index (NFI), Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI) are some of the most widely used incremental fit measures. The indices range between 0 and 1, and a model with perfect fit would produce the indices of 1. However, CFI value above 0.90 is usually associated with a model that fits well (Hair et al., 2010).

Chapter 5. Results

Chapter 5 reported the results of the study. The results reported in this chapter are related to basic demographic and behavioral details of the subjects involved in this study, the fit of the CFA measurement model and the structural model, path analysis, and hypotheses testing.

5.1 Descriptive Statistics

Demographic characteristics of gender, age, educational qualification, and nationality of the respondents are provided in Table 2. In totality, 214 respondents comprised the final sample of this study. Majority of the respondents were male (52.8%). However, the ratio between male ($n = 113$) and female ($n = 107$) is approximately 1:1. The sample respondents' ages ranged from 20 to 73, and the average of them was 35.4 years, most of them were between 26 – 35 years (39.2%) and 85% of the respondents were less than 50 years old. Interestingly, all the subjects were educated. One hundred ninety respondents (88.9%) held minimum a degree. Undergraduate degree ($n = 91$) and master's degree ($n = 86$) holders among the subjects were approximately 40% each. Most of the respondents were from cold weather countries, especially from the United States and Europe. 19.2% Asians ($n = 41$) except Koreans, and 3.7% Africans ($n = 08$) were also in the sample.

Table 2. Demographic Characteristics (Respondents = 214)

Demographic Variables	Category	Frequency	Percent
Gender	Male	113	52.8%
	Female	101	47.2%
Age	18 – 25	44	20.6%
	26 – 35	84	39.2%
	36 – 45	44	20.6%
	46 – 55	23	10.7%
	56 – 65	15	7.0%
	65 +	04	1.9%
Education	High school	22	10.3%
	Degree	91	42.5%
	Master's degree	86	40.2%
	Doctorate degree	13	6.1%
	Not available	00	0.0%
	Other	02	0.9%
Nationality	United States of America	44	20.6%
	Canada	31	14.5%
	Great Britain	09	4.2%
	Russia	09	4.2%
	France	09	4.2%
	Germany	08	3.7%
	Switzerland	08	3.7%
	Australia	08	3.7%
	Norway	06	2.8%
	Poland	06	2.8%
	Asia	41	19.2%
	Other Europe Countries	18	8.4%
	South America	09	4.2%
	Africa	08	3.7%

The respondents' winter sports characteristics are reported in Table 3 which includes their previous attended, watched and participated experience in any winter sport event, the number of nights stayed in the Gangwon province where the PyeongChang 2018 was held, number of times they visited South Korea before PyeongChang 2018, the watched event in

PyeongChang 2018, and number of Olympic Winter Games attended before the PyeongChang Olympic Winter Games.

Out of 214 respondents, 191 subjects (56.5%) attended any type of winter sports events. Among the attendees, most of them have attended ice hockey games ($n = 47, 38.8\%$), and 22 respondents (18.2%) attended alpine skiing as well as figure skating. Among the respondents, 92.1% have watched winter sports events through media, and almost half of the respondents (50.5%) have participated in at least in one winter sport event. Sixty-two respondents (57.4%) among them have participated in alpine skiing. More than 30% have also participated in speed skating and snowboarding.

Since the data were collected from the spectators who have stayed at least one night in Gangwon province, approximately 35% of the total respondents ($n = 74$) have stayed 1 - 2 nights. Interestingly, 14% of the total subjects have stayed 21 or more days. Moreover, 33.6% of the respondents ($n = 72$) have visited South Korea for the first time. Thirty-six respondents (16.8%) have visited 11 or more times or a longer stay in South Korea.

Table 3. Winter Sports Characteristics (Respondents = 214)

Demographic Variables	Category	Frequency	Percent
Attended winter sports	Yes	121	56.5%
	No	93	43.5%
Attended winter sport event	Ice hockey	47	38.8%
	Alpine skiing	22	18.2%
	Figure skating	22	18.2%
	Speed skating	21	17.4%
	Cross country skiing	18	14.9%
	Snowboard	18	14.9%
	Other	61	50.4%
Watched winter sports through media	Yes	197	92.1%
	No	17	7.9%
Participated in winter sports	Yes	108	50.5%
	No	106	49.5%
Participated winter sport events	Alpine skiing	62	57.4%
	Speed skating	39	36.1%
	Snowboard	34	31.5%
	Ice hockey	15	13.9%
	Curling	08	7.4%
	Other	26	24.1%
Number of nights stayed in Gangwon province	1 night	36	16.8%
	2 nights	38	17.8%
	3 nights	27	12.6%
	4 nights	13	6.1%
	5 nights	11	5.6%
	6 nights	12	10.3%
	7 - 10 nights	22	15.9%
	11 – 15 nights	14	6.5%
	16 – 20 nights	11	5.1%
	21 or more nights	30	14.0%
Number of times visited Korea before the PyeongChang 2018	Never	72	33.6%
	1 time	40	18.7%
	2 times	14	6.5%
	3 times	12	5.6%
	4 – 5 times	13	6.1%
	6 – 10 times	27	12.6%
	11 or more times	36	16.8%
Number of Olympic Winter Games attended before the PyeongChang 2018	None	166	77.6%
	1 time	18	8.4%
	2 times	14	6.5%
	3 – 4 times	10	4.7%
	5 – 6 times	05	2.3%
	7 or more times	01	0.5%

Watched event in the PyeongChang 2018	Alpine Skiing	62	29.0%
	Biathlon	50	23.4%
	Bobsleigh	71	33.2%
	Cross-country Skiing	55	25.7%
	Curling	98	45.8%
	Ice Hockey	114	53.3%
	Skeleton	49	22.9%
	Nordic Combined	11	5.1%
	Luge	50	23.4%
	Short Track	50	23.4%
	Ski Jumping	54	25.2%
	Freestyle Skiing	41	19.2%
	Figure Skating	78	36.4%
	Snowboard	71	33.2%
	Speed Skating	61	28.5%
	Ceremonies	75	35.0%

PyeongChang 2018 was the very first Olympic Winter Games for 166 of the respondents (77.6%), and six spectators have already attended five or more Olympic Winter Games. Ice hockey was watched by more than half of the respondents ($n = 114$). Curling was the second most-watched game, and Nordic combined was watched by only 5.1% of the respondents ($n = 11$). 50 to 75 respondents on an average watched other games.

5.2 Measurement Model

Pretest of the Data Set

The collected sample data set from the spectators was assessed in order to determine whether the statistical assumptions for CFA and structural model had been met. Therefore, the data matrix was tested by correlation

matrix, anti-image correlation matrix, Bartlett's test of sphericity, and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy in the following sections.

Correlation Matrix

There are many substantial correlations above 0.30 found to be in the correlation matrix (See Appendix III). This revealed that the items share common factors and therefore factor analysis was appropriate for using the data set.

The Anti-Image Correlation Matrix

Since all the elements in the anti-image correlation matrix (Appendix IV) were more than 0.50 and the majority of the off-diagonal values were low and represented the negative value of the partial correlation, the correlation matrix was appropriate for use in factor analysis.

Bartlett's Test of Sphericity

The test value of Bartlett's Test of Sphericity is $\chi^2 = 13220.712$ with the degrees of freedom of 2775, and the significant value was very low ($0.000 < 0.05$). Since the test was significant at 95% confidence level and therefore it rejected the null hypothesis which concluded that the data were appropriate for the factor analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy

Finally, the KMO measure of sampling adequacy was examined, and the test statistic value was 0.910. According to Kaiser's (1974) guideline, this value was 'marvelous', indicating the sample was adequate to proceed factor analysis.

Confirmatory Factor Analysis

Prior to testing the CFA measurement model, CFA was used to identify the underlying factors in access quality, transportation quality, accommodation quality, venue quality, game quality, augmented service quality, interaction quality, and satisfaction separately. AMOS 4.0 was used for CFA along with the Maximum Likelihood Method. The CFA was undertaken using the same number of sample size ($n = 214$) for each dimension.

Item Purification

The purpose of subjecting the variables in a factor to CAF was to verify whether all the variables loaded highly on a single factor. Therefore, each factor was analyzed separately, and their results are presented below.

Table 4. Factor Loadings, Construct Reliability, and Average Variance Extracted

Factors	Items	Description	Loading	CR	AVE
Access quality	V7	Signages to the amenities were easy to understand.	0.55	0.77	0.53
	V8	Facility lighting was good in the surroundings.	0.85		
	V9	It was safe to walk from and to the venue.	0.76		
Transportation quality	V12	Transportation was convenient.	0.53	0.76	0.45
	V13	I had to wait for a long time for shuttle bus.	0.52		
	V14	The transportation to the venues was on time.	0.75		
	V15	There was adequate transportation to the venues.	0.82		
Accommodation quality	V20	Receptionists were polite.	0.70	0.88	0.59
	V22	Wi-Fi connection was good.	0.65		
	V24	Room temperature was comfortable.	0.74		
	V25	The room was clean.	0.88		
	V26	The smell inside the accommodation was good.	0.84		
Venue quality	V29	I felt very comfortable to watch games at the venues.	0.72	0.86	0.51
	V30	The venues were clean.	0.73		
	V32	Seating was comfortable.	0.67		
	V33	The venues were visually appealing.	0.85		
	V35	The interior décor was attractive.	0.68		
	V37	Venue staff were helpful.	0.60		
Game quality	V45	Sound systems were of high quality.	0.87	0.89	0.61
	V46	Announcements were clear.	0.86		
	V47	I could see replays clearly on widescreens.	0.78		
	V48	Officiates at the games were fair.	0.68		
	V49	The games were exciting.	0.69		

Augmented service quality	V53	I am satisfied with the information provided by the official media of PyeongChang 2018.	0.73	0.86	0.57
	V54	Korean cultural activities were awesome.	0.62		
	V55	Quality of souvenirs and merchandises were good.	0.62		
	V56	Street decorations were very attractive.	0.71		
	V57	Information technology centers were informative.	0.90		
	V58	Olympic exhibition centers were informative.	0.89		
Interaction quality	V61	Security staff controlled disorderly behavior.	0.74	0.88	0.56
	V62	Customer service at the ticket office was good.	0.81		
	V63	Volunteers were helpful.	0.78		
	V65	Venue employees controlled the crowd well.	0.73		
	V66	I can count on the employees to be friendly.	0.80		
	V67	Other spectators did not affect my enjoyment.	0.59		
Satisfaction	V72	Overall, I am satisfied with my experience at PyeongChang 2018 Olympic Winter Games.	0.92	0.94	0.81
	V73	Overall, the experiences in PyeongChang Olympics met my expectations.	0.88		
	V74	Overall, I am pleased with my experience at PyeongChang 2018 Olympic Winter Games.	0.94		
	V75	Considering my whole PyeongChang 2018 experience, I would consider this Olympic was worth the money I spent.	0.85		

Access Quality

The first factor for service quality to be subjected to CAF was access quality with nine variables (V1, V2, V3, V4, V5, V6, V7, V8, V9). The value of CMIN/DF was 0.140 which is below the recommended value of 3.0. The RMSEA for the model was 0.000 which is less than 0.08 and indicates a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.999, TLI = 1.000, CFI = 1.000). The results are summarized in Table 5 including each of the fit indices for the access quality. When the model fit good, three of the variables (V7, V8, V9) loaded higher than 0.50 which have been identified as the underlying variables of access quality having a significant relationship with spectator's satisfaction. The loadings were V7 = 0.55, V8 = 0.85, and V9 = 0.76.

Transportation Quality

The second factor for service quality to be subjected to CAF was transportation quality with five variables (V11, V12, V13, V14, V15). The value of CMIN/DF was 0.818 which is below the recommended value of 3.0. The RMSEA for the model was 0.000 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.992, TLI = 1.000, CFI = 1.000). The results are summarized in Table 5 including each of the fit indices for the transportation quality. When

the model fit good, four of the variables (V12, V13, V14, V15) loaded higher than 0.50 which have been identified as the underlying variables of transportation quality having a significant relationship with spectator's satisfaction. The loadings were V12 = 0.53, V13 = 0.52, V14 = 0.75, and V15 = 0.82.

Accommodation Quality

The third factor for service quality to be subjected to CAF was accommodation quality with eleven variables (V17, V18, V19, V20, V21, V22, V23, V24, V25, V26, V27). The value of CMIN/DF was 1.765 which is below the recommended value of 3.0. The RMSEA for the model was 0.060 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.983, TLI = 0.985, CFI = 0.993). The results are summarized in Table 5 including each of the fit indices for the accommodation quality. When the model fit good, five of the variables (V20, V22, V24, V25, V26) loaded higher than 0.50 which have been identified as the underlying variables of accommodation quality having a significant relationship with spectator's satisfaction. The loadings were V20 = 0.70, V22 = 0.65, V24 = 0.74, V25 = 0.88, and V26 = 0.84.

Venue Quality

The fourth factor for service quality to be subjected to CAF was venue quality with eleven variables (V29, V30, V31, V32, V33, V34, V35, V36, V37, V38, V39, V40, V41). The value of CMIN/DF was 1.914 which is below the recommended value of 3.0. The RMSEA for the model was 0.065 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.967, TLI = 0.973, CFI = 0.984). The results are summarized in Table 5 including each of the fit indices for the venue quality. When the model fit good, six of the variables (V29, V30, V32, V33, V35, V37) loaded higher than 0.50 which have been identified as the underlying variables of venue quality having a significant relationship with spectator's satisfaction. The loadings were V29 = 0.72, V30 = 0.73, V32 = 0.67, V33 = 0.85, V35 = 0.68, and V37 = 0.60.

Game Quality

The fifth factor for service quality to be subjected to CAF was game quality with eight variables (V43, V44, V45, V46, V47, V48, V49, V50). The value of CMIN/DF was 0.899 which is below the recommended value of 3.0. The RMSEA for the model was 0.000 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.992, TLI = 1.000, CFI = 1.000). The results are summarized in

Table 5 including each of the fit indices for the game quality. When the model fit good, five of the variables (V45, V46, V47, V48, V49) loaded higher than 0.50 which have been identified as the underlying variables of game quality having a significant relationship with spectator's satisfaction. The loadings were V45 = 0.87, V46 = 0.86, V47 = 0.78, V48 = 0.68, and V49 = 0.69.

Augmented Service Quality

The sixth factor for service quality to be subjected to CAF was augmented quality with eight variables (V52, V53, V54, V55, V56, V57, V58, V59). The value of CMIN/DF was 1.714 which is below the recommended value of 3.0. The RMSEA for the model was 0.058 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.977, TLI = 0.984, CFI = 0.990). The results are summarized in Table 5 including each of the fit indices for the augmented quality. When the model fit good, six of the variables (V53, V54, V55, V56, V57, V58) loaded higher than 0.50 which have been identified as the underlying variables of augmented quality having a significant relationship with spectator's satisfaction. The loadings were V53 = 0.73, V54 = 0.62, V55 = 0.62, V56 = 0.71, V57 = 0.90, and V58 = 0.89.

Interaction Quality

The seventh factor for service quality to be subjected to CAF was interaction quality with ten variables (V61, V62, V63, V64, V65, V66, V67, V68, V69, V70). The value of CMIN/DF was 1.185 which is below the recommended value of 3.0. The RMSEA for the model was 0.029 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 0.982, TLI = 0.995, CFI = 0.997). The results are summarized in Table 5 including each of the fit indices for the interaction quality. When the model fit good, six of the variables (V61, V62, V63, V65, V66, V67) loaded higher than 0.50 which have been identified as the underlying variables of interaction quality having a significant relationship with spectator's satisfaction. The loadings were V61 = 0.74, V62 = 0.81, V63 = 0.78, V65 = 0.73, V66 = 0.80, and V67 = 0.59.

Satisfaction

Finally, the response factor from the spectators to service quality to be subjected to CAF was satisfaction with four variables (V72, V73, V74, V75). The value of CMIN/DF was 0.196 which is below the recommended value of 3.0. The RMSEA for the model was 0.000 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and acceptable model fit (NFI = 1.000, TLI = 1.000, CFI = 1.000). The results are

summarized in Table 5 including each of the fit indices for the interaction quality. When the model fit good, all the four variables (V72, V73, V74, V75) loaded higher than 0.50. The loadings were V72 = 0.92, V73 = 0.88, V74 = 0.94, and V75 = 0.85.

Twenty-nine items were eliminated using the CFA and a total number of 39 items retained. The final factor loading for each of the items is presented under their dimension in Table 4. These remaining 39 items were used to develop the measurement model.

Table 5. Fit Indices from the CFA

Service qualities	CMIN (χ^2)	CMIN/DF	SRMR	NFI	TLI	CFI	RMSEA	90% CI of RMSEA
Access	0.280	0.140	0.007	0.999	1.000	1.000	0.000	(0.085, 0.094)
Transportation	1.636	0.818	0.018	0.992	1.000	1.000	0.000	(0.000, 0.128)
Accommodation	8.824	1.765	0.044	0.983	0.985	0.993	0.060	(0.000, 0.124)
Venue	17.233	1.914	0.031	0.967	0.973	0.984	0.065	(0.009, 0.112)
Game	4.496	0.899	0.015	0.992	1.000	1.000	0.000	(0.000, 0.090)
Augmented service	15.427	1.714	0.029	0.977	0.984	0.990	0.058	(0.000, 0.106)
Interaction	10.666	1.185	0.022	0.982	0.995	0.997	0.029	(0.000, 0.086)
Satisfaction	0.393	0.196	0.003	1.000	1.000	1.000	0.000	(0.000, 0.081)
Cutoff	Low χ^2	≤ 3.0	≤ 0.08	≈ 1	≈ 1	0.900	0.080	-

CFA Measurement Model

Reliability analysis for each factor was conducted for the remaining items. The Cronbach's alpha, mean, and standard deviation (S.D) for each factor are presented in Table 6.

Table 6. Cronbach's Coefficient Alpha

Factors	Cronbach's alpha	Mean	S.D
Access	0.746	5.706	1.553
Transportation	0.739	4.408	1.934
Accommodation	0.871	5.190	1.642
Venue	0.854	5.630	1.444
Game	0.882	5.864	1.452
Augmented service	0.882	5.153	1.570
Interaction	0.876	5.562	1.555
Satisfaction	0.939	5.624	1.475

All the variables were run subjected to three reliability tests to proceed the CFA measurement model. Internal reliability was measured with Cronbach's coefficient alpha. For all the factors, the scores were above 0.70 as recommended by Hair et al. (2010). The Cronbach's coefficient alpha values are between 0.739 and 0.939 and value for each factor(s) is presented in Table 6. Since all the Cronbach's alpha values were more than the threshold value of 0.70, all the factors were used for CFA measurement model.

From Table 4, all construct reliability values are greater than 0.7; the CR ranged from 0.76 to 0.94. Therefore, the composite reliability achieved the required level. The values of AVEs are higher than 0.5 except one of the

factors. The AVE values ranged from 0.45 to 0.81. However, According to Fornell & Larcker criteria (1981), the required level is achieved. Based on all the values, the measurement model is valid and reliable.

The proposed CFA measurement model is presented in Figure 2. The proposed CFA measurement model consists of access, transportation, accommodation, venue, game, augmented service, interaction, and satisfaction and the items selected in the scale purification stage to measure them. AMOS was used for analysis along with the maximum likelihood method to estimate the parameters.

The first step was to assess the CFA measurement model by examining offending estimates. Examples of offending estimates included negative error variances for any construct, standardized coefficients exceeding or very close to 1.0, or very large standard errors associated with any estimated coefficient. The author considered to eliminate one of the constructs when correlations in the standardized solution exceed 1.0 (Hair et al., 2010). Some of the parameters were eliminated when their t-statistic values were not statistically significant. Finally, based on the cutoff values of the indices the model was fit, and it is presented in Figure 4.

Fit Indices of the CFA Measurement Model

The first step in assessing the CFA measurement model was to consider the fit indices. The minimum default measurement model was achieved subject to five dimensions: transportation quality, accommodation quality, game quality, augmented service quality, and interaction quality and satisfaction with 325 number of distinct sample moments, 65 number of distinct parameters to be estimated, and 260 degrees of freedom. The venue quality was eliminated as it had a high correlation of 0.90 with games quality. The value of CMIN/DF was 1.459 which is below the recommended value of 3.0. The RMSEA for the model was 0.046 which is also less than 0.08 and indicated a good model fit. Other fit indices also pointed to a fair and good model fit (NFI = 0.894, TLI = 0.958, CFI = 0.963). The whole results are summarized in Table 7 including each of the fit indices for the CFA measurement model.

Table 7. Fit Indices for the CFA Measurement Model

CMIN (χ^2)	379.433
CMIN/DF	1.459
RMSEA	0.046
SRMR	0.050
TLI	0.958
CFI	0.963

Correlations for the CFA Measurement Model

The correlations between the factors are presented in Table 8. Ten of them were statistically significant ($C.R > 1.96$) at 95% confident level. Only one correlation between augmented service and accommodation was negative, and the correlations ranged from - 0.075 to 0.779.

The variance for each of the factors: transportation, accommodation, game, augmented service, interaction qualities, and satisfaction were analyzed and presented in Table 9. The critical value of the estimates ranged from 3.129 for transportation to 9.000 for satisfaction, and all the estimated values were statistically significant at the 95% confidence level ($C.R > 1.96$).

Table 8. Correlations for the CFA Measurement Model

Covariances	Estimate	S.E	C.R	Correlation
Transportation ←→ Augmented service	0.440	0.117	3.774	0.470
Transportation ←→ Interaction	0.382	0.109	3.497	0.414
Transportation ←→ Satisfaction	0.557	0.136	4.085	0.515
Transportation ←→ Game	0.381	0.112	3.400	0.370
Transportation ←→ Accommodation	0.031	0.105	0.293	0.024
Augmented service←→Interaction	0.749	0.129	5.832	0.635
Augmented service ←→ Satisfaction	1.069	0.147	7.252	0.773
Augmented service ←→ Game	0.880	0.139	6.326	0.670
Augmented service ←→ Accommodation	- 0.123	0.126	- 0.976	- 0.075
Interaction ←→ Satisfaction	1.003	0.144	6.946	0.736
Interaction ←→ Game	1.008	0.151	6.686	0.779
Interaction ←→ Accommodation	0.205	0.130	1.574	0.126
Satisfaction ←→ Game	1.114	0.150	7.434	0.734
Satisfaction ←→ Accommodation	0.142	0.142	1.001	0.075
Game ←→ Accommodation	0.138	0.139	0.994	0.077

Table 9. Variances for the CFA Measurement Model

Service qualities	Estimates	S.E	C.R
Transportation	0.733	0.234	3.129
Accommodation	2.261	0.300	7.545
Game	1.441	0.216	6.661
Augmented service	1.197	0.208	5.757
Interaction	1.164	0.208	5.599
Satisfaction	1.598	0.178	9.000

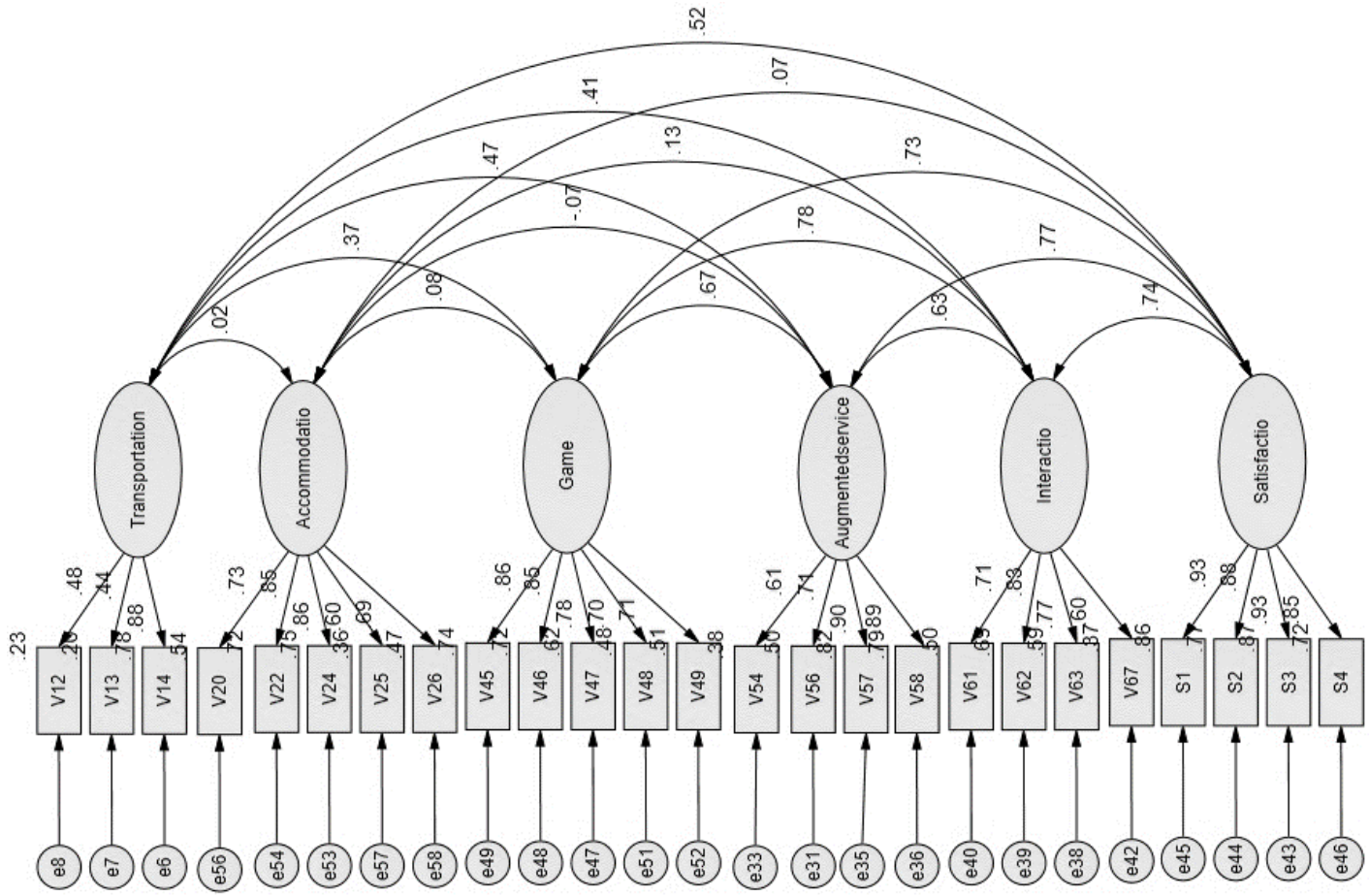

Figure 4. The CFA Measurement Model

5.3 Structural Model

Using the CFA measurement model obtained in Figure 4, the structural model was developed. The structural model with its coefficients is presented in Figure 5. Finally, transportation quality, accommodation quality, game quality, augmented service quality, and interaction quality played a role in contributing to spectators' satisfaction. The fairness of the model was evaluated based on the fit indices discussed in the next section.

Fit Indices of the Structural Model

The minimum default structural model was achieved with 325 number of distinct sample moments, 56 number of distinct parameters to be estimated, and 269 degrees of freedom. The value of CMIN/DF was 2.003 which is below the recommended value of 3.0. The RMSEA for the model was 0.069 which is less than 0.08 and indicated a good model fit. Other fit indices also pointed to fair and the model fit good (NFI = 0.849, TLI = 0.908, CFI = 0.917). The fit indices of the model are summarized in Table 10.

Table 10. Fit Indices for the Structural Model

CMIN (χ^2)	538.754
CMIN/DF	2.003
RMSEA	0.069
SRMR	0.150
TLI	0.908
CFI	0.917

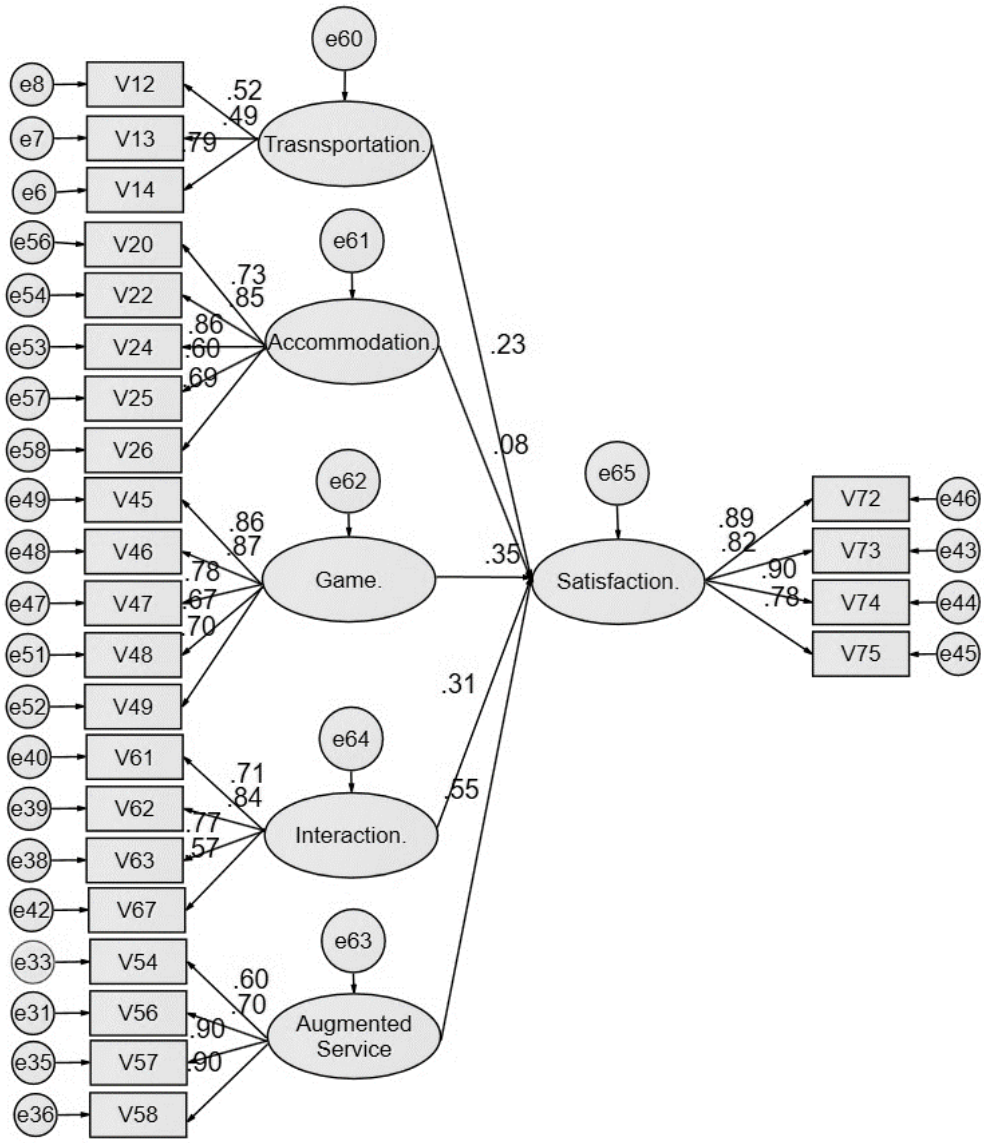

Figure 5. The Structural Model

Path Analysis

Path analysis is a form of multiple regression statistical analysis used to evaluate causal models by examining the relationships between a dependent variable, and independent variables. Here, spectators' satisfaction is the dependent variable and five service qualities (See Table 11) are independent variables.

The standardized total effects of each dimension in the structural model are presented in Table 11. The results showed that all five dimensions have positive influences on spectators' satisfaction. Among all the factors, augmented service quality (0.547) has the most influence on spectators' satisfaction, and accommodation quality (0.076) does not show a significant influence on spectators' satisfaction. Transportation quality (0.233), game quality (0.349), and interaction quality (0.306) have also a significant influence on spectators' satisfaction.

Table 11. Standardized Total Effects of Model

Service qualities	Estimates
Transportation	0.233
Accommodation	0.076
Game	0.349
Augmented service	0.547
Interaction	0.306

Hypothesis Testing

Seven hypotheses were developed to identify the relationship between each service quality and spectators' satisfaction. However, only five dimensions retained in the final structural model. Therefore, the hypothesis testing was undertaken only for the five dimensions. The statistic values and results of hypothesis tests are summarized in Table 12.

Transportation Quality

According to the RQ_2, the hypothesis ($H_{2.2}$) proposed that transportation quality influences the spectators' satisfaction in a winter mega-sport event. Since the statistic result in Table 12 accepted the hypothesis ($C.R > 1.96$), it can be concluded that transportation quality influences the spectators' satisfaction in a winter mega-sport event.

Accommodation Quality

According to the RQ_2, the hypothesis ($H_{2.3}$) proposed that accommodation quality influences the spectators' satisfaction in a winter mega-sport event. Since the statistics result in Table 12 rejected the null hypothesis ($C.R < 1.96$), it can be concluded that accommodation quality does not influence the spectators' satisfaction in a winter mega-sport event.

Game Quality

According to the RQ_2, the hypothesis ($H_{2.5}$) proposed that game quality influences the spectators' satisfaction in a winter mega-sport event. Since the statistics result in Table 12 accepted the hypothesis ($C.R > 1.96$), it can be concluded that game quality influences the spectators' satisfaction in a winter mega-sport event.

Augmented Service Quality

According to the RQ_2, the hypothesis ($H_{2.6}$) proposed that augmented service quality influences the spectators' satisfaction in a winter mega-sport event. Since the statistic result in Table 12 accepted the hypothesis ($C.R > 1.96$), it can be concluded that augmented service quality influences the spectators' satisfaction in a winter mega-sport event.

Interaction Quality

According to the RQ_2, the hypothesis ($H_{2.7}$) proposed that interaction quality influences the spectators' satisfaction in a winter mega-sport event. Since the statistics result in Table 12 accepted the hypothesis ($C.R > 1.96$), it can be concluded that interaction quality influences the spectators' satisfaction in a winter mega-sport event.

Table 12. Standardized Total Effects of Model

Hypothesis	Description	C.R	Accept / Reject
H_2	Transportation to satisfaction	2.794	Accept
H_3	Accommodation to satisfaction	1.496	Reject
H_5	Game to satisfaction	5.894	Accept
H_6	Augmented service to satisfaction	7.911	Accept
H_7	Interaction to satisfaction	4.978	Accept

Alternative Structural Model Comparisons

Hair et al. (2010) suggested that alternative SEM comparisons may provide the same fit of the original model or better fit. A total of three different structural models were developed for the comparison. The better fit structural model is already presented in Figure 5. The following alternative models and their fit indices are presented in tables and figures to compare with Figure 5.

Accessibility could be subdivided into two subdimensions: access to venues and access to destination (Shonk J. D., 2006). In these alternative models, access to destination was considered as transportation. On the other hand, Chelladurai (2014) has mentioned that peripheral services facilitate and support the provisions of primary services. Therefore, the author has deemed to consider two of the primary dimensions of the hierarchical model (See Figure 1): augmented service quality and interaction quality, as the sub-dimensions of peripheral service.

Fit Indices of the Alternative Structural Model – I

The alternative structural model - I is presented in Figure 6, which had 561 number of distinct sample moments, 73 number of distinct parameters to be estimated, and 488 number of degrees of freedom. The value of CMIN/DF was 2.683 which is below the recommended value of 3.0. However, the RMSEA for the alternative model - I was 0.089 which is more than 0.08. Other fit indices also did not support to an acceptable model fit (NFI = 0.758, GFI = 0.720, TLI = 0.818, CFI = 0.832). The results are summarized in Table 13 for each of the fit indices of the alternative structural model – I.

Table 13. Results of Fit Indices for the Alternative SEM - I

CMIN (χ^2)	1309.240
CMIN/DF	2.683
RMSEA	0.089
SRMR	0.238
TLI	0.818
CFI	0.832

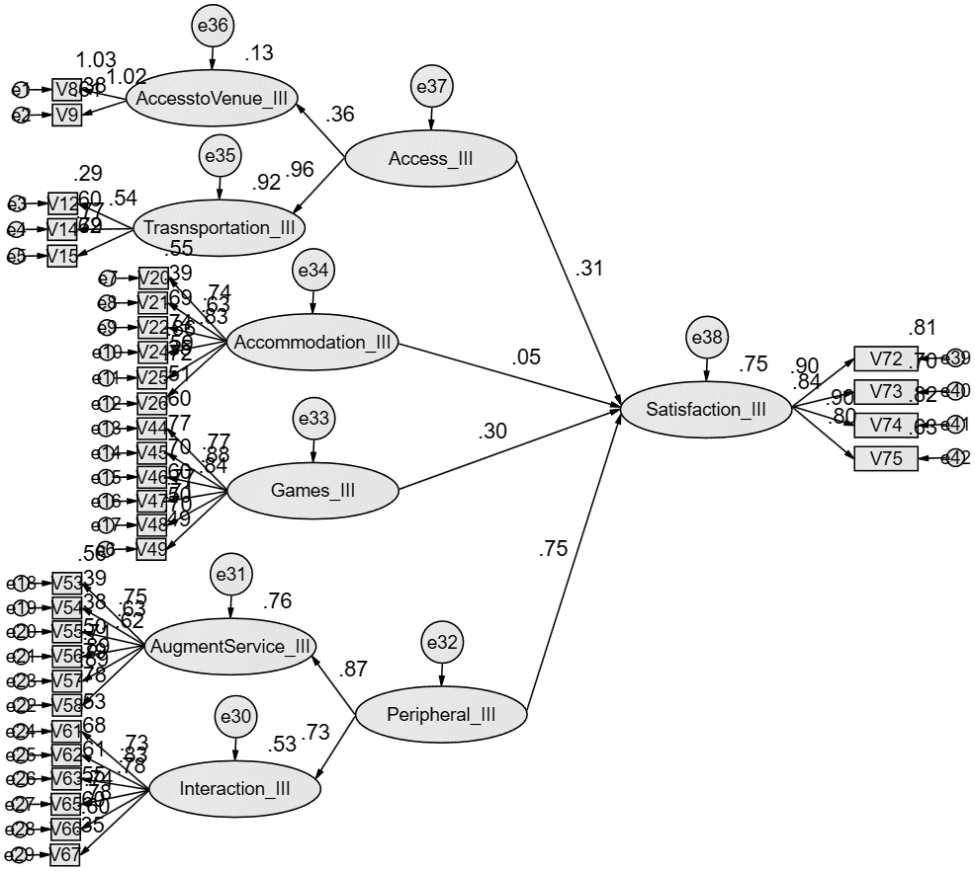

Figure 6. Alternative Structural Model - I

Fit Indices of the Alternative Structural Model – II

In the alternative structural model – II, game quality was subdivided into two: process (V43, V45, V46, V47) and product (V44, V48, V49, V50) (Bernthal & Sawyer, 2004). CFA was done separately and only V48 was eliminated from product. In the same way, accommodation quality was also subdivided into two: reservation (V17, V18, V19, V20) and environment (V21, V22, V23, V24, V25, V26, V27). CFA was run separately for each of

the sub-dimensions. Only V23 was eliminated from environment. Then, averages of all the sub-dimensions were taken to run the SEM (Hair et al., 2010).

The alternative structural model - II is presented in Figure 7, which had 45 number of distinct sample moments, 20 number of distinct parameters to be estimated, and 25 number of degrees of freedom. The value of CMIN/DF was 17.980 which is above the recommended value of 3.0. The RMSEA for the alternative model - II was 0.282 which is also above 0.08. Other fit indices also did not support to an acceptable model fit (NFI = 0.549, GFI = 0.658, TLI = 0.364, CFI = 0.558). The results of this model are summarized in Table 14.

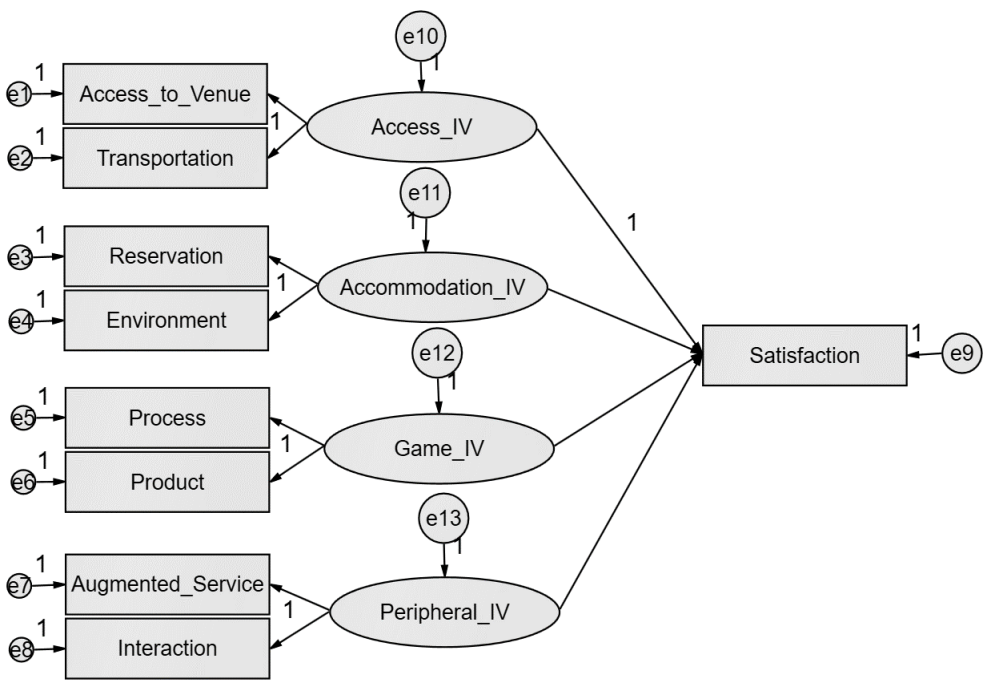

Figure 7. Alternative Structural Model - II

Table 14. Results of Fit Indices for the Alternative SEM - II

CMIN (χ^2)	449.505
CMIN/DF	17.980
RMSEA	0.282
SRMR	0.548
TLI	0.364
CFI	0.558

Both alternative structural models did not meet the threshold values of the fit indices which resulted that they are not acceptable models. Therefore, the researcher has concluded that the original model presented in Figure 5 is the best fit structural model in this study.

Chapter 6. Discussion and Conclusion

Chapter 6 is the final chapter of the research. This chapter provides a discussion including the implications from the academic and managerial views. Secondly, limitations and future directions are discussed. Finally, the chapter is completed with a conclusion.

6.1 Discussion

The discussion begins with a summary of the study. The research is primarily developed with the purpose of examining the relationship between service qualities and spectators' satisfaction in a mega-sport event as the case of the PyeongChang 2018 Olympic Winter Games. Therefore, the first research question – RQ_1 was developed to identify the underlying factors of perceived service quality for winter mega-sport event and the second research question – RQ_2 was designed to examine the relationship between perceived service quality factors and satisfaction for winter mega-sport event. Since the research was initially designed with seven dimensions and satisfaction, eight hypotheses were developed to identify the underlying factors under each dimension separately.

Signages, lighting, and safety around the venues were identified as important factors under access quality. Spectators commonly commented that PyeongChang 2018 had 'Good Signage' along the road or area of the event

in English, since many visitors used English as a communication language, to guide visitors to their bus and railway stations or event location. The guide information and handouts were found to be in English, Chinese, or French. However, spectators have noted that the organising committee should have recruited volunteers who can speak English fluently to guide the spectators without any language barriers. Convenient, waiting time, arrival time to the venues and adequacy of buses were identified as the significant transportation qualities. However, the spectators have commented that KTX information was a nightmare, especially with competing Seollal (Korean New Year) local travellers. Requiring seat booking for travellers on the free shuttle between the venue and outlying areas was ridiculous. Also, the lack of transportation communication was severely embarrassing to the organizers as well. Therefore, organizers should have increased the number of shuttle buses and taxies to and from the venue, include timetables, other signage related to transportation information in English and other languages, and the drivers should be able to communicate in English well.

Under the accommodation quality, politeness of the receptionists, and hotel facilities such as Wi-Fi, heater, cleanliness, and smell of a room were identified as the significant factors perceived by the spectators. Also, it is

noted that PyeongChang 2018 had a good free Wi-Fi connection for visitors at sporting venues, bus and railway stations.

In the sporting venues, spectators' primary concern was on comfortability to watch games, cleanliness, seating, visual appeal, decoration, and staff's helpfulness. Sound systems, announcement, replays on widescreen, fair officiating, and excitement of the games were identified as the primary factors under game quality. Spectators' perception on augmented service qualities was on information from the official media, cultural activities, souvenirs and merchandises, street decorations, information technology centers, Olympic exhibitions. Interaction with the security staff, customer service at the ticket office, volunteers, venue employees and co-spectators, and friendliness were identified as the underlying factors of the interaction quality. Finally, spectators' satisfaction was mostly based on their experience, expectations, happiness, and the money they spent throughout PyeongChang 2018.

The second objective of the research was to identify the relationship between perceived service quality factors and satisfaction. The path analysis concluded that service quality explains 55% of the total variation in the perception of augmented service, as the most influencing service quality, which supports to the findings of Ko and Pastore (2005) as well.

Transportation, game, and interaction qualities also contribute averagely to the spectators' satisfaction. Transportation quality explained approximately 23% of the total variation in spectators' satisfaction. Each game quality and interaction quality explained approximately 31% of the total variation in spectators' satisfaction. Game quality was identified in many pieces of research as one of the essential service qualities (Ko, 2005; Shonk, 2006; Kelley, 2001), which has also been proved the same through this research. This research revealed another supportive result to Ko (2005) that interaction quality was identified as one of the prime service qualities. Shonk (2006) mentioned in research that several studies (Bitner, 1992; Brady & Cronin, 2001) have highlighted the importance of the physical environment in relation to the service quality construct. Wakefield et al. (1996) have found that the stadium environment may have a significant effect on the extent to which a spectator desires to return to the venue. In this study, venue quality was not identified as an influencing factor since they were already eliminated in the CFA. Shonk (2006) also found no significant relationship between the physical environment and the spectator's perception of the sport venue.

Finally, the proposed measurement model of service quality for the winter mega-sport event was structured with five dimensions. The overall model was statistically proven a good fit based on the threshold values of fit

indices. Moreover, the factor loadings and the correlations among the dimensions were statistically significant. Also, this study proposed scales to measure mega-sport event qualities from the spectators' perception for the future.

Implications

There are plenty of service quality models that have been developed in the sports industry (Table 1): SERVQUAL (Parasuraman et al., 1988), TEAMQUAL (McDonald, Sutton, & Milne, 1995), *Sportscape* (Wakefield, Blodgett, & Sloan, 1996) are some of the popular models. This model can also be used for the mega-sport events to ensure and evaluate the service qualities. However, there is currently no model found to be used for winter mega-sport event. Therefore, this study is unique from all the above models. The structural model of this study becomes one and only one model for winter-mega-sport events service qualities, therefore, it has been named as "Win-SERVQUAL" model where 'Win' refers to Winter and 'SERVQUAL' refers to SERVice QUALity. The Win-SERVQUAL model could be used by researchers in the future as one of the primary tools to develop further new models. Moreover, sport management students can get basic ideas of the important service qualities of a mega-sport event through this exclusive Win-SERVQUAL model.

The Win-SERVQUAL was developed using seven dimensions which consisted of a higher number of factors compared to other researches. Therefore, the research findings from the above three conclusions are significantly important to the sport managers who organize mega-sport events. Since the subjects are foreigners, the findings can also be used by the tourism sectors in any kind of sports in many country. They can use the Win-SERVQUAL model to measure and improve the service qualities in mega-sport events. Also, sport and event managers, who work in mega-sport events, are highly encouraged to consider the five dimensions: transportation, accommodation, game, interaction and augmented service qualities while organizing mega-sport events. Among the above five, augmented service quality was found to be a significant service quality. Because, the spectators mostly visit the city or country not only to watch the games, but also to entertain with the country's tradition, food, and culture, souveniors, exhibitions and other attractive activities. Therefore, the tourism sectors should pay more attention during those mega-sport events. Moreover, sport managers and facility managers of sporting venues may focus on the significant items of each factor described already in the discussion section. The instrument used for this research was constructed well after many reviews by the experts in the field. It has been finally made as a user-friendly

questionnaire. Therefore, the instrument can also be simply used not only for winter mega-sport-events but also for other mega-sport-events.

Since the next two Olympics – Tokyo 2020 Summer Olympic Games and Beijing 2022 Olympic Winter Games are going to be held in Asia, therefore, this research findings will be helpful to the Organising Committee of the Olympic Games to improve the service quality of those events. For instance, South Korea was worried about the low level of Olympics ticket sales up to the start of the Games. Thus, the identified issues and suggestions will be useful to the managers to increase revenue of the ticket sales in the future. Moreover, both organising committees should focus on recruiting English speaking volunteers and staff as Japanese and Chinese are not world-wide spoken common language. This research is feedback from the PyeongChang 2018 Olympic spectators. Therefore, it can also be used as a report to review the service qualities of any Olympic Games by the International Olympic Committee.

6.2 Limitations and Future Directions

As many of the researchers said, no study can be done without limitations. Often, the researcher faced various constraints that may force them to use inadequate sample sizes because of practical versus statistical reasons. These constraints may include budget, time, personnel, and other

resource limitations (Barlett, Kotrlik, & Higgins, 2001). Since the data collection of this study was undertaken via a survey, it might be problematic in the sense that respondents may misinterpret various items on the questionnaire. Some respondents in the study might have forgotten to complete and return the questionnaire. It might have happened only in Part – II of the questionnaire. It is possible that segments of the population might not be able to read and respond to the questionnaire (Ary, 2010). Moreover, some of the spectators would not undergo with all the service quality related questions mentioned in the questionnaire, however, they would have marked.

Several other germane factors to sport services also limited this study. First, the study was limited only to spectators who were asked to respond to the questionnaire. Since the whole study was related to spectators alone, the study provided no insight into the perceptions of active sport participants, volunteers, staff or officials of PyeongChang 2018. However, a less countable number of athletes were also part of this study as they too filled the survey while they were watching the games as spectators in some sporting venues. Importantly, this study was limited in scope as to the number of quality targets of evaluation. For example, seven dimensions are outlined in this research and others are not included due to the time constraints and difficulties in collecting data from Olympic venues.

In addition to the limitations discussed in the above section, a number of steps could be undertaken in the future to improve this research or read a new one. Many researchers have focused on the service quality sub-dimensions, but it was not measured in this research. It can be taken into account to improve the quality of this research. Within a short period of a master's thesis research, it was very hard to consider many items or factors. Some of the imperative items such as win or loss of a game, smoking, spectators' attitude and behaviour under the interaction quality were not included under some of the factors in this study. The missing items and factors can be included in future research. On the other side, a couple of items were later identified as not significantly important or could be combined with another item. In this study, each factor consisted of high number of items compared to previous studies, therefore, this can be reduced to seven or eight in future works.

Due to the time constraints and adverse climate at the PyeongChang 2018, the researcher could reach only up to 214 responses. This sample size will be increased in future studies. Most of the past studies were interested in the factor of 'intention to return'. It was not included in this research. Further research can have a question based on the spectators' intention to attend future mega-sport event.

6.3 Conclusion

This research is developed with the intention of identifying the underlying factors of perceived service quality for a winter mega-sport event (RQ_1) and their relationship with spectator's satisfaction (RQ_2). First, this study has identified the problems faced by the PyeongChang 2018 before the start of the games and it has also contributed to the literature on event management and marketing as Ko, et al. (2011) mentioned in their research, and compiled selected service quality frameworks for spectator sports events. With regard to the RQ_1, a measurement model provides the significant factors involved in spectators' perceptions of service quality in winter mega-sport events. With regard to the RQ_2, Win-SERVQUAL has been developed with scales, which is unique as it is the very first model for service quality for a winter mega-sport event. This can be used by scholars, managers, and marketers as a measurement tool to assess service quality from the spectators' perception or improve the qualities for future events.

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Appendix I: Cover Letter

A Survey of Spectator's Perceptions of Service Quality for PyeongChang 2018 Winter Olympics Games

Dear Spectator,

I am particularly interested in learning about spectators' perceptions of winter sports experience upon traveling to PyeongChang 2018 Winter Olympic Games. The collected information in this survey will be used to measure service quality in selected dimensions and spectators' satisfaction.

It would be greatly appreciated if you would simply complete the following questionnaires. Your contribution and participation in this survey is very important to provide better service and event qualities in the future for Winter Mega-Games. There are no known risks to you if you decide to participate in this survey and we guarantee that your responses will be kept anonymous. The information you provide will not be shared with anyone.

There are no direct benefits or compensation to you for participating in the study. Your participation is voluntary and there is no penalty if you do not participate. If you have any questions or concerns about completing the questionnaire or about being in this study, please contact the addresses below. Thank you again for your cooperation and for the valuable information you are providing in this survey.

Sincerely,

GOBINATH Sivarajah
MSM. Candidate, Dream Together - Global Sport Management
Department of Physical Education
Seoul National University

Appendix II: Questionnaire

S.No: PC2018/S/ /

Questionnaire

The questions below are about your overall attitude associated with your PyeongChang 2018 Winter Olympic experience. Please use the rating scale below to describe how accurately each statement describes you by circling **1 = Strongly Disagree** and **7 = Strongly Agree**. If you are not sure or unable to answer, you can choose the neutral value 4.

PART - 1

	Section – I: Access Quality	Strongly Disagree						Strongly Agree
1.	Web information made it easy to find the venues.	**1**	2	3	4	5	6	**7**
2.	I faced communication problems with the staff to access the venues.	**1**	2	3	4	5	6	**7**
3.	There was an uncontrollable crowd.	**1**	2	3	4	5	6	**7**
4.	Venue layout was easily accessible.	**1**	2	3	4	5	6	**7**
5.	Security checking was very smooth at the venues.	**1**	2	3	4	5	6	**7**
6.	Venue designs allowed quick access to amenities, such as toilets, cafeterias and so on.	**1**	2	3	4	5	6	**7**
7.	Signages to the amenities were easy to understand.	**1**	2	3	4	5	6	**7**
8.	Facility lighting was good in the surroundings.	**1**	2	3	4	5	6	**7**
9.	It was safe to walk from and to the venue.	**1**	2	3	4	5	6	**7**
10.	**I'm satisfied with overall accessibility.**	**1**	2	3	4	5	6	**7**

	Section – II: Transportation Quality	Strongly Disagree						Strongly Agree
1.	I got delayed due to traffic congestion.	**1**	2	3	4	5	6	**7**
2.	Transportation was convenient.	**1**	2	3	4	5	6	**7**
3.	I had to wait for a long time for shuttle bus.	**1**	2	3	4	5	6	**7**
4.	The transportation to the venues was on time.	**1**	2	3	4	5	6	**7**
5.	There was adequate transportation to the venues.	**1**	2	3	4	5	6	**7**
6.	Overall, I'm satisfied with the transportation service quality.	**1**	2	3	4	5	6	**7**

	Section – III: Accommodation Quality	Strongly Disagree						Strongly Agree
1.	It was easy to reserve accommodations.	**1**	2	3	4	5	6	**7**
2.	Accommodations close to the venues were available.	**1**	2	3	4	5	6	**7**
3.	Pricing for accommodations was reasonable.	**1**	2	3	4	5	6	**7**
4.	Receptionists were polite.	**1**	2	3	4	5	6	**7**
5.	My room was very comfortable.	**1**	2	3	4	5	6	**7**
6.	Wi-Fi connection was good.	**1**	2	3	4	5	6	**7**
7.	The place surrounding the accommodation was quiet.	**1**	2	3	4	5	6	**7**
8.	Room temperature was comfortable.	**1**	2	3	4	5	6	**7**
9.	The room was clean.	**1**	2	3	4	5	6	**7**
10.	The smell inside the accommodation was good.	**1**	2	3	4	5	6	**7**
11.	TV, magazines, and newspapers were available.	**1**	2	3	4	5	6	**7**
12.	**I'm satisfied with overall accommodation quality.**	**1**	2	3	4	5	6	**7**

	Section – IV: Venue Quality	Strongly Disagree						Strongly Agree
1.	I felt very comfortable to watch games at the venues.	**1**	2	3	4	5	6	**7**
2.	The venues were clean.	**1**	2	3	4	5	6	**7**
3.	The temperature at the venues was comfortable.	**1**	2	3	4	5	6	**7**
4.	Seating was comfortable.	**1**	2	3	4	5	6	**7**
5.	The venues were visually appealing.	**1**	2	3	4	5	6	**7**
6.	It was comfortable to walk around at the facility.	**1**	2	3	4	5	6	**7**
7.	The interior décor was attractive.	**1**	2	3	4	5	6	**7**
8.	It was noisy.	**1**	2	3	4	5	6	**7**
9.	Venue staff were helpful.	**1**	2	3	4	5	6	**7**
10.	Food and beverage service was good.	**1**	2	3	4	5	6	**7**
11.	The toilets in the venues were clean.	**1**	2	3	4	5	6	**7**
12.	There were adequate numbers of toilets.	**1**	2	3	4	5	6	**7**
13.	I had enough space around me at the venue.	**1**	2	3	4	5	6	**7**
14.	**I'm satisfied with overall quality of the venues.**	**1**	2	3	4	5	6	**7**

	Section – V: Game Quality	Strongly Disagree						Strongly Agree
1.	Scoreboards were easy to read.	**1**	2	3	4	5	6	**7**
2.	Games started on time.	**1**	2	3	4	5	6	**7**
3.	Sound systems were of high quality.	**1**	2	3	4	5	6	**7**
4.	Announcements were clear.	**1**	2	3	4	5	6	**7**
5.	I could see replays clearly on widescreens.	**1**	2	3	4	5	6	**7**
6.	Officiates at the games were fair.	**1**	2	3	4	5	6	**7**
7.	The games were exciting.	**1**	2	3	4	5	6	**7**
8.	Players showed good sportsmanship.	**1**	2	3	4	5	6	**7**
9.	**I'm satisfied with overall game quality.**	**1**	2	3	4	5	6	**7**

	Section – VI: Augmented Service Quality	Strongly Disagree						Strongly Agree
1.	The venues offered quality entertainment. (e.g., Korean-pop)	**1**	2	3	4	5	6	**7**
2.	I am satisfied with the information provided by the official media of PyeongChang 2018.	**1**	2	3	4	5	6	**7**
3.	Korean cultural activities were awesome.	**1**	2	3	4	5	6	**7**
4.	Quality of souvenirs and merchandises were good.	**1**	2	3	4	5	6	**7**
5.	Street decorations were very attractive.	**1**	2	3	4	5	6	**7**
6.	Information technology centers were informative.	**1**	2	3	4	5	6	**7**
7.	Olympic exhibition centers were informative.	**1**	2	3	4	5	6	**7**
8.	I could find the foods I liked.	**1**	2	3	4	5	6	**7**
9.	**I am satisfied with overall quality of entertainments and concessions.**	**1**	2	3	4	5	6	**7**

	Section – VII: Interaction Quality	Strongly Disagree						Strongly Agree
1.	Security staff controlled disorderly behavior.	**1**	2	3	4	5	6	**7**
2.	Customer service at the ticket office was good.	**1**	2	3	4	5	6	**7**
3.	Volunteers were helpful.	**1**	2	3	4	5	6	**7**
4.	I did not have communication problems with the staff in the accommodation.	**1**	2	3	4	5	6	**7**
5.	Venue employees controlled the crowd well.	**1**	2	3	4	5	6	**7**
6.	I can count on the employees to be friendly.	**1**	2	3	4	5	6	**7**
7.	Other spectators did not affect my enjoyment.	**1**	2	3	4	5	6	**7**
8.	Athletes acknowledged the spectators after the game.	**1**	2	3	4	5	6	**7**
9.	Restaurant workers provided great service.	**1**	2	3	4	5	6	**7**
10.	Weather forecasts were accurate.	**1**	2	3	4	5	6	**7**
11.	**Overall, I am satisfied with the quality of interactions with other spectators and employees involved in the PyeongChang 2018.**	**1**	2	3	4	5	6	**7**

	Section – VIII: Spectator's Satisfaction	Strongly Disagree						Strongly Agree
1.	Overall, I am satisfied with my experience at PyeongChang 2018 Olympic Winter Games.	**1**	2	3	4	5	6	**7**
2.	Overall, the experiences in PyeongChang Olympics met my expectations.	**1**	2	3	4	5	6	**7**
3.	Overall, I am pleased with my experience at PyeongChang 2018 Olympic Winter Games.	**1**	2	3	4	5	6	**7**
4.	Considering my whole PyeongChang 2018 experience, I would consider this Olympic was worth the money I spent.	**1**	2	3	4	5	6	**7**

PART - 2

Section – IX: Behavioral and Demographics Questions

1. Please check all of your winter sports experiences before this Olympics.

   a. I have attended winter sports events.

      i. Yes ☐ ii. No ☐

      If **Yes**, what kind of winter sports events have you attended?

      .....

   b. I have watched winter sports events through media.

      i. Yes ☐ ii. No ☐

   c. I have participated in winter sports.

      i. Yes ☐ ii. No ☐

      If **Yes**, what kind of winter sports have you participated in?

      .....

2. How many Winter Olympics did you attend before PyeongChang 2018?

   a. None ☐ b. 1 – 2 ☐ c. 3 - 4 ☐

   d. 5 - 6 ☐ e. 7 or more ☐

3. What event/s have you watched in this Olympics?

a. Alpine Skiing	☐	i. Luge	☐
b. Biathlon	☐	j. Short Track	☐
c. Bobsleigh	☐	k. Ski Jumping	☐
d. Cross-country Skiing	☐	l. Freestyle Skiing	☐
e. Curling	☐	m. Figure Skating	☐
f. Ice Hockey	☐	n. Snowboard	☐
g. Skeleton	☐	o. Speed Skating	☐
h. Nordic Combined	☐	p. Ceremonies	☐

4. What impressed you most in this PyeongChang 2018 Olympics?

   ……

   ……

   ……

5. What made you disappointed in this PyeongChang 2018 Olympics?

   ……

   ……

   ……

6. You can suggest if any of the service quality to be improved.

   ……

   ……

   ……

7. How many times have you visited to Korea before? ……. times

8. How many nights do you stay in Gangwon Province? ..... nights

9. What is your ***nationality***? .....

10. What is your ***gender***?

    a. Male ☐ b. Female ☐

11. In which ***year*** you were born? .....

12. What is your ***educational qualification***?

    a. High school ☐ b. Degree ☐ c. Master's degree ☐

    b.d. Doctorate ☐ e. N/A ☐ f. Other ……. ☐

Thank you for your patience and completion of this survey!

Appendix III: Correlation Matrix

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
V2	0.29	1.00																		
V3	-0.09	0.28	1.00																	
V4	0.39	0.22	0.05	1.00																
V5	0.23	0.26	0.27	0.30	1.00															
V6	0.41	0.13	-0.04	0.28	0.30	1.00														
V7	0.29	0.17	0.06	0.22	0.26	0.45	1.00													
V8	0.19	0.11	0.20	0.20	0.36	0.31	0.47	1.00												
V9	0.10	-0.08	0.03	0.21	0.34	0.27	0.41	0.64	1.00											
V10	0.55	0.34	0.06	0.53	0.42	0.54	0.46	0.43	0.39	1.00										
V11	0.14	0.39	0.15	0.16	0.18	0.10	0.09	0.24	0.15	0.35	1.00									
V12	0.17	0.24	0.11	0.30	0.24	0.12	0.05	0.16	0.15	0.40	0.34	1.00								
V13	0.19	0.38	0.22	0.16	0.11	0.07	0.14	0.10	-0.04	0.36	0.33	0.22	1.00							
V14	0.30	0.18	0.07	0.37	0.38	0.26	0.30	0.40	0.34	0.56	0.34	0.42	0.39	1.00						
V15	0.41	0.26	0.05	0.43	0.29	0.33	0.24	0.26	0.18	0.71	0.34	0.44	0.44	0.60	1.00					
V16	0.21	0.26	0.07	0.17	0.23	0.17	0.21	0.21	0.12	0.47	0.29	0.54	0.25	0.35	0.46	1.00				
V17	0.22	0.12	0.01	0.10	0.11	0.26	0.08	0.14	0.00	0.20	0.14	0.20	-0.03	0.11	0.22	0.29	1.00			
V18	0.01	0.05	-0.11	-0.03	-0.04	0.04	0.08	0.05	0.02	-0.02	0.04	0.12	-0.08	0.07	0.08	0.28	0.35	1.00		
V19	0.11	0.13	0.02	0.03	0.02	0.16	0.12	0.07	-0.01	0.16	0.00	0.06	0.12	0.14	0.13	0.29	0.29	0.30	1.00	
V20	0.15	0.11	0.10	0.11	0.11	0.16	0.18	0.40	0.27	0.25	0.28	0.10	0.11	0.24	0.16	0.17	0.13	-0.01	0.05	1.00
V21	0.17	0.06	0.09	0.25	0.22	0.18	0.15	0.33	0.25	0.23	0.26	0.14	0.14	0.27	0.20	0.14	0.17	-0.04	-0.02	0.59
V22	0.22	0.09	0.10	0.18	0.26	0.10	0.18	0.36	0.31	0.17	0.17	0.09	0.10	0.23	0.09	0.17	0.08	-0.04	0.07	0.53
V23	0.09	-0.09	0.15	0.19	0.13	0.15	0.25	0.29	0.34	0.18	0.09	0.04	-0.07	0.15	0.04	0.04	-0.01	-0.04	0.02	0.52
V24	0.19	0.03	0.10	0.23	0.13	0.24	0.25	0.28	0.24	0.22	0.09	0.11	0.03	0.21	0.15	0.13	0.16	0.02	0.09	0.51
V25	0.09	-0.05	0.09	0.22	0.15	0.17	0.22	0.39	0.36	0.17	0.17	0.07	-0.01	0.15	0.06	0.10	0.07	-0.03	0.01	0.58
V26	0.17	0.10	0.19	0.17	0.24	0.09	0.20	0.39	0.33	0.22	0.30	0.10	0.05	0.22	0.10	0.15	0.14	-0.01	0.05	0.60
V27	0.16	0.06	-0.04	0.04	0.13	0.08	0.04	0.20	0.05	0.07	0.15	0.06	0.00	0.12	0.10	0.15	0.12	-0.01	0.14	0.28
V28	0.21	0.11	0.12	0.24	0.23	0.22	0.11	0.40	0.26	0.26	0.31	0.20	0.12	0.27	0.19	0.24	0.16	-0.02	0.07	0.63
V29	0.22	0.07	0.17	0.26	0.33	0.24	0.40	0.53	0.51	0.34	0.12	0.08	0.00	0.20	0.16	0.13	0.03	-0.10	0.06	0.24
V30	0.18	0.11	0.19	0.19	0.35	0.30	0.46	0.99	0.63	0.41	0.23	0.14	0.08	0.38	0.25	0.18	0.13	0.04	0.07	0.43
V31	0.23	0.18	0.22	0.10	0.20	0.20	0.27	0.34	0.25	0.27	0.06	0.13	0.11	0.10	0.13	0.26	0.12	0.00	0.10	0.10
V32	0.22	0.28	0.27	0.13	0.34	0.23	0.31	0.49	0.35	0.36	0.25	0.18	0.16	0.24	0.20	0.23	0.05	-0.10	0.09	0.27
V33	0.15	0.01	0.15	0.22	0.29	0.24	0.39	0.65	0.55	0.40	0.11	0.12	0.04	0.34	0.26	0.21	0.05	-0.08	0.02	0.24
V34	0.17	0.05	0.19	0.28	0.24	0.28	0.41	0.51	0.48	0.40	0.13	0.14	0.07	0.24	0.20	0.18	0.04	-0.01	0.03	0.20
V35	0.29	0.08	0.02	0.30	0.29	0.31	0.25	0.47	0.34	0.41	0.10	0.24	0.08	0.30	0.29	0.27	0.14	-0.09	0.06	0.20

V36	0.13	0.14	0.23	0.12	0.22	0.19	0.17	0.23	0.19	0.20	0.15	0.03	0.11	0.13	0.11	-0.05	0.00	-0.04	-0.05	-0.03
V37	0.24	0.00	-0.01	0.12	0.17	0.32	0.47	0.48	0.52	0.38	0.08	-0.01	0.05	0.31	0.25	0.16	0.04	-0.01	0.10	0.36
V38	0.33	0.19	0.04	0.25	0.20	0.35	0.19	0.15	-0.01	0.40	0.31	0.20	0.26	0.22	0.41	0.24	0.25	0.07	0.10	0.18
V39	0.21	0.16	0.24	0.02	0.26	0.28	0.30	0.50	0.33	0.29	0.23	0.14	0.01	0.18	0.09	0.08	0.04	-0.02	0.12	0.24
V40	0.18	0.08	0.26	0.06	0.34	0.31	0.23	0.50	0.35	0.24	0.21	0.14	-0.04	0.20	0.13	0.13	0.08	-0.04	0.06	0.26
V41	0.10	0.09	0.31	0.16	0.32	0.27	0.30	0.45	0.38	0.26	0.16	0.11	-0.01	0.18	0.13	0.04	-0.04	-0.15	0.05	0.31
V42	0.33	0.23	0.26	0.23	0.39	0.43	0.50	0.56	0.49	0.57	0.28	0.20	0.16	0.29	0.34	0.28	0.08	-0.11	0.03	0.32
V43	0.19	0.09	0.05	0.00	0.03	0.02	0.20	0.11	0.13	0.16	0.07	-0.08	0.02	0.16	0.12	0.09	0.00	-0.02	0.02	0.03
V44	0.12	0.03	0.07	0.13	0.22	0.25	0.45	0.54	0.63	0.33	0.15	0.06	0.04	0.26	0.15	0.22	0.04	-0.08	0.04	0.30
V45	0.17	0.04	0.09	0.17	0.24	0.33	0.43	0.58	0.54	0.36	0.14	-0.01	0.05	0.31	0.20	0.21	0.04	0.04	0.00	0.30
V46	0.23	0.12	0.08	0.18	0.25	0.28	0.38	0.49	0.44	0.41	0.11	0.04	0.09	0.25	0.21	0.29	-0.03	-0.08	0.00	0.23
V47	0.19	0.13	0.04	0.22	0.25	0.27	0.33	0.50	0.48	0.37	0.15	0.19	0.11	0.32	0.25	0.32	0.09	0.02	0.08	0.29
V48	0.18	0.00	0.03	0.19	0.22	0.32	0.47	0.47	0.53	0.39	0.13	0.09	0.00	0.24	0.21	0.18	0.10	0.00	-0.05	0.21
V49	0.19	0.08	0.15	0.14	0.31	0.19	0.33	0.55	0.52	0.32	0.17	0.12	0.00	0.28	0.21	0.25	0.00	-0.08	-0.01	0.27
V50	0.14	0.09	0.17	0.15	0.33	0.19	0.34	0.57	0.52	0.29	0.21	0.16	0.02	0.29	0.19	0.27	0.08	-0.05	0.02	0.29
V51	0.20	0.11	0.11	0.18	0.30	0.28	0.50	0.66	0.62	0.43	0.22	0.13	0.05	0.32	0.22	0.29	0.03	-0.07	-0.01	0.33
V52	0.32	0.18	-0.03	0.27	0.22	0.45	0.33	0.33	0.32	0.49	0.18	0.17	0.12	0.28	0.37	0.32	0.15	-0.02	0.08	0.24
V53	0.51	0.26	-0.01	0.34	0.25	0.47	0.49	0.32	0.28	0.70	0.20	0.22	0.22	0.37	0.49	0.33	0.18	-0.07	0.12	0.24
V54	0.23	0.15	0.07	0.25	0.20	0.43	0.31	0.35	0.31	0.42	0.17	0.16	0.11	0.27	0.27	0.30	0.09	-0.05	0.10	0.26
V55	0.29	0.04	-0.08	0.26	0.08	0.39	0.29	0.33	0.28	0.43	0.10	0.15	0.07	0.21	0.27	0.16	0.05	-0.06	0.13	0.17
V56	0.38	0.04	-0.08	0.26	0.23	0.44	0.30	0.39	0.38	0.49	0.15	0.16	0.08	0.36	0.34	0.28	0.14	-0.01	0.07	0.23
V57	0.46	0.25	-0.08	0.27	0.23	0.44	0.35	0.34	0.33	0.57	0.22	0.17	0.20	0.37	0.37	0.37	0.16	-0.02	0.12	0.29
V58	0.43	0.17	-0.06	0.31	0.28	0.39	0.33	0.41	0.34	0.56	0.26	0.20	0.12	0.37	0.41	0.32	0.14	-0.05	0.09	0.35
V59	0.18	0.16	0.20	0.18	0.27	0.31	0.08	0.19	0.08	0.22	0.17	0.06	0.22	0.15	0.21	0.11	0.05	-0.12	0.03	0.32
V60	0.37	0.14	0.12	0.31	0.31	0.59	0.32	0.38	0.34	0.54	0.16	0.20	0.16	0.32	0.40	0.32	0.16	-0.04	0.09	0.37
V61	0.12	0.11	0.07	0.16	0.34	0.21	0.34	0.45	0.44	0.35	0.16	0.10	0.03	0.29	0.17	0.19	0.03	-0.03	-0.03	0.20
V62	0.24	0.20	0.07	0.23	0.30	0.26	0.37	0.51	0.46	0.43	0.28	0.19	0.06	0.30	0.30	0.31	0.15	-0.03	0.02	0.36
V63	0.24	0.24	0.04	0.19	0.22	0.35	0.45	0.51	0.46	0.49	0.24	0.19	0.13	0.26	0.32	0.35	0.09	0.07	0.03	0.23
V64	0.20	0.42	0.06	0.12	0.32	0.21	0.24	0.32	0.21	0.38	0.31	0.19	0.26	0.38	0.36	0.33	0.21	0.04	0.10	0.37
V65	0.18	0.34	0.27	0.22	0.41	0.25	0.29	0.50	0.38	0.48	0.41	0.25	0.26	0.40	0.31	0.39	0.09	-0.04	0.07	0.30
V66	0.11	0.07	0.11	0.09	0.31	0.24	0.38	0.57	0.56	0.30	0.22	0.07	-0.03	0.30	0.15	0.20	0.11	-0.02	-0.01	0.33
V67	0.01	0.07	0.22	0.15	0.27	0.23	0.31	0.53	0.49	0.32	0.18	0.11	0.04	0.27	0.18	0.20	-0.01	0.00	0.03	0.28
V68	0.15	0.17	0.14	0.02	0.28	0.08	0.20	0.39	0.27	0.22	0.13	0.09	0.11	0.19	0.14	0.29	0.15	0.04	0.19	0.24
V69	0.28	0.17	0.19	0.25	0.36	0.43	0.27	0.37	0.28	0.41	0.20	0.20	0.10	0.32	0.29	0.25	0.22	-0.05	0.06	0.29
V70	0.14	0.14	0.18	0.20	0.37	0.26	0.32	0.49	0.45	0.36	0.21	0.14	0.12	0.38	0.23	0.27	0.11	-0.02	0.02	0.36
V71	0.32	0.25	0.17	0.29	0.44	0.41	0.46	0.59	0.49	0.63	0.29	0.23	0.18	0.37	0.40	0.45	0.13	-0.02	0.09	0.36
V72	0.36	0.27	0.15	0.28	0.39	0.42	0.48	0.53	0.45	0.67	0.36	0.21	0.19	0.42	0.47	0.40	0.11	-0.03	0.13	0.36

V73	0.40	0.33	0.12	0.35	0.39	0.39	0.41	0.44	0.32	0.70	0.35	0.29	0.23	0.42	0.50	0.44	0.15	-0.02	0.13	0.29
V74	0.33	0.23	0.11	0.26	0.36	0.36	0.47	0.50	0.41	0.63	0.32	0.19	0.18	0.39	0.42	0.37	0.07	-0.06	0.13	0.32
V75	0.35	0.30	0.14	0.27	0.37	0.34	0.34	0.46	0.32	0.61	0.31	0.23	0.29	0.44	0.43	0.40	0.13	-0.04	0.13	0.24

	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40
V22	0.51	1.00																		
V23	0.56	0.40	1.00																	
V24	0.63	0.48	0.68	1.00																
V25	0.67	0.56	0.70	0.67	1.00															
V26	0.62	0.53	0.54	0.60	0.75	1.00														
V27	0.28	0.36	0.09	0.21	0.28	0.35	1.00													
V28	0.72	0.57	0.51	0.64	0.69	0.70	0.43	1.00												
V29	0.25	0.31	0.39	0.33	0.43	0.37	0.15	0.31	1.00											
V30	0.33	0.37	0.30	0.29	0.38	0.38	0.20	0.41	0.51	1.00										
V31	0.09	0.17	0.04	0.08	0.15	0.27	0.22	0.19	0.43	0.32	1.00									
V32	0.23	0.35	0.15	0.19	0.26	0.40	0.21	0.33	0.51	0.49	0.69	1.00								
V33	0.22	0.27	0.34	0.29	0.40	0.31	0.19	0.29	0.58	0.64	0.42	0.54	1.00							
V34	0.23	0.29	0.27	0.29	0.38	0.33	0.11	0.35	0.63	0.49	0.42	0.46	0.58	1.00						
V35	0.31	0.28	0.18	0.34	0.36	0.31	0.31	0.41	0.49	0.45	0.42	0.49	0.61	0.52	1.00					
V36	0.04	-0.08	0.11	0.04	0.02	0.09	-0.03	-0.02	0.11	0.21	0.07	0.11	0.17	0.13	0.15	1.00				
V37	0.29	0.29	0.47	0.37	0.39	0.35	0.20	0.32	0.51	0.46	0.30	0.37	0.50	0.46	0.34	0.17	1.00			
V38	0.22	0.21	0.06	0.21	0.10	0.19	0.19	0.29	0.06	0.14	0.13	0.22	0.03	0.20	0.23	0.04	0.16	1.00		
V39	0.20	0.24	0.20	0.18	0.24	0.29	0.18	0.28	0.44	0.48	0.39	0.49	0.46	0.42	0.38	0.19	0.35	0.20	1.00	
V40	0.23	0.30	0.16	0.14	0.23	0.31	0.24	0.31	0.35	0.48	0.32	0.46	0.42	0.28	0.39	0.14	0.32	0.13	0.65	1.00
V41	0.26	0.32	0.31	0.29	0.34	0.31	0.18	0.34	0.52	0.43	0.23	0.46	0.42	0.45	0.32	0.15	0.38	0.18	0.47	0.49
V42	0.26	0.31	0.32	0.33	0.36	0.43	0.17	0.41	0.61	0.54	0.48	0.64	0.59	0.56	0.51	0.22	0.51	0.31	0.61	0.55
V43	0.03	0.10	0.03	0.05	0.01	0.15	0.11	0.04	0.12	0.10	0.13	0.20	0.12	0.16	0.04	0.08	0.36	0.02	0.11	0.13
V44	0.32	0.31	0.46	0.36	0.45	0.38	0.17	0.34	0.56	0.52	0.26	0.39	0.58	0.52	0.36	0.17	0.74	0.03	0.27	0.32
V45	0.27	0.28	0.40	0.33	0.37	0.31	0.19	0.30	0.51	0.59	0.31	0.42	0.67	0.49	0.42	0.26	0.71	0.11	0.40	0.36
V46	0.22	0.23	0.24	0.22	0.30	0.30	0.16	0.27	0.43	0.48	0.35	0.51	0.55	0.41	0.42	0.20	0.62	0.09	0.36	0.37
V47	0.27	0.30	0.32	0.29	0.35	0.34	0.19	0.34	0.45	0.49	0.33	0.43	0.51	0.43	0.47	0.09	0.65	0.16	0.39	0.33
V48	0.29	0.16	0.33	0.31	0.34	0.25	0.06	0.20	0.41	0.48	0.25	0.38	0.52	0.46	0.37	0.10	0.55	0.07	0.28	0.35
V49	0.27	0.29	0.28	0.22	0.31	0.39	0.34	0.32	0.42	0.54	0.38	0.51	0.56	0.38	0.39	0.07	0.48	0.08	0.39	0.43
V50	0.27	0.33	0.23	0.27	0.34	0.42	0.33	0.38	0.46	0.56	0.40	0.51	0.60	0.43	0.46	0.07	0.48	0.11	0.40	0.45
V51	0.29	0.33	0.40	0.35	0.41	0.40	0.23	0.41	0.58	0.65	0.35	0.51	0.66	0.53	0.45	0.09	0.64	0.09	0.46	0.47
V52	0.32	0.24	0.23	0.33	0.33	0.27	0.25	0.35	0.28	0.33	0.22	0.25	0.28	0.35	0.37	0.10	0.43	0.34	0.15	0.19
V53	0.16	0.18	0.14	0.22	0.21	0.20	0.15	0.24	0.30	0.31	0.29	0.34	0.35	0.35	0.34	0.09	0.37	0.37	0.24	0.15

V54	0.26	0.28	0.22	0.30	0.35	0.31	0.25	0.35	0.27	0.35	0.30	0.34	0.34	0.37	0.34	0.07	0.37	0.34	0.24	0.21
V55	0.21	0.22	0.23	0.31	0.25	0.18	0.14	0.27	0.30	0.33	0.12	0.17	0.34	0.28	0.34	0.12	0.35	0.29	0.18	0.12
V56	0.22	0.16	0.19	0.17	0.25	0.21	0.16	0.24	0.26	0.37	0.27	0.29	0.41	0.27	0.42	0.12	0.36	0.22	0.28	0.21
V57	0.21	0.22	0.14	0.24	0.24	0.28	0.37	0.33	0.30	0.34	0.29	0.37	0.41	0.30	0.42	0.13	0.46	0.36	0.37	0.29
V58	0.24	0.20	0.18	0.26	0.26	0.31	0.35	0.40	0.33	0.41	0.25	0.34	0.43	0.34	0.46	0.09	0.45	0.42	0.41	0.34
V59	0.15	0.31	0.12	0.19	0.18	0.27	0.16	0.32	0.12	0.20	0.23	0.28	0.16	0.14	0.23	0.00	0.21	0.40	0.21	0.18
V60	0.29	0.28	0.23	0.36	0.32	0.35	0.24	0.45	0.33	0.37	0.32	0.38	0.35	0.42	0.39	0.15	0.45	0.46	0.31	0.27
V61	0.21	0.23	0.25	0.20	0.31	0.33	0.06	0.29	0.44	0.44	0.26	0.35	0.42	0.32	0.28	0.11	0.38	0.00	0.22	0.27
V62	0.38	0.38	0.29	0.32	0.39	0.38	0.23	0.38	0.50	0.50	0.26	0.46	0.47	0.42	0.41	0.14	0.54	0.25	0.35	0.32
V63	0.23	0.25	0.21	0.28	0.32	0.26	0.13	0.24	0.49	0.50	0.31	0.39	0.50	0.44	0.37	0.17	0.46	0.14	0.28	0.27
V64	0.29	0.24	0.09	0.20	0.15	0.31	0.24	0.31	0.22	0.32	0.30	0.41	0.29	0.20	0.32	0.12	0.30	0.28	0.23	0.30
V65	0.30	0.29	0.15	0.18	0.31	0.40	0.21	0.38	0.39	0.48	0.40	0.57	0.51	0.37	0.43	0.11	0.30	0.21	0.37	0.40
V66	0.34	0.28	0.36	0.33	0.40	0.35	0.14	0.32	0.49	0.57	0.25	0.37	0.59	0.41	0.41	0.17	0.51	0.10	0.36	0.35
V67	0.27	0.21	0.26	0.28	0.36	0.32	0.08	0.35	0.44	0.53	0.37	0.45	0.45	0.48	0.29	0.21	0.41	0.14	0.37	0.27
V68	0.17	0.26	0.10	0.16	0.18	0.34	0.36	0.29	0.32	0.38	0.41	0.38	0.36	0.21	0.31	0.03	0.35	0.13	0.33	0.31
V69	0.28	0.33	0.20	0.32	0.26	0.31	0.24	0.38	0.24	0.37	0.27	0.37	0.32	0.38	0.42	0.16	0.37	0.45	0.38	0.35
V70	0.34	0.36	0.27	0.27	0.35	0.37	0.29	0.43	0.40	0.50	0.28	0.47	0.52	0.42	0.41	0.03	0.41	0.23	0.41	0.41
V71	0.29	0.32	0.30	0.31	0.34	0.37	0.23	0.41	0.48	0.59	0.40	0.53	0.60	0.49	0.51	0.18	0.54	0.29	0.45	0.42
V72	0.26	0.21	0.28	0.27	0.29	0.41	0.21	0.38	0.48	0.51	0.36	0.52	0.53	0.45	0.40	0.16	0.58	0.28	0.40	0.37
V73	0.19	0.20	0.23	0.28	0.26	0.35	0.15	0.36	0.40	0.43	0.34	0.45	0.44	0.40	0.40	0.13	0.48	0.34	0.29	0.29
V74	0.22	0.23	0.28	0.29	0.28	0.40	0.24	0.41	0.46	0.49	0.31	0.44	0.48	0.41	0.35	0.12	0.56	0.24	0.31	0.35
V75	0.20	0.24	0.12	0.19	0.19	0.31	0.23	0.38	0.35	0.45	0.35	0.46	0.40	0.40	0.38	0.10	0.42	0.28	0.32	0.31

	V41	V42	V43	V44	V45	V46	V47	V48	V49	V50	V51	V52	V53	V54	V55	V56	V57	V58	V59	V60
V42	0.54	1.00																		
V43	0.09	0.18	1.00																	
V44	0.38	0.54	0.25	1.00																
V45	0.32	0.53	0.21	0.70	1.00															
V46	0.36	0.56	0.24	0.58	0.75	1.00														
V47	0.35	0.49	0.19	0.58	0.67	0.68	1.00													
V48	0.29	0.48	0.14	0.66	0.61	0.55	0.53	1.00												
V49	0.29	0.52	0.22	0.54	0.58	0.60	0.55	0.50	1.00											
V50	0.32	0.55	0.20	0.59	0.60	0.57	0.58	0.50	0.84	1.00										
V51	0.39	0.67	0.23	0.75	0.75	0.72	0.68	0.67	0.81	0.82	1.00									
V52	0.16	0.41	0.12	0.43	0.46	0.46	0.48	0.52	0.35	0.33	0.45	1.00								
V53	0.23	0.53	0.12	0.35	0.38	0.45	0.40	0.39	0.34	0.34	0.44	0.59	1.00							
V54	0.27	0.45	0.16	0.38	0.45	0.44	0.49	0.39	0.39	0.45	0.43	0.64	0.54	1.00						

V55	0.22	0.29	-0.01	0.34	0.35	0.32	0.27	0.36	0.26	0.29	0.35	0.43	0.45	0.39	1.00					
V56	0.21	0.33	0.07	0.34	0.41	0.43	0.35	0.42	0.40	0.34	0.40	0.44	0.50	0.42	0.53	1.00				
V57	0.17	0.48	0.20	0.41	0.49	0.51	0.47	0.42	0.49	0.44	0.52	0.56	0.66	0.54	0.53	0.64	1.00			
V58	0.28	0.49	0.09	0.37	0.45	0.44	0.50	0.36	0.47	0.47	0.50	0.50	0.64	0.54	0.55	0.61	0.81	1.00		
V59	0.17	0.26	0.03	0.06	0.17	0.19	0.33	0.06	0.22	0.28	0.18	0.22	0.24	0.30	0.16	0.20	0.25	0.36	1.00	
V60	0.35	0.58	0.08	0.40	0.49	0.48	0.50	0.40	0.40	0.44	0.46	0.58	0.64	0.64	0.53	0.56	0.66	0.68	0.51	1.00
V61	0.29	0.47	0.07	0.49	0.44	0.40	0.43	0.48	0.39	0.42	0.52	0.38	0.31	0.37	0.23	0.33	0.30	0.27	0.19	0.33
V62	0.39	0.58	0.12	0.61	0.54	0.47	0.52	0.51	0.44	0.48	0.57	0.45	0.49	0.43	0.37	0.39	0.51	0.49	0.21	0.51
V63	0.30	0.58	0.15	0.59	0.51	0.50	0.44	0.54	0.40	0.40	0.59	0.48	0.50	0.39	0.38	0.40	0.47	0.39	0.05	0.45
V64	0.23	0.38	0.15	0.22	0.30	0.31	0.31	0.22	0.24	0.24	0.29	0.27	0.38	0.25	0.08	0.25	0.37	0.39	0.26	0.34
V65	0.35	0.58	0.15	0.39	0.45	0.45	0.40	0.41	0.49	0.56	0.54	0.39	0.41	0.44	0.24	0.38	0.45	0.41	0.31	0.47
V66	0.35	0.53	0.15	0.64	0.58	0.47	0.50	0.55	0.45	0.50	0.62	0.33	0.33	0.32	0.25	0.36	0.34	0.33	0.13	0.33
V67	0.41	0.49	0.15	0.44	0.48	0.42	0.44	0.38	0.46	0.45	0.55	0.27	0.32	0.37	0.23	0.31	0.32	0.36	0.19	0.42
V68	0.11	0.41	0.16	0.35	0.42	0.39	0.44	0.29	0.52	0.62	0.50	0.32	0.34	0.37	0.14	0.19	0.41	0.39	0.31	0.32
V69	0.28	0.43	0.11	0.25	0.39	0.32	0.37	0.29	0.38	0.43	0.38	0.40	0.42	0.42	0.32	0.38	0.50	0.47	0.52	0.57
V70	0.26	0.50	0.14	0.44	0.50	0.47	0.46	0.38	0.63	0.64	0.59	0.37	0.35	0.35	0.19	0.43	0.48	0.43	0.40	0.44
V71	0.36	0.73	0.13	0.55	0.64	0.63	0.60	0.55	0.61	0.63	0.72	0.50	0.61	0.51	0.40	0.51	0.59	0.63	0.35	0.65
V72	0.35	0.66	0.25	0.54	0.59	0.59	0.53	0.47	0.60	0.58	0.69	0.47	0.62	0.46	0.42	0.53	0.62	0.66	0.29	0.59
V73	0.29	0.59	0.16	0.44	0.51	0.55	0.54	0.38	0.46	0.47	0.59	0.47	0.66	0.45	0.45	0.51	0.62	0.68	0.35	0.61
V74	0.30	0.61	0.24	0.55	0.56	0.57	0.52	0.47	0.55	0.56	0.68	0.44	0.60	0.44	0.50	0.49	0.62	0.64	0.28	0.59
V75	0.25	0.56	0.26	0.42	0.49	0.55	0.48	0.44	0.54	0.54	0.61	0.45	0.59	0.42	0.37	0.49	0.61	0.55	0.31	0.57

	V61	V62	V63	V64	V65	V66	V67	V68	V69	V70	V71	S1	S2	S3	S4
V62	0.60	1.00													
V63	0.55	0.66	1.00												
V64	0.34	0.48	0.41	1.00											
V65	0.59	0.57	0.56	0.53	1.00										
V66	0.59	0.64	0.63	0.43	0.56	1.00									
V67	0.42	0.49	0.40	0.25	0.46	0.50	1.00								
V68	0.41	0.41	0.29	0.34	0.48	0.39	0.34	1.00							
V69	0.32	0.44	0.28	0.36	0.48	0.37	0.36	0.40	1.00						
V70	0.44	0.47	0.37	0.35	0.59	0.48	0.44	0.44	0.59	1.00					
V71	0.58	0.68	0.64	0.50	0.70	0.61	0.54	0.54	0.60	0.62	1.00				
V72	0.46	0.60	0.54	0.45	0.59	0.53	0.51	0.45	0.38	0.52	0.73	1.00			
V73	0.38	0.48	0.48	0.41	0.50	0.35	0.42	0.42	0.41	0.46	0.68	0.81	1.00		
V74	0.48	0.54	0.53	0.39	0.53	0.50	0.45	0.48	0.39	0.49	0.70	0.87	0.83	1.00	
V75	0.44	0.52	0.48	0.40	0.59	0.43	0.42	0.47	0.43	0.55	0.68	0.78	0.75	0.79	1.00

Appendix III: Anti-Image Correlation Matrix

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
V1	0.88																			
V2	-0.23	0.75																		
V3	0.18	-0.28	0.70																	
V4	-0.08	-0.15	-0.02	0.89																
V5	0.02	-0.14	-0.08	-0.01	0.93															
V6	-0.10	0.01	0.19	0.04	-0.07	0.87														
V7	0.05	-0.12	0.03	-0.06	-0.03	-0.31	0.90													
V8	0.05	-0.07	-0.02	0.00	0.06	-0.02	-0.02	0.89												
V9	0.09	0.19	0.09	-0.01	-0.13	0.04	-0.04	-0.09	0.94											
V10	-0.11	-0.07	0.07	-0.26	-0.12	-0.24	0.13	-0.09	-0.24	0.93										
V11	0.12	-0.23	0.11	0.03	0.17	-0.01	0.10	-0.03	-0.09	0.00	0.84									
V12	0.00	-0.04	0.01	-0.15	-0.03	0.04	0.06	0.04	-0.17	0.00	-0.07	0.80								
V13	-0.09	-0.04	-0.22	0.13	0.07	0.09	-0.15	-0.13	0.09	-0.08	-0.16	-0.03	0.67							
V14	-0.04	0.17	-0.05	-0.10	-0.17	-0.05	-0.09	-0.10	0.05	-0.04	-0.15	-0.22	-0.15	0.91						
V15	-0.01	0.02	0.00	-0.05	0.07	0.09	0.08	0.12	0.01	-0.34	-0.02	-0.04	-0.21	-0.28	0.91					
V16	0.03	0.10	-0.06	0.21	-0.05	0.11	-0.15	-0.11	0.20	-0.18	-0.06	-0.44	0.06	0.07	-0.10	0.84				
V17	-0.05	0.06	-0.15	0.04	-0.02	-0.21	0.08	-0.08	0.14	-0.03	-0.11	-0.11	0.17	0.17	-0.08	0.01	0.67			
V18	-0.06	-0.09	0.10	-0.01	-0.01	0.01	-0.08	-0.16	-0.12	0.17	-0.01	0.01	0.17	-0.06	-0.14	-0.20	-0.21	0.45		
V19	0.01	-0.04	0.02	-0.07	0.09	-0.03	-0.07	0.09	-0.07	-0.06	0.11	0.24	-0.11	-0.12	0.09	-0.26	-0.25	-0.18	0.50	
V20	0.04	-0.05	0.02	0.08	0.20	0.06	0.03	0.14	0.09	-0.16	-0.07	-0.02	0.01	-0.02	0.05	-0.04	-0.01	0.01	0.02	0.92
V21	-0.01	0.07	0.04	-0.06	-0.10	-0.03	-0.09	-0.07	0.06	-0.08	0.00	0.06	-0.16	-0.01	-0.05	0.05	-0.09	0.08	0.13	-0.13
V22	-0.21	0.01	0.02	-0.04	-0.15	0.19	-0.09	0.09	-0.21	0.01	0.01	0.15	-0.01	-0.11	0.10	-0.17	-0.06	0.05	0.09	-0.17
V23	0.01	0.05	-0.14	0.00	0.00	0.03	0.01	0.15	0.03	-0.12	-0.03	-0.10	0.14	0.01	0.12	0.02	0.16	-0.08	-0.07	-0.11
V24	-0.07	-0.01	-0.06	-0.04	0.08	-0.05	-0.05	-0.01	0.04	0.08	0.13	-0.02	-0.02	-0.04	-0.07	0.01	-0.04	-0.01	-0.07	0.03
V25	0.11	0.04	0.04	-0.07	0.00	-0.11	-0.01	-0.22	0.06	0.09	0.03	-0.01	-0.08	0.15	-0.05	0.03	0.04	-0.04	-0.01	-0.10
V26	-0.03	0.04	-0.01	0.05	0.00	0.23	-0.07	-0.04	-0.10	-0.03	-0.06	0.07	0.08	-0.12	0.10	0.07	-0.12	-0.01	0.02	-0.14
V27	0.00	0.07	0.04	0.05	-0.06	-0.02	0.00	-0.02	0.22	0.00	-0.12	-0.10	0.11	0.04	-0.07	0.12	0.06	0.01	-0.14	0.05
V28	-0.09	-0.05	0.00	-0.06	0.00	-0.10	0.22	0.16	-0.04	0.14	-0.14	-0.03	-0.02	0.03	0.00	-0.12	0.01	-0.03	-0.02	-0.07
V29	-0.16	0.05	-0.03	-0.15	-0.17	-0.03	0.06	0.00	-0.07	0.11	-0.10	0.07	0.02	0.06	-0.09	-0.05	-0.05	0.14	-0.05	0.06
V30	-0.05	0.07	-0.01	0.01	-0.07	0.02	-0.04	-0.97	0.02	0.07	0.04	-0.02	0.11	0.07	-0.11	0.12	0.04	0.13	-0.07	-0.22
V31	-0.12	0.05	-0.12	-0.09	0.09	0.05	-0.17	-0.02	-0.07	-0.04	0.11	0.07	-0.02	0.07	0.09	-0.19	-0.13	-0.01	0.19	0.01
V32	0.07	-0.11	0.06	0.13	-0.03	-0.04	0.10	0.07	0.10	0.05	-0.06	-0.15	-0.01	0.01	0.01	0.20	0.10	-0.01	-0.19	0.00
V33	0.02	0.09	0.02	-0.03	0.01	0.08	0.07	-0.05	0.03	-0.01	0.09	0.01	0.05	-0.08	-0.18	-0.02	-0.09	0.15	-0.02	0.13
V34	0.01	0.08	-0.10	-0.06	0.09	0.02	-0.04	-0.01	-0.02	-0.08	-0.02	-0.02	-0.05	0.05	0.09	0.06	0.12	-0.15	0.00	0.03
V35	0.03	0.02	0.13	0.02	0.01	0.05	-0.02	-0.08	0.09	-0.12	0.16	-0.03	0.06	-0.05	0.03	-0.02	0.01	0.08	0.03	0.05
V36	-0.15	0.05	-0.17	-0.05	-0.12	0.02	-0.08	-0.13	-0.02	-0.03	-0.16	0.00	-0.03	0.06	0.00	0.12	-0.01	0.02	0.05	0.09
V37	-0.05	0.07	0.13	0.15	0.07	0.08	-0.09	-0.16	0.00	-0.03	0.11	0.01	0.02	-0.10	-0.11	0.21	0.03	-0.01	-0.10	-0.13

V38	-0.08	0.16	0.04	-0.08	-0.06	0.06	-0.10	-0.05	0.18	-0.09	-0.16	0.04	-0.10	0.13	-0.12	-0.01	-0.09	-0.08	0.05	0.16
V39	0.01	-0.12	-0.02	0.26	0.00	0.04	-0.02	0.00	0.13	-0.15	-0.12	-0.21	0.16	0.02	0.06	0.20	0.14	-0.01	-0.20	0.10
V40	-0.09	0.19	-0.22	-0.05	-0.03	-0.28	0.15	-0.12	0.03	0.11	-0.04	-0.06	0.09	0.05	-0.09	0.03	0.10	-0.02	-0.11	-0.01
V41	0.08	-0.03	-0.16	0.01	-0.08	-0.02	-0.11	-0.06	-0.07	0.02	0.03	0.02	0.06	0.03	0.00	0.05	0.04	0.04	0.00	-0.17
V42	-0.04	0.00	-0.01	0.01	0.03	-0.08	-0.10	-0.02	-0.12	-0.02	-0.03	0.06	-0.12	0.07	-0.05	-0.04	-0.01	0.05	0.13	-0.02
V43	-0.19	0.06	-0.08	0.01	0.08	0.15	-0.15	-0.01	0.04	-0.12	-0.04	0.13	0.19	-0.04	-0.03	-0.06	-0.04	0.03	0.12	0.11
V44	0.09	-0.14	0.00	0.03	-0.03	-0.12	0.12	0.01	-0.17	0.06	0.01	-0.03	-0.14	0.02	0.05	-0.15	-0.03	0.17	-0.14	0.09
V45	0.06	0.02	-0.04	-0.06	0.05	-0.11	0.00	0.23	-0.04	0.10	-0.06	0.17	-0.10	-0.05	0.06	-0.01	0.02	-0.22	0.15	-0.05
V46	-0.06	0.05	0.02	-0.08	-0.02	0.09	0.04	-0.04	0.09	-0.04	0.05	0.08	0.07	0.05	0.04	-0.18	0.08	0.09	0.03	0.07
V47	0.05	-0.10	0.08	-0.10	0.07	-0.05	0.14	0.01	-0.09	0.10	0.07	-0.10	-0.19	-0.03	0.04	-0.09	-0.07	-0.06	-0.04	0.07
V48	-0.06	0.09	-0.05	-0.03	-0.05	0.11	-0.21	0.25	-0.05	-0.11	-0.12	0.02	0.05	0.05	0.03	0.01	-0.12	-0.09	0.17	0.00
V49	-0.13	0.04	-0.13	0.00	-0.03	-0.04	0.09	-0.15	-0.09	0.11	0.01	-0.01	0.12	0.05	-0.17	-0.01	0.15	0.08	-0.07	0.04
V50	0.05	-0.08	0.05	-0.02	-0.06	-0.01	0.02	0.13	-0.02	0.10	-0.10	-0.07	0.04	0.01	-0.03	-0.01	-0.02	-0.04	0.02	-0.02
V51	0.00	0.02	0.10	0.03	0.09	0.10	-0.18	-0.20	0.01	-0.05	0.05	0.04	0.02	-0.06	0.07	0.05	-0.10	0.10	0.13	-0.02
V52	0.06	-0.15	0.02	0.07	-0.05	-0.07	0.10	-0.01	-0.05	0.08	-0.05	0.00	0.12	0.04	-0.15	-0.05	0.06	0.12	-0.07	0.04
V53	-0.22	0.13	-0.05	0.07	0.09	0.09	-0.30	-0.02	0.09	-0.26	-0.01	-0.06	0.07	-0.01	-0.03	0.22	-0.04	0.06	-0.04	-0.02
V54	0.13	-0.06	-0.02	-0.01	0.08	-0.12	0.01	0.08	0.01	-0.04	-0.01	-0.01	0.00	-0.03	0.07	-0.05	0.05	0.05	-0.05	0.08
V55	0.11	-0.05	0.02	0.06	0.20	-0.11	0.05	0.01	0.04	-0.08	0.05	-0.16	-0.04	0.04	0.05	0.12	0.11	-0.03	-0.17	0.14
V56	-0.15	0.10	0.03	-0.03	-0.01	-0.11	0.07	-0.14	-0.09	0.13	-0.06	0.04	-0.03	-0.02	-0.08	-0.05	-0.03	0.06	-0.02	-0.03
V57	0.03	-0.19	0.07	-0.01	0.04	-0.11	0.05	0.23	-0.13	-0.07	0.06	0.10	-0.24	-0.03	0.16	-0.14	-0.03	-0.09	0.09	-0.09
V58	-0.11	0.09	0.10	-0.07	-0.03	0.26	-0.09	-0.03	-0.02	0.06	-0.02	0.09	0.10	-0.08	0.01	0.00	-0.05	0.06	0.10	-0.04
V59	0.01	0.01	-0.09	-0.08	-0.07	-0.27	0.06	0.06	0.01	0.10	-0.13	0.06	-0.18	0.19	-0.08	0.03	0.16	0.04	-0.01	-0.12
V60	-0.01	0.11	-0.11	0.04	-0.03	-0.18	0.14	-0.16	-0.02	0.09	0.23	-0.05	0.12	-0.07	-0.05	0.02	-0.02	-0.01	0.01	-0.14
V61	-0.03	0.06	0.09	0.06	-0.04	0.06	-0.11	-0.02	0.10	-0.16	0.08	-0.01	0.07	-0.10	0.02	0.13	0.00	-0.03	0.08	0.10
V62	-0.07	0.04	0.01	-0.11	0.04	0.19	-0.03	-0.17	0.05	0.12	-0.06	-0.03	0.19	0.07	-0.09	-0.04	-0.06	0.08	0.07	0.02
V63	0.09	-0.11	0.03	0.05	0.11	-0.16	0.04	0.12	0.04	-0.01	-0.01	-0.07	-0.06	0.14	-0.05	-0.05	0.13	-0.19	0.03	0.03
V64	0.24	-0.39	0.24	0.10	-0.02	-0.05	0.09	0.13	-0.10	0.09	0.11	0.03	-0.15	-0.14	-0.03	-0.08	-0.10	0.02	0.00	-0.10
V65	-0.04	-0.01	-0.08	-0.02	-0.02	0.09	0.05	-0.09	0.02	-0.06	-0.17	0.01	-0.07	-0.06	0.09	-0.04	0.08	0.02	-0.08	0.07
V66	-0.09	0.05	-0.08	0.08	-0.06	0.04	0.02	-0.05	-0.13	0.13	-0.08	0.05	0.20	-0.13	0.07	0.04	-0.05	0.05	0.03	-0.10
V67	0.22	-0.03	0.01	0.01	0.01	-0.05	0.12	0.12	-0.08	0.03	0.02	0.01	0.01	-0.06	-0.02	-0.04	0.12	-0.03	-0.07	0.05
V68	0.02	0.03	0.00	0.06	-0.03	0.07	0.10	-0.10	0.01	0.10	0.15	-0.01	-0.12	0.04	0.03	0.02	-0.03	-0.09	-0.15	-0.06
V69	-0.02	-0.01	-0.08	-0.01	-0.04	-0.15	0.03	-0.04	0.00	0.01	-0.03	-0.06	0.13	-0.03	-0.05	-0.04	-0.10	0.16	0.02	0.06
V70	0.13	-0.01	-0.01	-0.01	0.06	0.11	-0.16	0.10	-0.09	-0.04	0.14	0.09	-0.03	-0.13	0.13	-0.02	-0.11	-0.11	0.14	-0.08
V71	0.03	0.00	-0.03	-0.04	-0.09	-0.03	0.00	0.15	0.03	-0.15	-0.03	0.07	-0.10	0.17	0.04	-0.15	0.04	-0.04	-0.03	-0.01
V72	-0.01	-0.01	-0.12	0.01	-0.02	-0.23	-0.03	0.09	-0.05	-0.08	-0.03	0.03	0.02	0.07	-0.05	-0.10	0.00	-0.05	0.01	-0.12
V73	-0.03	-0.09	-0.04	0.06	-0.10	0.08	0.03	0.02	0.11	-0.17	-0.15	-0.08	0.18	-0.01	0.01	0.01	-0.02	-0.01	0.01	0.07
V74	0.03	0.09	0.00	-0.01	-0.05	0.14	-0.21	-0.07	0.09	-0.07	-0.08	0.03	0.05	0.08	-0.04	0.03	0.10	0.06	-0.01	0.02
V75	0.08	-0.07	0.09	0.01	0.02	-0.02	0.23	-0.04	0.09	0.03	0.11	-0.05	-0.18	-0.12	0.03	0.07	-0.03	0.03	-0.11	0.13

	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32	V33	V34	V35	V36	V37	V38	V39	V40
V21	0.92																			
V22	-0.05	0.86																		
V23	-0.14	0.01	0.86																	
V24	-0.11	-0.11	-0.34	0.90																
V25	-0.05	-0.19	-0.30	0.02	0.90															
V26	-0.04	0.05	0.03	-0.21	-0.43	0.91														
V27	0.02	-0.20	0.14	0.06	-0.05	-0.11	0.81													
V28	-0.39	-0.01	0.01	-0.14	-0.21	-0.13	-0.12	0.90												
V29	-0.02	0.06	-0.13	0.00	-0.13	-0.01	0.02	0.23	0.92											
V30	0.08	-0.07	-0.12	0.03	0.22	0.04	0.01	-0.19	-0.02	0.89										
V31	0.01	0.19	-0.04	0.07	0.07	-0.03	-0.22	-0.05	-0.13	0.06	0.81									
V32	0.00	-0.26	0.06	0.00	0.09	-0.07	0.14	-0.01	-0.09	-0.11	-0.56	0.91								
V33	0.07	0.04	-0.11	-0.01	-0.19	0.10	0.00	0.08	0.15	-0.01	-0.08	-0.12	0.94							
V34	0.06	-0.16	0.10	0.15	0.04	-0.12	0.12	-0.11	-0.29	0.02	-0.16	0.14	-0.23	0.91						
V35	0.02	0.10	0.15	-0.22	-0.05	0.13	-0.14	-0.21	-0.18	0.08	0.04	-0.14	-0.18	-0.25	0.91					
V36	0.02	0.14	-0.20	0.10	0.10	-0.13	-0.04	0.06	0.13	0.11	0.13	-0.01	0.04	0.04	-0.16	0.64				
V37	0.06	-0.01	-0.16	0.01	-0.05	0.15	-0.02	-0.03	-0.07	0.17	-0.21	0.13	0.11	0.03	0.06	0.00	0.93			
V38	0.00	-0.02	-0.10	0.04	0.10	-0.08	-0.01	-0.03	0.13	0.03	0.09	-0.14	0.19	-0.09	-0.01	0.13	-0.04	0.87		
V39	-0.11	0.01	0.09	-0.10	-0.06	0.01	0.07	0.05	-0.03	-0.02	-0.13	0.04	0.00	-0.18	0.15	-0.07	0.00	-0.02	0.87	
V40	-0.04	-0.23	0.01	0.22	0.05	-0.08	0.10	0.01	0.11	0.08	-0.12	0.09	0.05	0.23	-0.21	0.05	0.03	0.04	-0.36	0.87
V41	0.08	0.01	-0.03	-0.11	0.07	0.14	-0.27	-0.11	-0.25	0.08	0.25	-0.12	-0.15	-0.11	0.16	0.01	-0.08	-0.10	-0.05	-0.24
V42	0.14	0.00	-0.06	0.02	0.07	-0.14	0.09	-0.08	-0.12	0.05	-0.02	-0.14	-0.15	0.12	-0.15	-0.06	-0.04	-0.14	-0.30	-0.10
V43	0.00	0.04	0.06	-0.01	0.07	-0.11	-0.01	-0.02	0.01	0.02	0.19	-0.15	0.00	-0.06	0.09	0.04	-0.26	0.10	0.00	-0.06
V44	-0.04	-0.02	-0.09	0.08	0.00	-0.09	-0.02	0.01	0.09	0.00	-0.02	-0.06	0.02	-0.16	0.00	-0.10	-0.37	0.04	0.17	-0.01
V45	0.01	-0.06	-0.05	-0.05	0.07	0.06	-0.09	0.05	-0.13	-0.23	0.02	0.08	-0.36	0.05	0.00	-0.17	-0.20	-0.09	-0.15	-0.01
V46	-0.08	0.10	0.18	0.03	-0.12	-0.06	0.09	0.04	0.10	0.04	0.07	-0.22	0.10	0.00	0.04	-0.09	-0.12	0.09	0.09	-0.04
V47	-0.05	-0.08	-0.12	0.18	0.08	-0.13	0.06	0.08	0.02	-0.01	-0.01	0.00	0.03	0.10	-0.27	0.07	-0.22	0.05	-0.20	0.14
V48	-0.15	0.28	0.07	-0.17	-0.15	0.07	0.02	0.24	0.14	-0.22	0.16	-0.23	-0.02	-0.20	0.04	0.11	-0.10	0.07	0.10	-0.24
V49	-0.14	0.00	-0.18	0.15	0.06	-0.14	-0.12	0.17	0.14	0.13	-0.07	-0.09	0.05	0.06	-0.02	0.08	0.03	0.04	0.05	0.11
V50	-0.05	-0.02	0.29	-0.16	-0.06	-0.06	0.05	0.12	0.02	-0.11	-0.15	0.06	-0.09	0.02	-0.07	-0.17	-0.02	-0.04	0.15	-0.10
V51	0.20	0.01	-0.19	-0.01	0.08	0.16	-0.03	-0.29	-0.14	0.18	0.20	0.02	0.03	-0.03	0.10	0.23	0.13	0.03	-0.16	-0.06
V52	-0.08	-0.01	0.05	-0.10	-0.05	0.04	-0.08	0.00	0.00	-0.01	-0.11	0.12	0.14	-0.08	-0.03	-0.10	-0.02	-0.11	0.18	-0.08
V53	0.09	-0.04	-0.03	0.09	-0.11	0.09	0.09	0.01	0.05	0.05	-0.02	-0.02	0.00	0.03	0.03	0.12	0.16	0.07	0.02	0.15
V54	0.04	-0.06	-0.04	-0.03	-0.13	0.06	-0.03	0.04	0.09	-0.10	-0.04	0.02	0.03	-0.09	0.05	0.04	0.07	-0.10	0.05	0.03
V55	-0.05	-0.25	-0.01	-0.01	0.10	-0.04	0.11	-0.03	-0.15	-0.04	-0.04	0.12	-0.13	0.13	-0.08	-0.06	-0.02	-0.13	-0.02	0.14
V56	-0.01	-0.08	-0.14	0.19	0.01	-0.07	0.11	0.09	0.12	0.12	-0.19	0.07	0.01	0.18	-0.26	0.06	0.06	0.06	-0.18	0.19
V57	0.09	0.01	0.13	-0.09	-0.07	-0.02	-0.17	0.07	-0.05	-0.17	0.00	-0.02	-0.16	0.12	-0.01	-0.16	-0.04	-0.07	-0.10	-0.07
V58	0.02	0.23	-0.03	0.05	0.02	0.08	-0.10	-0.15	-0.04	0.02	0.17	0.00	-0.02	-0.04	0.00	0.11	-0.01	-0.06	-0.16	-0.13
V59	0.17	-0.23	0.02	0.01	0.01	-0.09	0.09	0.05	0.04	-0.06	-0.15	0.07	-0.15	0.18	-0.11	0.01	-0.06	-0.15	-0.07	0.12

V60	-0.03	0.08	0.05	-0.04	0.08	0.01	-0.01	-0.13	-0.01	0.17	0.03	0.00	0.15	-0.15	0.19	-0.02	0.06	-0.05	0.08	0.09
V61	0.14	0.03	0.03	0.04	0.01	-0.11	0.15	-0.18	-0.10	0.02	-0.04	0.03	0.03	0.06	0.14	-0.03	0.05	0.17	0.12	-0.02
V62	-0.14	-0.08	0.02	0.07	0.00	0.02	-0.01	0.06	-0.06	0.15	0.19	-0.14	0.10	0.06	-0.04	0.09	-0.04	0.00	-0.06	0.05
V63	-0.03	-0.11	0.18	-0.15	-0.07	0.01	-0.02	0.15	-0.09	-0.14	-0.10	0.09	-0.06	-0.04	0.05	-0.12	-0.03	0.01	0.09	0.00
V64	-0.08	-0.01	0.03	-0.08	0.13	-0.12	-0.06	0.03	0.01	-0.11	-0.15	0.02	-0.05	-0.05	-0.04	-0.15	-0.10	-0.11	0.11	-0.18
V65	-0.07	0.06	-0.04	0.20	-0.07	-0.08	0.06	0.04	0.07	0.09	-0.02	-0.14	-0.03	0.13	-0.12	0.15	0.10	0.06	-0.01	0.05
V66	-0.07	0.07	0.01	-0.07	-0.08	0.15	0.01	0.05	-0.02	0.04	0.00	0.14	-0.13	0.08	-0.06	0.02	0.11	-0.17	-0.03	0.05
V67	-0.09	0.02	0.20	-0.13	-0.18	0.09	0.12	0.00	0.03	-0.15	-0.27	0.02	0.09	-0.09	0.11	-0.27	0.01	-0.07	0.07	0.06
V68	-0.03	-0.07	-0.04	0.06	0.17	-0.05	-0.13	-0.05	-0.15	0.08	-0.09	0.13	-0.02	0.15	-0.01	0.05	0.03	0.01	-0.14	0.07
V69	0.02	0.02	-0.01	-0.09	-0.03	-0.03	0.07	0.06	0.20	0.03	0.03	-0.10	0.19	-0.24	-0.08	-0.06	-0.19	-0.09	0.00	-0.03
V70	-0.04	0.10	-0.06	0.01	0.04	0.16	-0.18	-0.15	-0.21	-0.07	0.32	-0.12	-0.15	-0.10	0.14	0.12	-0.01	-0.06	-0.11	-0.15
V71	0.08	-0.05	-0.06	-0.02	0.04	0.03	-0.07	0.00	0.07	-0.15	0.02	0.06	-0.07	-0.01	-0.01	-0.04	-0.06	0.08	0.01	0.01
V72	-0.03	0.13	0.01	0.03	0.04	-0.14	0.01	0.09	0.03	-0.05	0.16	-0.17	-0.07	-0.09	0.00	0.00	-0.21	0.01	-0.08	0.06
V73	-0.02	0.05	0.10	-0.12	-0.16	-0.03	0.19	0.14	0.06	-0.02	-0.07	-0.03	0.03	-0.02	-0.01	0.00	0.00	-0.03	0.24	-0.04
V74	0.10	0.05	-0.05	-0.02	0.12	-0.04	-0.13	-0.17	-0.10	0.06	0.06	-0.02	-0.01	0.03	0.14	0.07	-0.02	0.10	0.13	-0.18
V75	0.05	-0.16	0.01	0.05	0.03	0.06	0.02	-0.14	0.07	0.01	-0.17	0.14	0.18	-0.09	-0.03	-0.06	0.10	0.00	-0.02	0.09

	V41	V42	V43	V44	V45	V46	V47	V48	V49	V50	V51	V52	V53	V54	V55	V56	V57	V58	V59	V60
V41	0.88																			
V42	-0.10	0.95																		
V43	0.02	-0.01	0.69																	
V44	-0.06	0.01	-0.09	0.93																
V45	0.19	0.18	0.02	-0.11	0.93															
V46	-0.19	-0.08	0.05	0.06	-0.38	0.95														
V47	-0.15	0.18	-0.05	0.13	-0.02	-0.23	0.93													
V48	0.02	-0.02	0.13	-0.16	-0.01	0.05	-0.12	0.91												
V49	-0.05	0.03	0.00	0.14	-0.03	-0.04	0.06	-0.06	0.94											
V50	-0.03	0.05	-0.06	-0.08	0.06	0.09	-0.09	0.07	-0.36	0.91										
V51	0.12	-0.10	0.06	-0.25	-0.13	-0.16	-0.12	-0.15	-0.30	-0.45	0.92									
V52	0.10	-0.01	-0.05	0.02	-0.04	-0.03	-0.14	-0.20	0.00	0.26	-0.12	0.93								
V53	-0.07	-0.04	0.09	-0.07	0.04	-0.08	0.01	0.05	0.06	-0.10	0.06	-0.25	0.94							
V54	-0.02	-0.07	-0.15	0.03	-0.06	-0.03	-0.10	0.03	-0.02	-0.17	0.11	-0.26	-0.07	0.96						
V55	-0.07	0.14	0.02	0.04	0.05	-0.11	0.21	-0.14	0.02	-0.13	0.03	-0.12	0.04	0.07	0.90					
V56	-0.16	0.28	-0.04	0.02	0.02	-0.08	0.20	-0.18	0.03	0.04	0.02	0.01	0.05	-0.06	-0.11	0.91				
V57	0.16	0.08	-0.14	0.01	0.10	-0.09	0.03	0.00	-0.15	0.26	-0.19	0.01	-0.12	-0.02	-0.04	-0.15	0.91			
V58	0.00	0.02	0.15	-0.08	0.05	0.13	-0.12	0.06	-0.04	-0.17	0.21	-0.04	-0.06	-0.11	-0.18	-0.10	-0.48	0.92		
V59	0.05	0.20	-0.11	0.07	0.18	-0.05	-0.10	-0.06	0.02	0.10	-0.10	0.07	0.06	0.04	0.05	0.15	0.25	-0.19	0.80	
V60	-0.01	-0.31	0.09	-0.06	-0.19	0.03	-0.11	-0.02	0.05	-0.17	0.17	-0.05	-0.13	-0.15	-0.12	-0.18	-0.20	-0.01	-0.38	0.93
V61	-0.08	-0.04	0.14	-0.04	-0.03	0.08	-0.12	-0.04	-0.02	0.09	-0.01	-0.10	0.13	-0.14	-0.01	-0.12	0.02	0.07	-0.12	0.11
V62	-0.04	-0.03	0.14	-0.24	-0.09	0.13	-0.05	0.00	0.06	-0.02	0.14	0.04	-0.05	-0.03	-0.10	0.10	-0.19	0.08	-0.05	-0.01

V63	0.04	-0.09	-0.08	-0.05	0.12	-0.03	0.02	0.03	-0.08	0.17	-0.17	-0.04	-0.08	0.07	-0.02	-0.06	0.04	-0.04	0.15	-0.09
V64	-0.05	0.11	-0.12	0.20	0.03	-0.07	0.09	-0.02	-0.04	0.21	-0.10	0.11	-0.19	0.05	0.15	0.01	0.15	-0.16	0.01	-0.06
V65	-0.17	0.07	-0.05	0.11	-0.09	0.05	0.19	-0.06	0.17	-0.19	0.00	-0.08	0.11	-0.07	0.00	0.11	-0.10	0.07	-0.01	-0.11
V66	0.07	-0.08	0.00	-0.24	0.01	-0.02	-0.16	-0.03	0.09	-0.01	0.06	0.08	-0.05	0.00	-0.01	-0.08	0.02	0.09	-0.04	0.17
V67	-0.16	0.03	-0.14	0.13	0.01	0.09	-0.04	0.02	-0.05	0.21	-0.26	0.16	-0.07	-0.02	0.04	-0.02	0.08	-0.11	0.10	-0.10
V68	0.14	-0.06	-0.02	-0.02	-0.02	-0.05	0.07	-0.11	0.02	-0.35	0.16	-0.14	-0.11	-0.05	0.13	0.11	-0.13	0.05	-0.12	0.18
V69	-0.08	0.10	-0.02	0.21	-0.11	0.11	0.08	0.06	0.02	-0.01	-0.03	0.02	-0.04	0.02	-0.07	0.03	-0.16	0.03	-0.18	-0.01
V70	0.27	-0.09	0.10	-0.13	0.09	-0.09	-0.02	0.16	-0.20	-0.27	0.26	-0.18	0.00	0.11	0.12	-0.26	-0.10	0.19	-0.24	0.14
V71	0.13	-0.18	0.05	0.09	0.01	-0.10	-0.04	-0.02	-0.08	0.07	-0.13	0.09	-0.07	0.06	0.00	-0.07	0.26	-0.21	0.11	-0.15
V72	0.05	-0.02	0.01	0.12	-0.02	0.00	0.10	0.15	-0.12	-0.04	-0.04	-0.11	-0.03	0.03	0.07	-0.11	0.12	-0.16	-0.03	0.09
V73	-0.10	-0.09	0.10	-0.03	-0.16	0.07	-0.18	0.19	0.09	0.15	-0.16	0.05	-0.08	0.03	-0.03	-0.11	0.05	-0.21	-0.09	0.04
V74	0.14	0.01	0.02	-0.10	0.04	0.01	-0.06	0.00	0.05	0.00	0.01	0.13	0.05	-0.01	-0.26	0.03	-0.09	0.07	0.03	-0.12
V75	-0.10	-0.02	-0.20	0.16	-0.03	-0.06	0.07	-0.24	-0.03	-0.02	-0.03	0.02	-0.09	0.08	0.11	-0.02	-0.10	0.10	0.00	-0.02

	V61	V62	V63	V64	V65	V66	V67	V68	V69	V70	V71	V72	V73	V74	V75
V61	0.94														
V62	-0.21	0.94													
V63	-0.08	-0.22	0.94												
V64	-0.03	-0.19	0.01	0.87											
V65	-0.21	0.05	-0.20	-0.17	0.95										
V66	-0.09	-0.01	-0.24	-0.19	-0.08	0.94									
V67	-0.02	-0.15	0.13	0.16	-0.04	-0.12	0.92								
V68	-0.15	0.00	0.05	-0.04	-0.01	-0.02	-0.11	0.92							
V69	0.00	-0.06	0.09	0.03	-0.04	-0.13	0.01	-0.14	0.92						
V70	-0.07	0.04	0.00	-0.02	-0.14	0.04	-0.14	0.17	-0.26	0.90					
V71	-0.08	-0.18	-0.03	-0.04	-0.19	-0.07	-0.03	-0.11	-0.23	-0.04	0.96				
V72	0.06	-0.19	0.12	0.00	-0.11	-0.14	-0.10	0.03	0.24	0.06	0.04	0.95			
V73	0.09	0.08	-0.05	-0.03	0.04	0.22	0.01	-0.16	0.04	-0.12	-0.02	-0.09	0.95		
V74	-0.08	0.14	-0.04	-0.05	0.06	-0.10	-0.02	-0.08	-0.08	0.05	0.02	-0.41	-0.30	0.95	
V75	-0.01	-0.13	0.03	0.11	-0.05	-0.08	0.11	0.03	0.05	-0.16	-0.04	-0.23	-0.17	-0.25	0.95

국문초록

메가 스포츠 이벤트에서 관중들의 자각하는 서비스 품질과 만족도: 2018 평창 동계 올림픽

GOBINATH Sivarajah
글로벌스포츠매니지먼트 전공
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메가 스포츠 이벤트로써 스포츠를 강조하기 위해서 고객 및 주최측에 의해 스포츠 분야에서 서비스 품질은 상당히 기대된다. 많은 스포츠 경영 학자들은 다양한 유형의 스포츠 서비스에 존재하는 품질들과 관련된 많은 문제를 다루었다. 미래에 있을 스포츠 이벤트 서비스 품질을 향상시키기 위해서 메가 스포츠 이벤트에서의 겪은

관중들의 경험을 토대로 그들의 만족도 결정 요인을 파악하는 것은 필수적이다.

23회 동계 올림픽이 대한민국 평창에서 2018년 2월에 개최되었다. 따라서 이 연구에서는 관중들의 인식, 경험 및 만족도를 바탕으로 본 경기대회의 서비스 품질을 신속하게 평가할 수 있는 기반을 마련하려는 목적에 의미를 두고있다. 비록 서비스 품질과 관련하여 많은 연구가 이루어졌지만, 동계 올림픽에서 서비스 품질에 대한 관객의 인식과 관련한 연구는 부족한 실정이다. 이 연구의 목적은 2018 평창 동계 올림픽 대회의 사례를 통한 메가 스포츠 이벤트에서의 서비스 품질과 관중 만족도 간의 관계를 조사하는 것이다.

2018 평창 동계 올림픽 대회 기간 동안 관객으로부터 자료를 수집하기 위해 자체 관리 된 설문지가 준비되었다. 설문지는 7가지 차원을 기반으로 개발되었다: 접근성 품질, 교통 품질, 숙박 시설 품질,

경기장 품질, 대회 전체 품질, 확장 서비스 품질 및 상호 작용 품질. 이 조사의 결과는 2018 평창 동계 올림픽 대회에 참석 한 214 명의 응답을 분석 한 것을 토대로 한 것이다. 통계 결과에 따르면 남성과 여성의 관람자 비율은 1:1이며, 동계 메가 스포츠 관광객의 대부분은 미국, 캐나다 및 유럽이었다. 대부분의 연령대는 18 세에서 75 세 사이이며, 80 %는 적어도 학위를 소지하고 있었다. 수집 된 데이터는 CFA (Confirmatory Factor Analysis) 및 구조 모델을 사용하여 분석되었다. CFA는 CFA 측정 모델이 잘 맞았다는 것을 확인했다 (CMIN/DF = 1.459, RMSEA = 0.046, TLI = 0.958, CFI = 0.963). 구조 모델 역시 데이터에 적합했다 (CMIN/DF = 2.003, RMSEA = 0.069, TLI = 0.908, CFI = 0.917). 이 모델은 겨울 메가 스포츠 이벤트의 첫 번째 측정 모델이기 때문에 “Win-SERVQUAL” 모델로 이름 붙여졌다. 나아가 확장 서비스는 가장

영향을 미치는 서비스 품질인 것으로 밝혀졌으며, 교통, 게임 및 상호작용 품질은 관객 만족도에 전반적으로 기여하는 것으로 나타났다.

본 연구는 단일 메가 스포츠 동계 대회에 한정된 샘플에 제한되어 있다. 이 연구는 관중들의 인식 가운데 가장 중요한 동계 메가스포츠 대회 품질이 무엇인지 발견할 수 있도록 미래에 쓰일 수 있는 측정 틀을 마침내 제공하였다. 본 측정 방식은 종목 매니저들도 사용할 수 있으며, 관객에게 제공되는 서비스 품질을 보장하는 데에 사용될 수 있다. 더불어, 이 연구는 메가 스포츠 이벤트 서비스 품질을 향상시키기 위해 메가 스포츠 이벤트 조직위원회에 그 필요성과 더 탁월한 지식을 제시한다.

주요어 : 서비스 품질, 스포츠 관중, 메가 스포츠 이벤트, 평창 2018, 동계 올림픽

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