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HOW TO CREATE SUSTAINABLE WINTER SPORTS PARTICIPATION LEGACY? - A CASE STUDY OF BEIJING 2022 WINTER SPORTS PARTICIPATION LEGACY WITH CRITICAL REALISM ONTOLOGY

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Abbreviations

SME	Sports Mega Events
IOC	International Olympic Committee
BOCWOG	Beijing 2022 Winter Olympics and Paralympics Organising Committee
GAS	General Administration of Sport of China
NBS	National Bureau of Statistics of China
CWSF	Chinese Winter Sports Federation
PRC	People's Republic of China
SSH	Social Sciences and Humanities
PRISMA-ScR	Systematic Reviews and Meta-Analyses Extension for Scoping Review
KT	Knowledge Transfer
TOK	Transfer of Knowledge
KS	Knowledge Sharing
KM	Knowledge Management
OGKM/TOK	Knowledge Management and Transfer
CR	Critical Realism
OG	Olympic Games
WOG	Winter Olympic Games
PLG	Paralympic Games
IKL	Knowledge and Games Learning

Introduction

I. An overview of the research project

The Olympic culture "Sport for All" (IOC, 2021b) propagates the shared vision of previous, present, and future hosts to increase sports participation. Evidence has been found in both academia and practice that hosting sports mega events (SME) has the potential to increase sports participation (A. Pappous, 2011; Weed et al., 2015) and facilitate sustainable development (Hindson et al., 1994; Hogan & Norton, 2000). Sustainability has been gradually penetrating into the agenda/ strategy of various types of organizations (Pernecky & Lück, 2012) and transforming individual behaviors since the late 1970s. Beijing 2022 Winter Olympics and Paralympics were the first Games to implement a legacy plan shaped by Olympic Agenda 2020/New Norm and the Legacy Strategic Approach of International Olympic Committee (IOC) (BOCWOG et al., 2021). The cornerstone of this plan was the ambitious "300 million" goal (IOC, 2022), a hard push to increase winter sports participation in China.

Based on the Chinese vision of becoming a sports power with the guidance of the Xi Jinping Thoughts on Socialism with Chinese Characteristics for a New Era (Li & Xue, 2020), China has encouraged active participation in sports following elite sports performances or events. The great achievement includes that engaging over 346 million people in winter sports (BOCWOG et al., 2021). This numerical milestone came after the official survey conducted by the General Administration of Sport of China (GAS) and the National Bureau of Statistics of China (NBS). Employing stratified random sampling, this survey involved 12,340 respondents across 31 provinces and autonomous regions in China. Its findings from 2015 to 2021 indicate that 24.56% of Chinese residents directly or indirectly participated in winter sports (GAS, 2022b). Residents aged 18 to 30 and those living in Northeast China exhibited the highest participation rates. Notably, the participation rate in northern China reached 32.43% ahead of the Games, marking a significant 13.24 percentage point difference compared to the southern regions. The urban-

rural distribution showed that 269 million participants resided in urban areas, while 77 million came from rural regions. In terms of frequency, 38.43% of participants engaged in winter sports 1 to 2 times annually, indicating a sporadic participation pattern. Motivationally, 92.64% of respondents were self-motivated and engaged in ice and snow sports activities voluntarily. Additionally, 70.35% participated in winter sports for recreational purposes, and 57.04% expressed satisfaction with their experiences in winter sports activities (GAS, 2022b). Overall, the survey indicates that the Chinese winter sports market is growing, with a diverse range of participants.

While these insights from the official survey serve as a valuable foundation for our study, national official surveys alone may not provide a comprehensive understanding of the multifaceted landscape of winter sports participation. Assessing the progress made towards realizing this ambitious goal and gaining insights into the legacy delivery process were proven to be challenging, possibly due to the limited availability of supporting literature, linguistic barriers, systemic configurations, and cultural distinctions. During IOC sessions, workshops and Observer Programs concerning legacy and sustainability, some international experts have raised questions about the precise delineation of participation in winter sports, as well as the origin and validity of the reported number of "346 million".

The current state of knowledge of the sports participation legacy is at a developing stage where the mainstream research is in management, medicine, and social science branches within the Western context. Meanwhile, Chinese scholars chose education and the three directions above for the relevant research. Regarding the content, the prior sports participation legacy investigations cover an enormous scope ranging from identifying, defining, and measuring the legacy (Wise et al., 2022) to specific case studies. The case studies, represented by "A case study investigating the impact of the London 2012 Olympic and Paralympic Games on participation in two non-traditional English sports, Judo and Fencing" (A. (Sakis) Pappous & Hayday, 2016), analyzed the Olympic sport participation legacy from the demographic

dimension, social dimension, and intervention processes. The impact of the Olympics on featured groups has been the most studied topic, while large amounts of studies concerning the intervention process led by government policy or media promotion (Shi & Bairner, 2022). Whilst most decision-makers applied beneficial policies to boost direct sports participation by generating an overall positive attitude towards hosting the Games (Hayday et al., 2017a), pioneering scholars argued about the social mechanisms behind the decline in sports engagement 5 years after the events (C. Brown & Pappous, 2018).

Despite an increasing number of researches accentuating the influence of sport participation on grassroots sports, education, non-host cities, specific sports disciplines, and public health (Shi & Bairner, 2022), the social dimension has received less research attention (Mair & Smith, 2021). Besides the topics, we carefully reviewed the methods implemented by previous researchers, since methodology plays an elevated significant role in shaping how the researchers think and the correlated results (May & Perry, 2022). Document analysis, video diary, and survey ranked as the most popular methods. Meanwhile, a growing number of investigations employed interview and quantitative analysis methods attributed to the development of technology.

However, most literature on legacy does little to systematically examine the process of achieving the sports participation legacy, which has been recognized as a "complex, fluid, and contested" concept (Byers et al., 2019). Moreover, less academic works have created conceptual frameworks that enable the transfer of knowledge between the prior and future hosts, to embrace critical perspectives of the concept. And this may be what is preventing the sustainable legacies from being efficiently realized.

II. Research goals

This investigation aims at exploring what Beijing 2022 has achieved in terms of winter sports participation legacy and how can future hosts learn from Beijing 2022 on the legacy, in order to create social sustainability. After conducting literature reviews on two essential topics "Winter Sports Participation" and "Knowledge Transfer at International SMEs", this research project was divided into two subprojects.

1) Research questions (RQ)

RQ1: Is there evidence from secondary data to suggest advancement towards Beijing 2022's objective of "Motivating 300 million individuals to engage in winter sports"?

RQ2: If yes, how did Beijing 2022 motivate 300 million people to engage in winter sports? Specifically, what were the key mechanisms and strategies that influenced the outcomes of Beijing 2022 in engaging 300 million Chinese people in winter sports? If not, what can we learn from Beijing 2022?

2) Research steps and methodology

Research steps

Literature reviews were conducted on two essential topics "Sport Participation Legacy of International Sport Mega Events" and "Knowledge Transfer at International SMEs". These reviews were used to conceptualize the study and find out the proper research framework and methods. Then this project is divided into two studies based on the research questions. Study 1 engages triangulation to examine the realization of Beijing 2022`s sports engagement legacy. Study 2 inspects the crucial leverage strategies that facilitate Beijing 2022`s winter sports participation legacy based on traditional qualitative data analysis methods and big data analysis methods etc.

Research methodology- Qualitative quantitative mixed method

The investigation applied purposive sampling data collection method and fused elements of both the top-down and bottom-up approach for analyzing diverse variables. Following the explanatory sequential design, this research engaged the Qualitative Quantitative Mixed Method. Integrating quantitative and qualitative research methods in the data-collecting and analyzing stage helps researchers gain a better understanding of the research problem (Tashakkori & Teddlie, 2010).

Chapter 1 - Scoping review on sport participation legacy of international sport mega-events (SME)

Abstract: Beijing beckoned to the world, daring 300 million individuals to embrace the thrill of ice and snow activities, setting an unprecedented milestone in the Olympic movement in terms of social sustainability. However, current literature on the legacy offers little empirical evidence on achieving sports participation goals and conceptualizing "Sports Participation" distinctly. This scoping review aimed to examine the state of research on sports participation at international sports mega-events. Applying the quality and eligibility criteria yielded a final corpus of 62 peer-reviewed scientific articles, involving 6 preceding literature reviews on the topic. This investigation followed the PRISMA-ScR protocol to identify the main concepts, theories, sources, and knowledge gaps while shedding light on the mechanism encouraging active participation. The results highlight a need for further research to fully understand sport participation in different contexts, engaging empirical data and international comparative methodology.

Keywords: Sports Participation Legacy; International Sport Mega-Events; Scoping Review; PRISMA-ScR; Knowledge Gaps

I. Introduction

As the world turned its gaze toward the historic Beijing 2022 Winter Olympics and Paralympics, the first Olympic Games ever to implement a legacy plan adapting Olympic Agenda 2020/ New Norm and the International Olympic Committee (IOC) Legacy Strategic Approach (BOCWOG et al., 2021), one goal stood at the forefront: an impressive and ambitious goal that challenged the boundaries of sport participation. Against the backdrop of a global pandemic, these Games etched their place in history, not only as a testament to human resilience but also as a harbinger

of a new era in winter sports. It was here that Beijing beckoned to the world, daring 300 million individuals to embrace the thrill of ice and snow activities, setting an unprecedented milestone in the Olympic movement. This remarkable accomplishment has piqued research interest both within and outside of mainland China, sparking inquiries into the complexities of this achievement.

The numerical milestone of over 346 million participants in winter sports was based on the results of an official survey conducted by the National Bureau of Statistics of China (NBS) and the General Administration of Sport of China (GAS)(2022). Although these insights from the official survey serve as a valuable foundation for in-depth studies, national official surveys alone may not provide a comprehensive understanding of the multifaceted landscape of winter sports participation. Moreover, international scholars have raised questions about the origin and validity of the reported number of "346 million," possibly due to the limited availability of supporting literature (Pitsiladis et al., 2018; Wang et al., 2021) and the "wicked problem" embedded into the legacy delivery process. Thus, it is necessary to conduct a systematic investigation concerning the legacy delivery process and mechanism, initiating a scoping review on the relevant topic.

Preceding investigations on sports participation legacy were mainly in social science, medicine, administrative management, and business management branches, based on the primary search results of high-quality databases and previous literature reviews (Shi & Bairner, 2022; Weed et al., 2015). As IOC Sport for All Commission Declaration (IOC, 2021) underscores the shared vision of the host cities to promote increased sports participation, scholarly research and practical evidence suggest that hosting sports mega-events (SMEs) has the potential to boost sports participation (A. Pappous & Hayday, 2016; Weed et al., 2015) and foster sustainable development (Hindson et al., 1994; Hogan & Norton, 2000). However, there are a rising number of discussions about the challenges (Gérard et al., 2020; Girginov & Hills, 2010) and negative

legacies (Hahm et al., 2020; Mair & Smith, 2021) relating to the implementation of the legacy plan and long-term effects.

II. Research goals and questions

The objective of this paper was to examine the state of research on sport participation at international sport mega-events, identify critical research gaps, and synchronize crucial findings. To realize these aims, we established the following research questions:

- RQ1: Who has conducted sports participation legacy research at international sports mega-events, on which mega-events, when, and where?
- RQ2: Which methods and theoretical frameworks have been applied by the researcher?
- RQ3: What are the advancements, limitations, and knowledge gaps in the social science area on the topic of sports participation legacy?

III. Research methods

1) The three-layer sports system and Chinese mass sports development

According to the news media reports on the achievement of the "300 Million" goal, the Chinese sports system, known as "Juguo Tizhi"(举国体制), has highlighted its executive power and the driving forces behind it. "Juguo Tizhi" has a complex framework and is characterized by a top-down approach, with the government playing a leading role in identifying, training, and supporting elite athletes. It is composed of three layers based on geographical and administrative features. From the administration perspective, the three layers are GAS, Provincial Sport Administrations, and Urban/ Prefectural Sport Administrations. From the dimension of sports teams, the three layers are the National teams, Provincial teams, and Urban/

Prefectural teams. The fundamental structure of the Three-Layer Sports Administration System has remained remarkably consistent throughout modern Chinese history.

GAS serves as the overarching body, responsible for formulating sports strategies and policies in alignment with the nation's economic and social development plans. Under the roof of the GAS, there are 56 Superior National Sports Associations for Olympic and Non-Olympic Sports, as well as 37 Local Sports Administrations. As the umbrella organization, GAS executes the central government's decisions, makes sports strategies and policies according to the "Five-Year Plan for Economic and Social Development of PRC", creates guidelines, allocates resources, and oversees the execution of sports-related activities (Official Website of the General Administration of Sport of China, 2023). The national teams, attached to GAS, select and develop top-level athletes with guidance and all-around support from GAS. Lower-level organizations, funded by local government, execute the tasks assigned by GAS and support the operation of provincial/ prefectural teams. Meanwhile, they take responsibility for developing detailed plans with specific conditions of the region, distributing resources based on the rules, and supervising the third-layer subordinate organizations.

The priority setting of elite and mass sports significantly impacts the shape of the sports pyramid and its socioeconomic vulnerability. The design of the current Chinese sports system has been inspired by the Soviet-style sports system. At the beginning of the People's Republic of China (PRC), the Chinese government initiated the "Elite-Sport-First" strategy with the "Olympic Glory Plan" to overtake some strong Western "Sports Powers" for the national self-esteem, self-confidence, and dignity (Lu & Hong, 2013). At that time, mass sports were used as an instrument to improve working efficiency, strengthen civil defense, and create a favorable breeding ground for elite sports` development (De Bosscher et al., 2013; Donnelly, 1991; Eady, 1993). However, there is a dichotomy relationship between mass sports promotion and elite sports development regarding resource distribution and investment strategy.

Besides, the preeminence could be discipline-specific or periodic. To achieve international sporting success at the elite sports level, Chinese sports governing bodies prioritized several medal-winning disciplines, such as badminton, ping-pong, and skating, which benefited from discipline-specific talent pools and popularity at the mass sports level. In contrast, skeleton, weightlifting, and freestyle skiing were minority disciplines with excellent historical performance. Thus, the discipline-specific strategic investment in Chinese elite sports only sometimes leads to the corresponding popularity and mass participation of the sports disciplines (Chen et al., 2021; Xiao, 2009). The 'global sporting arms race' has motivated more nations to invest strategically in elite sports and search for an optimal combination with policy to enhance competitive advantages (De Bosscher et al., 2013; Donnelly, 1991; Eady, 1993).

This transformation is interrelated with the sustainable development goals (SDGs) and the Olympic Movement, socio-economic development, and the change of people's attitudes and opinions. Governments are balancing their mass and elite sports goals and using the 'demonstration effect' (Weed et al., 2015) or trickle-down effect to justify its high investments in the elite sports (De Bosscher et al., 2010, 2015; K. Sotiriadou et al., 2006). Bidding for the 2022 Winter Olympics and Paralympics is one of the examples that Chinese sports governing body gradually switched its concepts and attitudes, and attached great weight to improving the health and fitness of everyone. Besides, mass participation and social inclusion translate to the public interest in elite sports via media/ social media and attendance at sporting events, as well as purchasing memberships, sporting goods, and other related services (Shilbury et al., 2008).

Before the successful bidding of Beijing 2022, only a few Provincial/ Urban/ Prefectural Sport Administrations were selected to develop winter and summer sports. As a result, only Hei Longjiang, Jilin, Liaoning, Beijing, Hebei, Neimeng, Jiangsu, Guangdong, and Xinjiang undertook the mission to develop winter sports (GAS, 2022a). The Chinese Winter Sports Federation (CWSF) was the superior association for all winter sports in the GAS system. The scope of winter sports extended rapidly from the north, with a tradition of developing winter

sports, to other parts of China; after winning the bids for the 2022 Winter Olympics and Paralympics. Sports engagement has brought healthier lifestyles to China's citizens and contributed to local and regional development, according to the official reports. Moreover, the pre-game legacy report issued by the Beijing Organizing Committee for the Winter Olympic Games (BOCWOG) affirmed three pillars of achieving the "300 Million" goal. The pillars are: (a) engaging the young generation, (b) increasing access to experience winter sports through infrastructure development and social organizations` commitment, and (c) creating a policy system advancing employment and investment to support winter sports (BOCWOG et al., 2021).

2) Defining and classify the sample of literature

The definition of sports participation in prior investigations has varied, often based on the context of grassroots sports, where physical activity and engagement by ordinary people are monitored. Some scholars have not distinguished between random and regular sports participation, with random participation referring to joining sports festivals or events and regular participation referring to committing to physical training and sports education (Breuer et al., 2011; Downward & Riordan, 2007; Humphreys & Ruseski, 2009; Leslie et al., 2004). Other scholars have identified sports participation with physical activity engagement during the previous four weeks (England, 2022), while many investigations have operationalized a more precise quantitative concept, such as the proportion of adults aged 16 or older who engaged in sports at moderate intensity for 30 minutes or more at least once in the past week (Sports Science Research Center, 2022). Additionally, the sport participation concept has referred to both mass and elite sports participation in some contexts (Chen, 2018; Sotiriadou et al., 2006), and different age criteria or discipline-specific definitions have been suggested in other studies.

For example, the "300 Million" aim has been described as one of the critical strategic approaches to advance China to be a sports power with the guidance of the Xi Jinping Thoughts on Socialism with Chinese Characteristics for a New Era (Li & Xue, 2020). On most official occasions, BOCWOG and relevant stakeholders applied the term "Engaging 300 million people

in ice and snow sports (2022)", corresponding to the sports participation legacy. Originating from the bidding promise "Create a winter sports market with the involvement of more than 300 million people" (Beijing 2022 Olympic Winter Games Bid Committee, 2014), Beijing 2022`s sports engagement concept has a broad connotation and denotation. It not only involves people who practice ice and snow sports, such as athletes and coaches; but also covers the scale of people who indirectly engage in winter sports, such as participants in winter experiential events, and the working staff of the Chinese winter sports industry (Chen et al., 2022a). Moreover, `Winter sports` involve all sports disciplines performed on ice or snow, and other non-Olympic disciplines performed in different mediums, such as winter swimming.

In conclusion, there`s no standardized or generative conception with clear criteria for both winter and summer sports participation internationally. To ensure the precision of our research, we excluded some ambiguous terms, such as "sports involvement" and "sports engagement" to develop our searching strategy. Accordingly, our search of electronic journal databases required ("World Cup" OR Paralympic* OR Olympic* OR "Sport* Mega Event*" OR "Mega Sport* Event*" OR "Commonwealth Games" OR "World Championship*") AND ("Sport* Participation" OR "Mass Participation") be presented in the key fields of the title, abstract or keywords.

3) Search strategy and literature sample

Scoping review synthesizes the preceding knowledge on a certain topic, follows a systematic approach to map the current state of research and identify main concepts, theories, sources and research gaps. Compare with other types of scoping reviews, Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Review (PRISMA-ScR) enhances the quality and transparency of research, and enables us to minimize bias in the process of synthesizing research evidence (Tricco et al., 2018). Following PRISMA-ScR (Tricco et al., 2018) and suggestions of supervisors, we firstly identified and studied preceding literature reviews on the topic of sports participation legacy. There were five preceding

literature reviews involving "The health and socioeconomic impacts of major multi-sport events: systematic review (1978-2008)" (McCartney et al., 2010), "Sports mega-event legacies and adult physical activity: A systematic literature review and research agenda" (Annear et al., 2019), "A systematic quantitative literature review of empirical research on large-scale sport events' social legacies" (Thomson et al., 2020), "Sport Events for Sport Participation: A Scoping Review" (Teare & Taks, 2021), and "Sustainable Development of Olympic Sport Participation Legacy: A Scoping Review Based on the PAGER Framework" (Shi & Bairner, 2022), providing periodical evidence for a cluster of research questions, and the mainstream research focus was on the efficiency and effectiveness of the leverage policies. Moreover, these investigations revealed that the current body of literature on sports participation at international SMEs is at a developing stage where most works located in the medicine, social science, and management area.

We continually searched literature in the area of social sciences and humanities (SSH) in Scopus, a high-quality database of scholarly literature providing expertly abstracts and methodology to support the systematic review of previous investigations across numerous topics and disciplines, as well as the two high-quality Chinese databases CNKI and Wanfang. Based on our searching strategy, the precise keywords were used for each database but adapted to the specific search engines. The secondary search was conducted in correspondence with the preceding literature reviews and the official reports, information, and documents from Olympic World Library. Afterwards, we imported all the reference lists into RefWorks and applied a four-staged strategy to locate the scientific literature.

The criteria for inclusion were the following: (a) non-duplicated documents; (b) having access to the full text and being able to be read; (c) in the social sciences area and highly relevant to the sports participation legacy of international SMEs; and (d) published in peer-reviewed journals/core journals of a nation or from high-quality databanks/official websites. The literature selection process has been demonstrated by Figure 1.

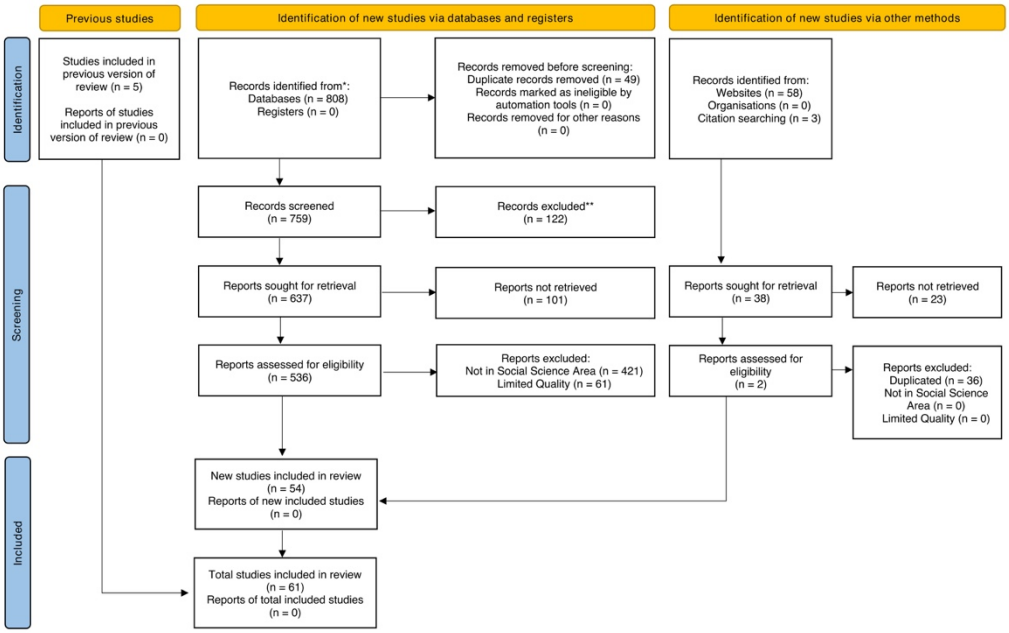

Figure 1. PRISMA-ScR Flow Diagram

Source: PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams (Haddaway et al., 2022)

Finally, 62 academic works arrived at after an integrated literature search and careful quality evaluation of the 874 documents. Referring to PRISMA-ScR framework and the sizeable overlapping area of the sports participation legacy of the Olympics and other international SMEs, we compare the 54 samples of prior scoping review from Shi & Bairner (2022) with the 55 works in our final corpus. There were 31 references in common and the initial gap among the 2 sets of samples was created by the engagement of distinguishing databases, especially the World Olympic Library and Chinese databases. Utilizing the same process to synthesize and compare our search results with the 146 sources provided by Teare & Taks (2021), we identified 19 documents in common. While this number was 10 for Weed et al.`s review on the demonstration effect of Olympic Games (2015), 4 for Thomson et al. (2020), 9 for Annear et al. (2019), and 0 for McCartney et al.(2010).

In general, we identified 3 factors that contributed to the variation, including the diverse research goals, selection criteria and different databanks in corresponding to languages. Despite the differences, the massive results of the initial study were in line with this review in terms of methodology and frameworks.

Based on the research topics, we carefully examined the 62 academic works in the cohort and divided the samples in the final corpus into 3 groups based on the events` features and motivations: (a) Case study of Olympic Games and Paralympics, (b) Non-Olympic Games case study or comparison study focusing on practice, and (c) Theory development-centric study (see Table 1).

Table 1. Categories and Subcategories covered across all the 62 studies

Category	Subcategory	n (%)	Study and Author	Journal Outlets
Non-Olympic Games or Comparison Studies Focusing on Practice (n=5, 8.06%)	EURO FIFA 2012	1(1.61%)	Wodniak (2021)	International Journal of Sport Policy and Politics
	FIFA 2002 World Cup	1(1.61%)	Hahm (2020)	Sport in Society
	London 2012 OG, Glasgow 2014 Commonwealth Games	1(1.61%)	Macrae (2017)	Journal of Sport Management
	Qualification for the 2006 World Cup	1(1.61%)	Frawley & Hoven (2015)	Soccer and Society
	The 2003 Rugby World Cup	1(1.61%)	Frawley & Cush (2011)	Managing Leisure
Olympic Games and Paralympics (n=39, 62.90%)	Atlanta 1996, Sydney 2000, Athens 2004, and Beijing 2008 OG	1(1.61%)	Kaplanidou (2017)	Event Management
	Beijing 2008 OG	1(1.61%)	Feng & Hong (2013)	International Journal of the History of Sport
	Beijing 2022 OG & PLG	1(1.61%)	Chen et al. (2022)	Sport Management Review
	Beijing 2022 WOG	2(3.23%)	Fengkai et al. (2023)	Journal of Capital University of Physical Education and Sports
	Beijing 2022 WOG		Xing et al. (2024)	Sport Management Review
	Lillehammer 2016 Youth Olympic Games	1(1.61%)	Nordhagen (2021)	International Journal of Sport Policy and Politics
	London 2012 OG	11(17.74%)	Bretherton et al. (2024)	International Journal of Sport Policy and Politics
	London 2012 OG		Chen & Henry (2016)	Leisure Studies
	London 2012 OG		Darko & Mackintosh (2016)	Qualitative Research in Sport, Exercise and Health
	London 2012 OG		G. Brown et al. (2017)	European Sport Management Quarterly
	London 2012 OG		Hayday et al. (2017)	International Journal of Sport Policy
	London 2012 OG		Henry (2016)	Journal of Global Sport Management
	London 2012 OG		Kokolakakis & Lera-López (2022)	Sport in Society
	London 2012 OG		Kokolakakis et al. (2019)	Sport management review
	London 2012 OG		Mackintosh et al. (2015)	Sport, Education and Society
	London 2012 OG		Mackintosh et al. (2016)	Leisure Studies
	London 2012 OG		Carmichael et al. (2013)	International Journal of Sport Policy and Politics
	London 2012 OG & PLG	3(4.84%)	Lovett et al. (2020)	Leisure Studies
	London 2012 OG & PLG		Pappous & Hayday (2016)	Leisure Studies

	London 2012 OG & PLG		Weed et al. (2012)	Perspectives in Public Health
	London 2012 PLG	2(3.23%)	C. Brown & Pappous (2021)	European Journal for Sport and Society
	London 2012 PLG		C. Brown & Pappous (2022)	Managing Sport and Leisure
	Nagano 1998 WOG, Beijing 2008 OG	1(1.61%)	A. E. Bauman et al (2021)	Lancet (London, England)
	PyeongChang 2018 WOG	2(3.23%)	H.-M. Kim & Grix (2021)	Sustainability (Switzerland)
	PyeongChang 2018 WOG		Karadakis & Kaplanidou (2012)	European Sport Management Quarterly
	Rio 2016 OG	3(4.84%)	Reis et al. (2014)	Leisure Studies
	Rio 2016 OG		Ribeiro et al. (2022)	Leisure Studies
	Rio 2016 OG		Sousa-Mast et al. (2013)	Managing Leisure
	Rio 2016 PLG	1(1.61%)	Kirakosyan (2019)	Societies
	Sydney 2000 OG	2(3.23%)	A. Bauman et al. (2015)	British journal of sports medicine
	Sydney 2000 OG		Veal et al. (2012)	Journal of Policy Research in Tourism, Leisure and Events
	Sydney 2000, London 2012, and Rio 2016 OG	1(1.61%)	Reis et al. (Reis et al., 2017)	Event Management
	Tokyo 1964 OG	1(1.61%)	Aizawa et al. (2018)	Sport Management Review
	Tokyo 2020 OG	1(1.61%)	Kolotouchkina (2024)	Communication & Society
	Vancouver 2010 WOG	5(8.06%)	Craig & Bauman (2014)	International Journal of Behavioral Nutrition and Physical Activity
	Vancouver 2010 WOG		Derom & Lee (2014)	Journal of Physical Activity & Health
	Vancouver 2010 WOG		L. R. Potwarka et al. (2016)	Event Management
	Vancouver 2010 WOG		L. R. Potwarka et al. (2016)	Leisure Studies
	Vancouver 2010 WOG		Perks (2015)	Canadian Review of Sociology
Theory Development-Centric Studies (n=18, 29.03%)	Analyse fundamental contradiction between austerity and securing participation objectives	1(1.61%)	Gérard et al. (2020)	Leisure Studies
	Analyse mechanism of increasing sports participation through events hosting (Trickle-down effect)	2(3.23%)	Castellanos-García et al. (2021)	International Journal of Sport Policy and Politics

Analyse mechanism of increasing sports participation through events hosting (Trickle-down effect)		L. Potwarka et al. (2023)	European Sport Management Quarterly
Analyse the mechanism of the leverage	7(11.29%)	C. Brown & Pappous (2018)	Journal of Sport and Social Issues
Analyse the mechanism of the leverage		Chalip et al. (2017)	International Journal of Sport Policy
Analyse the mechanism of the leverage		Charlton (2010)	International Journal of Sport Policy
Analyse the mechanism of the leverage		Dickson et al. (2021)	Sustainability (Switzerland)
Analyse the mechanism of the leverage		Hayday et al. (2019)	Leisure Studies
Analyse the mechanism of the leverage		Howe & Silva (2018)	Sport in Society
Analyse the mechanism of the leverage		Kokolakakis & Lera-Lopez (2020)	International Journal of Environmental Research and Public Health
How to leverage sports participation through hosting SMEs.	1(1.61%)	Piper & Garratt (2024)	Sociological Research Online
Literature Review	6(9.68%)	Shi & Bairner (2022)	Sustainability (Switzerland)
Literature Review		Weed et al. (2015)	European Sport Management Quarterly
Literature Review		McCartney et al. (2010)	The BMJ
Literature Review		Annear et al. (2019)	European Journal for Sport Science
Literature Review		Teare & Taks (2021)	Frontiers in sports and active living
Literature Review		Thomson et al. (2020)	Leisure Studies
Mechanism that sports involvement contributes to the success of SMEs.	1(1.61%)	C. Kim & Kaplanidou, (2024)	Sustainability

IV. Results

1) Distribution of literature, authors and growth

Referring to the PRISMA-ScR protocols, we carefully examined the demographic features of the 62 academic works in the final corpus and divided the academic works into 3 groups and 28 subcategories based on the research topics and events. 62.90% of investigations are case studies examining whether the selected Olympic Games or Paralympics increase sports participation. Among them, London 2012 OG has been the most studied Olympic Games, followed by Vancouver 2010 WOG and Rio 2016 OG, while there is a growing research interest in Beijing 2022 WOG and multi-case studies. 29.03% of the academic works explore how does the mechanism or relevant theories, such as the "trickle-down effect", significantly impact mass participation. Approximately 8% of the preceding studies discuss the sports involvement legacy with the contexts of other international SMEs, for instance, FIFA World Cup, Rugby World Cup, and Commonwealth Games.

Regarding the publication tendency, our results show that most peer-reviewed articles were published in 2016 and 2021. There was acute growth from 2014 to 2016, from 2019 to 2021, and from 2023 to 2024. In contrast, there was a slight downfall in publication from 2016 to 2018 and from 2021 to 2023 (see Figure 2). The mainstream case studies, represented by the academic works on London 2012 OG, examined the long-term sports participation legacy 3-5 years after the games. Counter to the case studies on different SMEs, there is no significant time pattern among the theory development-centric studies.

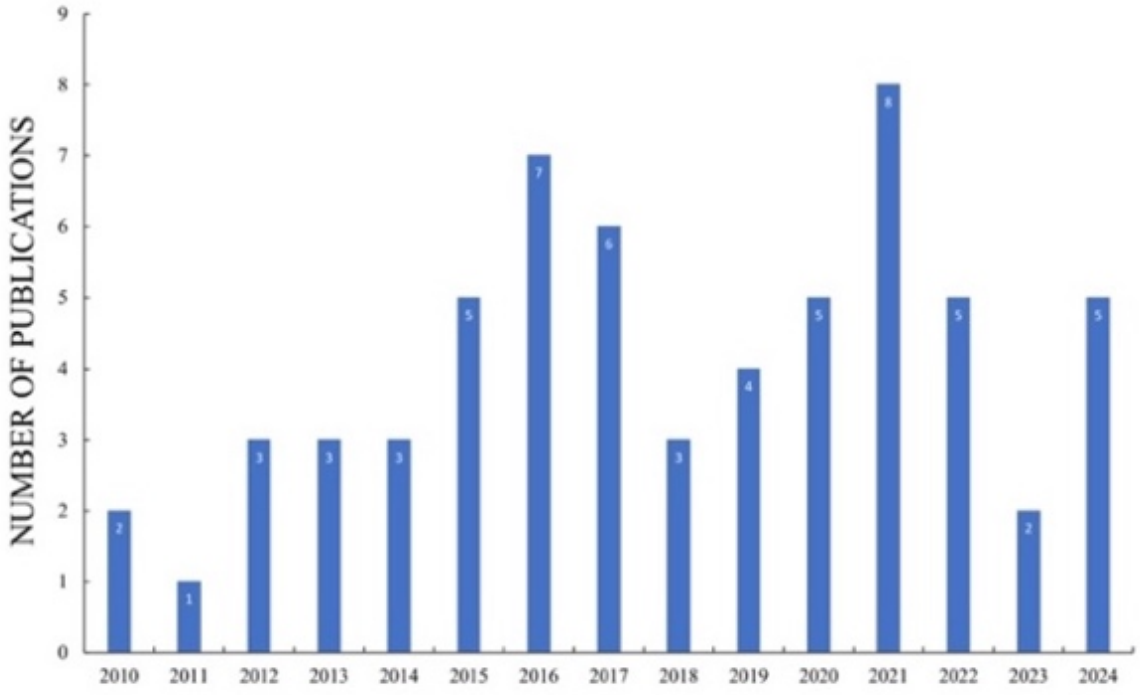

Figure 2. The Growth of Peer-Reviewed Articles on Sports Participation Legacy of International SMEs

Figure 3 mapped the journal coverage of our research topic. A large diversity of sources, including 33 high-quality international journals, has been identified. Leisure Studies collected the most literature (16.13%), whilst International Journal of Sport Policy and Politics (8.06%), Sport Management Review (6.45%), European Sport Management Quarterly (6.45%), and Sustainability (6.45%) stored the identical number of articles. Besides, the variety of sources also revealed that a significant number of studies have interdisciplinary features and engaged in theories from administrative/ business management, medicine, and psychology branches.

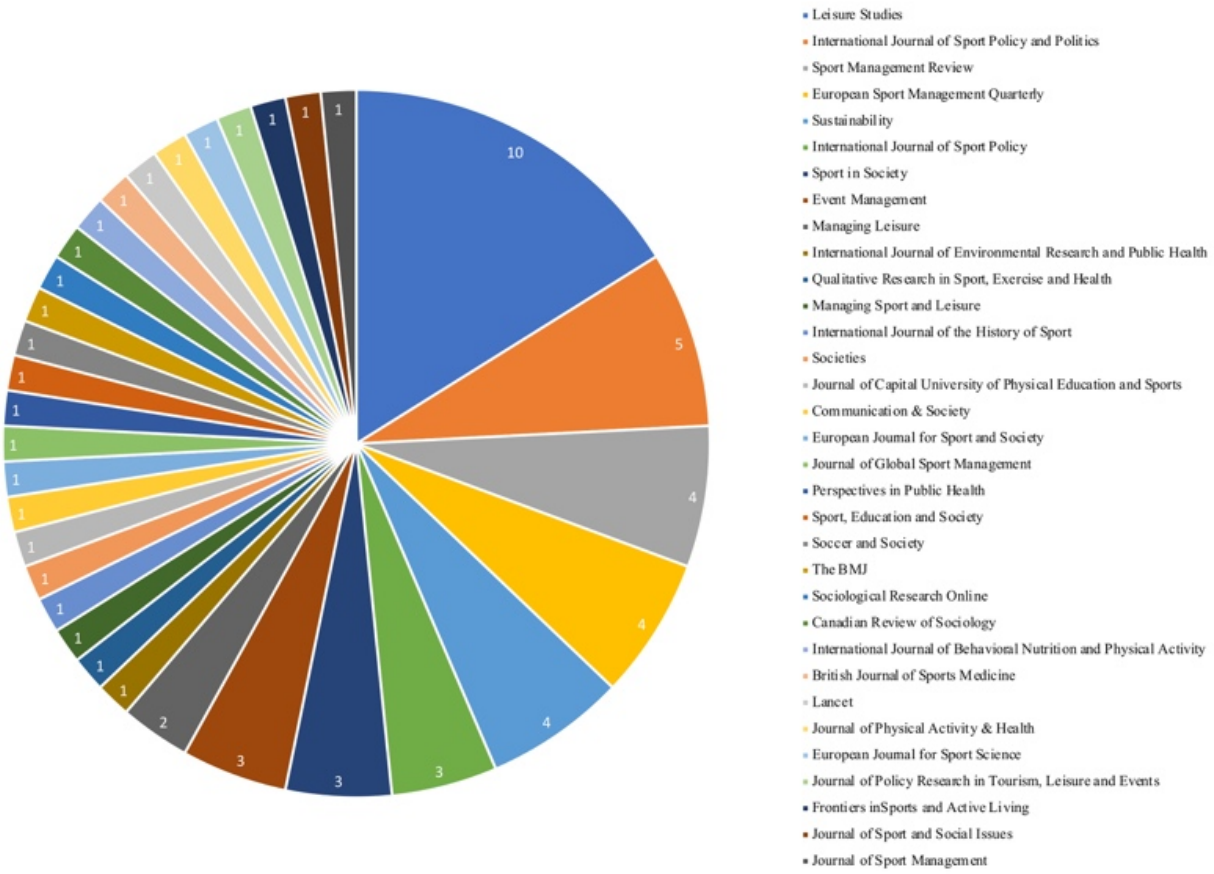

Figure 3. Mapping the Journal Outlets

Concomitantly, we identified that Pappous, Kokolakakis and Frawley, who conducted the majority of research on the London 2012 Olympic Games and Paralympics and developed their theories, ranked the top three experts in mass participation research. However, most publications were one-off papers in English, written by 1 or 2 author(s) from Europe, where English has been the default academic language or one of the official languages. In contrast, there is an increasing trend in scholars from China conducting legacy research in both English and Chinese, at international SMEs (Figure 4).

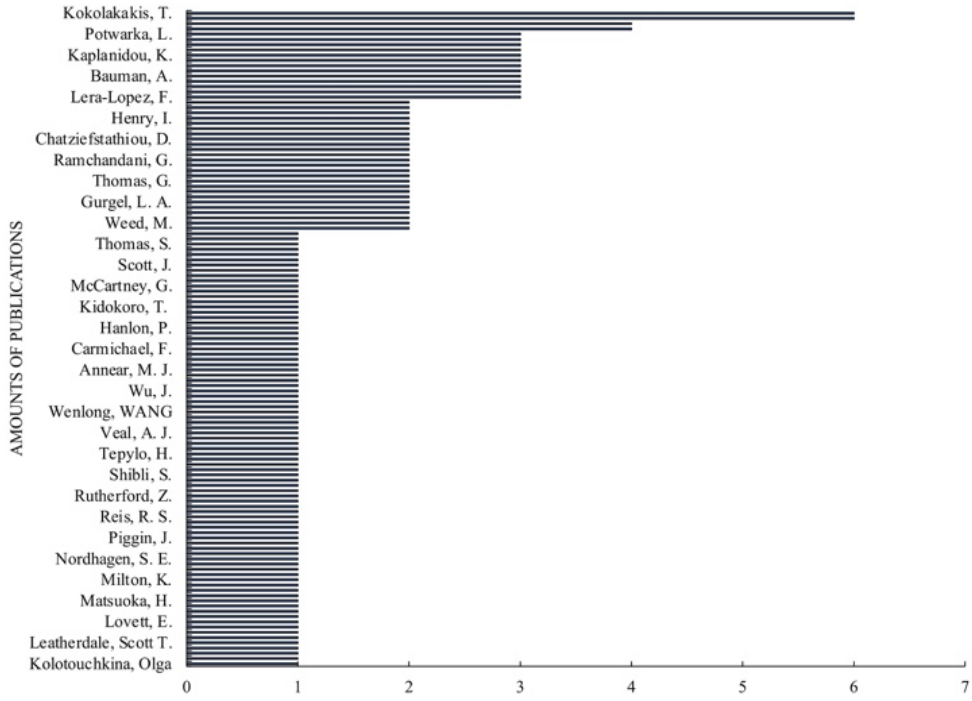

Figure 4. Amounts of Academic Works Published by Different Researchers

2) Methodology of research

The methodology is coherent to shape researchers` thoughts and to influence the results (Maitland et al., 2015). There are limited amounts of included academic papers engaging primary sources. This may be in tandem with the general design and the choice of research method, where we identified most studies applied qualitative research methods. The frequently presented methods involve interview, survey, document analysis, and video diaries (see Table 2). Despite the new trend of applying big-data based research methods and tools for the legacy studies, rare preceding research used philosophical frameworks and engaged observation and intervention.

Table 2. Map the Research Area and Methods of the Sample Works

Category	Study and Author	Subdiscipline of Social Science	Research Method and Model	Key Outcomes	Legacy Type	Attitude towards the hypothesis that SMEs leverage sports participation.
Non-Olympic Games or Comparison Studies Focusing on Practice	Wodniak (2021)	Management Science, Psychology	Ethnography Consisting of Interviews and Participant Observation	Supports hypothesis on the legacy of mega-events in terms of sport participation which discussed the advantages of bottom-up, local approaches in comparison to centrally planned programmes.	Long-Term	Positive
	Hahm (2020)	Psychology, Human Geography	Statistical Analysis	Deny the leverage effects: No difference among spectatorship type and nationality.	Long-Term	Neutral
	Macrae (2017)	Human Geography, Psychology	Interview, Survey, Thematic Analysis	Identify mechanism to build VSC capacity, retain members in the long-term, and promote general visibility of the VSC throughout the event.	Long-Term	Neutral
	Frawley & Hoven (2015)	Psychology, Human Geography	Statistical Analysis, Document Analysis	Confirm the leverage: An overall positive trend in Australian football participation post Australia's successful World Cup qualification.	Long-Term	Positive
	Frawley & Cush (2011)	Political Science	Interview	Prove the sport of rugby witnessed an increase in sport registrations following the staging of the event.	Long-Term	Positive
Olympic Games and Paralympics	Kaplanidou (2017)	Medical Science, Human Geography, Psychology	Intervention	Identify mechanism and crucial factors that influence the sports participation by comparing the leverage effects of different events.	NA	Neutral
	Feng & Hong (2013)	Political Science	Interview, Figurational Theory	Examine the long-term effects of the leverage on sports participation.	Long-Term	Negative
	Chen et al. (2022)	Political Science	Interview, Document Analysis	Confirmed the leverage effects of hosting MSE on mass participation.	Long-Term	Neutral
	Fengkai et al. (2023)	Psychology, Human	Survey, Social Influence Theory, Information Source Model	Identify the mechanism: Sports celebrities. Confirms the objective existence of the trickle-down effect of sports participation in Beijing	Short-Term	Positive

	Geography		Winter Olympic Games.		
Xing et al. (2024)	Management Science, Psychology	Transtheoretical Model-Based Intervention	Identify and develop strategy and plans for the leverage. Figure out the critical factors influence different people`s participation.	Short-Term	Neutral
Nordhagen (2021)	Political Science	Interview, Document Analysis	Identify mechanism, crucial factors and barriers that influence the sports participation.	Long-Term	Neutral
Bretherton et al. (2024)	Political Science	Critical Policy Analysis	Examine how London 2012's pre-event sport/PA participation legacy targets were constructed for their successful delivery. The target is to increase overall participation by two million between June 2008 and the Games in 2012 (a target that was abandoned in 2011).	Long-Term	Neutral
Chen & Henry (2016)	Medical Science, Human Geography	Survey, Document Analysis	Identify whether there is a positive impact of MSE in the non-hosting regions in the period leading to the Game and verify the causal mechanisms.	Short-Term	Positive
Darko & Mackintosh (2016)	Psychology, Medical Science	Video Diaries (VDs), Interview	Identify research tools for examining the influence of the London 2012 Olympics.	Short-Term	Neutral
G. Brown et al. (2017)	Psychology, Human Geography	Survey, Exploratory Factor Analysis, and Partial Least Squares Structural Equation Modelling	Deny the hypothesis of Mega-events could create sport participation legacies.	Long-Term	Negative
Hayday et al. (2017)	Management Science, Human Geography	Survey, CR	Identify the mechanism through the investigation of national governing bodies (NGBs) opinions and attitudes.	Long-Term	Positive
Henry (2016)	Human Geography	Meta-Evaluation	Confirm the increase of sports participation in associated with the hosts of London 2012 OG.	Long-Term	Positive
Kokolakakis & Lera-López (2022)	Political Science	Time Series Analysis	Inspect the mechanism and conditions of the increase: Asian females have the highest engagement, and the study suggest governing bodies to encourage social inclusion for ethnic minorities.	Short-Term	Neutral
Kokolakakis et al. (2019)	Political Science	Document Analysis, Statistical Analysis	Confirm the increase and inspect the mechanism	Short-Term	Positive
Mackintosh	Political Science	Video Diaries (VDs), Interview	Identify mechanism and crucial factors that influence the sports	Short-Term	Neutral

et al. (2015)			participation.		
Mackintosh et al. (2016)	Political Science, Psychology	Video Diaries (VDs), Interview	Identify mechanism and crucial factors that influence the sports participation.	Short-Term	Positive
Carmichael et al. (2013)	Human Geography, Medical Science	Survey, Multivariate models	Identify the mechanism and crucial factors of increasing sports participation in general and in some specific activities.	Short-Term	Neutral
Lovett et al. (2020)	Management Science, Human Geography	Double-Bind Concept, Observation and Intervention	Identify mechanism to facilitate opportunities for sports participation in non-host cities.	Long-Term	Positive
Pappous & Hayday (2016)	Political Science, Human Geography	Interview	Identify mechanism and crucial factors that influence the sports participation for non-traditional sports disciplines.	Long-Term	Neutral
Weed et al. (2012)	Human Geography, Psychology	Literature Analysis	Identify mechanism, critical factors and barriers that influence the sports participation.	Short-Term	Neutral
C. Brown & Pappous (2021)	Medical Science, Human Geography	Survey	Find out barriers constraining some non active PWD from participating in more sport.	Long-Term	Negative
C. Brown & Pappous (2022)	Human Geography	Survey	Confirm the leverage effects of MSE on the membership of clubs.	Long-Term	Positive
A. E. Bauman et al (2021)	Political Science, Human Geography	International Comparison Study, Document Analysis, Statistical Analysis,	NA	NA	NA
H.-M. Kim & Grix (2021)	Political Science, Human Geography	Interview, Document Analysis	Evaluate the legacy and study the mechanism.	Long-Term	Positive
Karadakis &	Political Science, Medical Science,	Structural Equation Modeling	Identify the mechanism: how sport involvement affected the relationships among impact perceptions	Short-Term	Positive

Kaplanidou (2012)	Human Geography				
Reis et al. (2014)	Political Science	Interview	Identify mechanism, crucial factors and barriers that influence the sports participation.	Long-Term	Neutral
Ribeiro et al. (2022)	Psychology, Human Geography	Field Study, Survey	Identify how sports participation could support the successful hosting of a SMEs and analyse the mechanism.	Long-Term	Positive
Sousa-Mast et al. (2013)	Management Science, Human Geography	Interview	Identify attitude towards the legacy and the crucial barriers that influence the realization of the sports participation.	Long-Term	Positive
Kirakosyan (2019)	Political Science	Document Analysis	Use Foucault's archaeological-genealogical approach to analyse Rio 2016`s sports participation legacy and mechanism	Long-Term	Neutral
A. Bauman et al. (2015)	Medical Science	Document Analysis, Statistical Analysis	Confirmed that holding MSE increases the intention to be active, but the change was not associated with physical activity behaviour.	Short-Term	Neutral
Veal et al. (2012)	Political Science, Human Geography	Statistical Analysis, Document Analysis	Examine whether the hosting of the 2000 Sydney Games boosted sports participation in Australia, and the mechanism in corresponding to other Games.	Long-Term	Neutral
Reis et al. (2017)	Political Science, Human Geography	International Comparison Study, Document Analysis, Statistical Analysis,	Identify mechanism and crucial factors that influence the sports participation.	Long-Term	Neutral
Aizawa et al. (2018)	Human Geography, Medical Science	Regression Analysis	Confirmed the leverage effects of hosting MSE on mass participation.	Long-Term	Positive
Kolotouchkina (2024)	Political Science	Exploratory Case Study,	Examine the legacy and its delivery strategy and mechanism.	Short-Term	Positive
Craig & Bauman (2014)	Medical Science, Human Geography	Surveillance Study	Deny the leverage effects: Hosting the 2010 Vancouver Olympic Games (OG) don`t have measurable impact on Canadian children` participation in the physical activities.	Long-Term	Negative
Derom & Lee (2014)	Medical Science, Human Geography,	Critical Policy Analysis	Identify the mechanism and crucial factors from policy dimension.	NA	Neutral

		Psychology				
	L. R. Potwarka et al. (2016)	Psychology, Human Geography	Interview, Thematic Analysis	Identify mechanism and process of creating new sports participation starting with the viewership.	Long-Term	Neutral
	L. R. Potwarka et al. (2016)	Human Geography, Management Science, Psychology	Interview, Thematic Analysis	Identify the mechanism and crucial factors.	Long-Term	Neutral
	Perks (2015)	Political Science, Human Geography	Statistical Analysis, Document Analysis	Confirm the short-term leverage and question about the long-term effects.	Long-Term	Neutral
Theory Development Centric Studies	Gérard et al. (2020)	Management Science, Human Geography	Interview, Document Analysis	Identify the mechanism: Explore the impact of austerity and sports participation.	Long-Term	Neutral
	Castellanos -García et al. (2021)	Management Science, Human Geography	Regression Analysis	Identify the mechanism of the leverage: A causal relationship between the trickle-down effect and sports club membership over a four-year period.	Long-Term	Positive
	L. Potwarka et al. (2023)	Management Science, Human Geography	Interview	Find out reasons for the decline of sports participation.	Long-Term	Negative
	C. Brown & Pappous (2018)	Political Science, Human Geography	A Combination of Dialectical Inquiry, Brainstorming, and Nominal Group	Identify the conditions of the leverage: 1) Forge alliances among sport organisations, event organisers and non-sport stakeholders and integrate each event into the marketing mix of sport organisations. And the barriers: negative effects on sport participation related to the events location, facilities, coaching resources etc.	Long-Term	Neutral
	Chalip et al. (2017)	Human Geography	Literature Analysis, Modelling Following the 'Process of Learning' Approach	Identify the provision and delivery of sporting opportunities in the context of a grassroots organization at community level (Whether sports organizations that are controlled and organized locally facilitate and enable individuals to participate and sustain sport and physical activity	Long-Term	Neutral

			programmes on behalf of the residents).		
Charlton (2010)	Computer Science, Management Science, Human Geography	Lens of the Novel TESEF, Document Analysis	Identify the mechanism: Find out how WAS leverage the Games to facilitate sports tourism.	Long-Term	Neutral
Dickson et al. (2021)	Management Science, Human Geography	Survey, Principal Component Analysis	Identify the mechanism: Voluntary Sport Organisations (VSOs) managers` attitude. Identify the components they felt enhanced or inhibited their organisations capacity to implement a sport participation legacy.	Long-Term	Positive
Hayday et al. (2019)	Political Science	Document Analysis, Statistical Analysis,	Identify mechanism and crucial factors that influence the sports participation.	NA	Neutral
Howe & Silva (2018)	Medical Science, Political Science	Time Series Analysis, ARIMA Model	Inspect the mechanism and conditions of the increase: Increasing frequency of engagement for existing participants rather than attracting new participants.	Short-Term	Neutral
Kokolakakis & Lera-Lopez (2020)	Political Science, Human Geography	Panel Data Analysis	Identify mechanism and conditions that influence the sports participation through demonstration effects.	Long-Term	Neutral
Piper & Garratt (2024)	Human Geography, Political Science	Foucauldian Theoretical Framework, Document Analysis, Statistical Analysis,	Identify mechanism and barriers that influence the sports participation.	NA	Negative
Shi & Bairner (2022)	Literature Review	Scoping Review, PAGER Framework	Review the research scope of Olympic sport participation legacy between 2000 and 2021, to identify the progress of studies on the sustainability of Olympic sport participation legacies.	NA	Neutral
Weed et al. (2015)	Literature Review, Political Science	Systematic Review	Review preceding works on demonstration effects and detailed mechanism.	NA	Neutral
McCartney et al. (2010)	Literature Review	Scoping Review, PRISMA-ScR	Assess the effects of major multi-sport events on health and socioeconomic determinants of health in the population of the city hosting the event.	NA	Neutral

	Annear et al. (2019)	Literature Review	Systematic Review, PRISMA	Identify current knowledge about increase sports participation through sports mega-events and develop a research agenda to guide future legacy evaluations.	NA	Neutral
	Teare & Taks (2021)	Literature Review	Scoping Review, Framework of Arksey and O`Malley	Assess the current state of literature on impacts, legacies, and leveraging of sport events for sport participation and detect the research gaps.	NA	Neutral
	Thomson et al. (2020)	Literature Review	Systematic Review, SQLR Approach	Analyse current research status of large-scale sport event social legacies and to make recommendations to future research.	NA	Neutral
	C. Kim & Kaplanidou, (2024)	Computer Science, Human Geography	Structural Equation Modeling	Examine the interaction mechanism between sports participation and events hosting.	NA	Positive

Among all the 39 studies on the Olympic Games and Paralympics, the subdiscipline of social science including human geography and political science was the most studied area. At the same time, qualitative data analysis methods represented by interviews, document analysis, and surveys were frequently engaged. In contrast, rare studies applied mixed methods involving field study, literature analysis, and observation. Although the majority of investigations didn`t establish a theoretical model, several attempts were made by some pioneering British and Korean authors engaging in Critical Realism ontology (C. Brown & Pappous, 2022) and structural equation modeling (C. Kim & Kaplanidou, 2019).

The investigations on other types of international sports mega-events were mainly in the psychology and human geography divisions, where similar methods as that of the studies on the Olympic Games and Paralympics contributed to the success. Interview and statistical analysis have been the most frequently applied method, at the same time, several innovative methods, such as ethnography consisting of interviews and participant observation have been used. Besides, the FIFA World Cup attracted research attention in the non-Olympic and Paralympic series of mega-events.

In contrast to the practice-oriented case studies, the rest of the research concentrates on theory development and examining the mechanism, pre-conditions, and critical factors for the planning and delivery of sports participation legacy. Besides the 6 literature reviews, this group of theory-centric research attached great weight to exploring new methods and modeling. New techniques and approaches, such as panel data analysis (Kokolakakis & Lera-Lopez, 2020), lens of the novel TESEF (Charlton, 2010), and Foucauldian theoretical framework (Piper & Garratt, 2024), have been engaged and suggested for future investigations.

3) Advancements and knowledge gaps

Our results demonstrated that most works are located in the subdiscipline of Human Geography, Political Science, Psychology, and Management Science. At the same time, there is still less

amount of cross-sectional research in integrating knowledge, theories, and methodologies from medical science and computer science.

Moreover, the dominant research topics remain to be the Olympics and Paralympics. The London 2012 Olympics and Paralympics have been the most studied events while the three Games held in Asia caught more research interest in recent years. There were less amounts of studies on non-Olympic games and comparison studies focusing on practice (see Table 2). Among the investigations on the Olympics and Paralympics, our review shows that more than 63% of the prior studies concerned long-term sports participation legacy, while more than half of the studies challenged the hypothesis that holding SMEs is most likely to promote sports engagement and requires further discussions about the mechanism and preconditions of increasing the relevant sports participation.

For instance, Kokolakakis and Lera-Lopez (2020) identified that hosting mega sports events can increase the frequency of engagement for existing participants rather than attracting new participants. Charlton (2010) stated that the leveraging effects are obvious in the pre-game legacy. Whilst Pappous and Brown (2018) warned that many hosts had difficulties maintaining residents` enthusiasm for participating in certain sports three or five years after the Games.

Regarding the research paradigm, our review sheds light on a tendency to combine quantitative and qualitative data analysis methods, apply new technology, and adapt and develop new approaches and models. Concomitantly, traditional methods, such as interviews, surveys, statistical analysis, and document analysis still played a fundamental role in mainstream studies. Last but not least, Reis et al. (2017) and A. E. Bauman et al. (2021) contributed to international comparison studies inspecting the legacy of various events. These attempts could inspire young scholars who are interested in developing theories and methodologies in different contexts to enrich their case studies by comparing the legacy of several events or conducting chronicle research.

V. Discussion

1) Factors influence the distribution of literature

Our sample of academic papers revealed an irregular and after-events pattern of academic publication on the sports participation legacy research. Regarding the growth of publications, no clear time pattern has been explored. Although the legacy planning and delivery timing of SME hosts could influence academic research interest in theory, much facts and evidence need to be accumulated to inspect whether there is a correlation between the topic popularity and the Game Time, which corresponds to the legacy strategies and reporting system.

Social science, devoted to the study of human society and the relationship among individuals within those societies, encompasses a wide range of academic disciplines, including anthropology, archaeology, political science, psychology, economics, human geography, management science, etc. (Faber & Scheper, 1997). Our samples were mainly in the subdivisions of political science, psychology, and human geography, which has a large folding area with medical science. In contrast, we have notified that numerous Chinese academic works on mass participation were in the branch of education, administrative science, and public health branches during the primary searching process.

Meanwhile, we observed a connection between the location of the event and the address information of the authors. The centralization and geographic feature of the authorships disclosed a switch of research interests and a relatively opportunistic or reactive research pattern. The leading researchers tend to pick up new research dimensions, extract longitudinal data, and engage innovative research methods, aiming at spreading their theories through interdisciplinary investigations in different contexts. In contrast, the newcomers who have published one-off papers on the topic may be interested in following up on the events and keeping exploring the topic with an extended research scope. We also observed a slight growth

of non-English and bilingual publications in Asia and South America, where SMEs have been held in recent decades.

Furthermore, the flagship legacy research on the sports participation of London 2012 OG and PLG was mainly conducted by English-speaking scholars from different countries. The majority of the representative works, for example, "Leveraging the London 2012 Paralympic Games to Increase Sports Participation" (C. Brown & Pappous, 2022), "The Role of Voluntary Sport Organizations in Leveraging the London 2012 Sport Participation Legacy" (Hayday et al., 2019), and "A New Conceptualization of Mega Sports Event Legacy Delivery: Wicked Problems and Critical Realist Solution" (Byers et al., 2019) were published in the high-quality journals from Taylor & Francis Group. In Chinese contexts, there is growing number of researches on Beijing 2022 WOG and Paralympics. However, there are scarce investigations on the sports participation legacy published in the international journals, probably due to language barriers, comprehensive and discontinuous data, different standards, and other contextual variables, such as COVID19`s impact on public health awareness and fitness demands. Thus, the selection of the events for the case studies or theoretical modeling might be related to the core values, attitudes, and criteria of the preferred journals.

2) Research paradigm for sports participation legacy at international SME

Our results demonstrated that rare theoretical models and methodology have been developed for generative studies or special cases, despite of various attempts to analyze sports participation legacy. The reasons could be the complexity of defining sports participant, which have been influenced by multiple variables correlated to the intensive SMEs preparation and the laborious legacy delivery process.

The all-around studies on London 2012 could inspire legacy studies of other SMEs. However, the changing protocols in sustainable development, the different research interests, culture

norms and contexts require the feasibility study of adopting the same research protocols and methodologies.

Critical realism (Byers et al., 2019) highlights the significance of underlying deep social structures, including government policies, values, cultural norms, institutional structures, and consumption structures; in shaping the evolution of winter sports in China. These structural elements function as causal mechanisms that can either propel or impede the progress of this industry. Referring to the preceding academic works, we have recognized a great opportunity to adopt Critical Realism (CR) as the theoretical foundation for our further investigations on the "300 million" legacy. Because of that the development of a winter sports sector in China cannot be viewed in isolation from the broader socio-cultural context. Unlike countries with well-established winter sports traditions, China faces the challenge of not only constructing physical infrastructure but also navigating the intricate web of societal values, beliefs, and political directives. These elements constitute the foundational layers of reality, encompassing material, ideal, and social dimensions.

Meanwhile, deep social structures act as hidden currents guiding the course of winter sports in China. Value, cultural norms, institutional structures, and consumption structures can either facilitate or hinder the adoption of winter sports as part of the national identity. Government policies, driven by political agendas and societal priorities, play a pivotal role in allocating resources, influencing stakeholder decisions, and setting the overarching tone for the industry's development.

In essence, the development of winter sports in China epitomizes the complexity of sports participation legacies when viewed through the lens of Critical Realism. Thus, we suggest to launch a feasibility study, and examine the advantages and limitations of applying CR to inspect the Chinese sports participation legacy in terms of the host of Beijing 2022.

3) A wicked problem: Can SMEs leverage sports participation legacy?

Recent research by Byers, Hayday, and Pappous (2019) has shed light on the intricate nature of sport participation legacies, characterizing them as "wicked problems". Wicked problems are complex social problems that are difficult or impossible to solve because they have no clear-cut solutions and are often interconnected with other problems (Rittel & Webber, 1973). This illustrated why the majority of the former investigations are published in the post-event period and focus on either pre- or post-event legacy. The throughout legacy have been rarely studied, probably due to a lack of data access and the availability of the corresponding longitudinal statistics.

Compared with London 2012, which already accumulated 14 years` post-game legacy, the "300 million" legacy of Beijing 2022 is still young and fresh. The winter sports participation legacy of the Beijing 2022 Winter Olympics, can be considered a wicked problem because it is influenced by a variety of factors, including cultural norms, government policies, and the availability of infrastructure. Additionally, the goal of motivating 300 million people to engage in winter sports is a challenging one, and it is unclear how to achieve this goal given the complex social and cultural factors that influence winter sports participation. Moreover, the expansion of winter sports in China emerges as a challenge that defies straightforward definition and solution. It is symptomatic of broader issues, deeply embedded within the cultural fabric and policy landscape. As solutions are devised and implemented, unanticipated consequences may arise, reshaping the very nature of the problem. This cyclical and evolving nature of the challenge necessitates ongoing scrutiny and adaptive strategies.

VI. Conclusion

This review demonstrated that the body of literature on sports participation at international SMEs is at a developing stage where the mainstream research focused on the efficiency and

effectiveness of the leverage policies. Within the limited and focused research interest in the social science area, which typically includes education, training, destination branding, volunteering, etc. (Mair & Smith, 2021), we identified a pattern of addressing the public participation legacy of London 2012 OG and PLG with multiple attempts to develop gold standard theories and research frameworks to inspire future generations.

Besides, the selected literature in the social science area demonstrated interdisciplinary characteristics penetrating medicine, administrative management, and business management branches. Based on the PRISMA-ScR paradigm, we carefully examined 62 peer-reviewed journal articles, coming from preceding works. Based on the characteristics of the selected investigations, we divided the samples in the final corpus into 3 groups based on the events` features and motivations: (a) Case study of Olympic Games and Paralympics, (b) Non-Olympic Games case study or comparison study focusing on practice, and (c) Theory development-centric study.

The majority of previous investigations have focused on examining whether the host nations have successfully increased physical activity participation through hosting international SMEs (Shi & Bairner, 2022), such as the Summer and Winter Olympics, Paralympic Games, and World Cup. A small number of researchers, represented by Kim & Kaplanidou (2024) and Ribeiro et al. (2022), discussed how would sports participation benefit international sporting success. At the same time, it is worth noticing that research on the legacy creation mechanism and delivery process has gained popularity in the past decades. In many cases, governments use the 'demonstration effect' or 'trickle-down effect' to promote physical activities and improve national brands (Hindson et al., 1994; Weed et al., 2015). By contrast, the autonomous approach has been suggested by a group of pioneering scholars, for example, Brown, Gérard, and Pappous.

Regarding the various attempts and needs to figure out a path leading to the sustainability, we carefully inspect the research paradigm, methods, and essential outputs of the preceding academic works in each group. The analysis results highlight the scarcity of empirical studies with mixed research methods while revealing a need for further research to fully understand sports participation in different contexts.

In general, we identified critical research gaps in scrutinizing the sports participation legacy and its delivery process of the latest three Olympics held in Asia. Moreover, the limited application of theoretical paradigms indicates a need for more continuous studies after the Games with international comparative frameworks to examine sports participation, targeting establishing gold standard theories and protocols for social sustainability.

Chapter 2 - Systematic review for knowledge transfer at international SME

Abstract: Sport mega-events are characterized by a high degree of organizational complexity and are where games organizers take opportunities to strengthen their competencies and forge network connections via knowledge transfer. However, there is scarce evidence that the knowledge generated is transmitted between former and future host cities. This investigation aimed at examining the state of research on knowledge transfer at international sport mega-events. It followed the PRISMA protocol to identify critical research gaps and shed light on the barriers and enablers within this subject. Applying the quality and eligibility criteria yielded a final corpus of 11 academic and 6 non-academic works. The results demonstrate that a small group of scholars conducted empirical studies applying mixed research in this area. The three significant barriers were identified as the following: the Accessibility and Availability of Knowledge; the Lack of Absorptive Capacity; and the Dilemma of Knowledge Sharing and Knowledge Protection. Three crucial enablers were determined as per the following: Knowledge Identifying and Tailoring Based on Needs, the Local Context, and Culture; Improving the Learning Culture and Capacities; and Communication, Cooperation, and Strategic Approach. The controversies among different studies also revealed the possible bias and insufficient knowledge transfer related to language, database, technology, geographic location, and priority setting, etc. We suggest further research focusing on specific cases between previous and future hosts.

Keywords: knowledge transfer; international sport mega-events; systematic review; PRISMA; barriers and enablers; research gaps

I. Introduction

The belief in a knowledge-based economy has grown since the late 1990s (Stadler, 2021). Knowledge drives the behavior of humans and shapes the activities that are contributing

significantly to the competitive advantages between nations, companies, and societies through the holding of events or the operation of organizations. Sporting mega-events are characterized by a high degree of organizational complexity and are where a plethora of multifaceted 'know-how' is produced (Mair & Smith, 2021). Know-how has been the essential mediator of knowledge transfer. The ability to transfer knowledge, especially tacit knowledge, is one of the determinants of organizational competencies (Forsman & Solitander, 2003; Levinson & Asahi, 1995; March & Simon, 1958; Powell et al., 1996).

Traditionally, sporting mega-events' organizing committees (OCs) put great weight on national pride, business prosperity, and infrastructure stimulus. However, these historical concepts have led to negative consequences, such as direct environmental damage and significant financial deficits, which may overshadow the positive effects. For example, the strategy of the Atlanta 1996 OC could not increase downtown Atlanta's primacy in the long term (Batuhan, 2020). The Beijing 2008 OC succeeded in the delivery of games, but still came across operational problems after the games before applying new strategies and plans (Mao, 2015).

The changes took place when the concept of organizations and individuals shifted. Sustainability has been gradually penetrating into the agenda/strategy of various types of organizations (Pernecky & Lück, 2012), as well as transforming individual behaviors since the late 1970s. The setting of the 17 universally applicable Sustainable Development Goals (17 SDGs) has been regarded as a cornerstone of sustainability (United Nations, 2021). With respect to the 17 SDGs, various governments and non-governmental organizations have been working together to improve sustainability in every field.

Sports play an essential role in supporting the realization of the 17 SDGs (United Nations, 2021). Sport mega-events—such as the Olympic Games, Paralympic Games, FIFA World Cup, World Championship, and Commonwealth Games—are known for their power to engage large amounts of people and to aid with leveraging economies. The hosting of sport mega-events has

been engaged in political propaganda and is regarded as an enabler of sustainability. Among all the sport mega-events, the Olympic Games receives the most attention across research and practices for reducing costs and conflicts in order to realize sustainable development (IOC, 2021c).

The Knowledge and Games Learning (IKL) program was first introduced to the public during preparations for the Sydney 2000 Olympic Games (IOC, 2014). It is a remarkable example of this integration, emphasizing the importance of sustainable development. Written into the host cities' contracts, the IKL gradually integrated into the games from the games planning stage to the after games legacy stage (IOC, 2014). At the same time, IKL has been used as an essential instrument by international sports governing bodies and games organizers to strengthen their competencies and to forge network connections (Davenport & Prusak, 1998; Halbwirth & Toohey, 2001; Mair & Smith, 2021; O'Dell & Grayson, 1998; Parent et al., 2013; Wiig, 2012).

The core of the IKL program is knowledge management and transfer. Knowledge management has been identified as a conscious strategy to help event organizations stay innovative and competitive in the long term (Davenport & Prusak, 1998; Halbwirth & Toohey, 2001; Mair & Smith, 2021; O'Dell & Grayson, 1998; Parent et al., 2013; Wiig, 2012). It is essential to transfer the proper knowledge to the right people at the right time and to put the learning into practice (O'Dell & Grayson, 1998). The significant impact of knowledge management and transfer resulted in the rapid growth of related academic investigations in numerous fields, such as information management, organization management, and education sciences. Among the knowledge management literature, knowledge transfer, or knowledge sharing, frequently appeared as a component of the knowledge management process. However, to date, there has been a common shortcoming in the previous investigations: limited attempts to distinguish knowledge management and knowledge transfer—which are the two fundamental intersectional conceptions. One of the crucial reasons for these shortcomings is that the mainstream research of knowledge management remains in the natural science and engineering

disciplines, which can be attributed to the rapid development of technology and artificial intelligence (Lee & Chen, 2012). In the social sciences and humanities (SSH) area, especially with the context of sporting mega-events, there is a scarcity of preceding studies regarding knowledge management—as the systematic review on knowledge management from Qin et al. (2022) demonstrated. The knowledge transfer literature is a great deal smaller than the knowledge management literature that possesses a sport mega-events context, despite knowledge sharing/transfer being a popular topic in physical education, organization theory, and business management. Moreover, prior studies have demonstrated that knowledge transfer is an emerging field lacking in form and structure.

However, it has been proven, based on certain facts and evidence that were revealed at preceding sporting mega-events, that knowledge transfer will likely benefit future organizing committees (OC) and applicant cities to reduce cost risks. In addition, knowledge transfer is an interactive process and could empower the former hosts by leveraging a long-term legacy (IOC, 2021a). The two advantages mentioned in the text above highlight that knowledge transfer deserves more research attention and examination in the SSH area, especially in regard to the more unpopular fields, such as sports mega-events.

II. Methods

1) Research goals and questions

The goal of this paper was to examine the state of research on knowledge transfer at international sport mega-events, to identify critical research gaps, and to synchronize crucial findings. To realize these goals, we established the following research questions:

RQ1: Who has conducted knowledge transfer research at international sport mega-events, which types, with which methods, when, and where?

RQ2: What are the focuses, limitations, and gaps in knowledge transfer investigations?

RQ3: Against the critical findings of previous research, what are the enablers and barriers of knowledge transfer?

2) Research methods

Defining and classifying the sample of literature

Defining key concepts has been essential in scientific research, as well as in practices that could foster more knowledge-sharing businesses and enable knowledge transfers in/among organizations (Tangaraja et al., 2016). The more consistent employment of terminology and clearness in definitions could contribute to the eligibility and quality of investigations (Paulin & Suneson, 2011; Tangaraja et al., 2016).

Since knowledge transfer (KT)/transfer of knowledge (TOK), knowledge sharing (KS), knowledge management (KM), and knowledge management and transfer (OGKM/TOK) were applied as interchangeable or different terms in different contexts, we investigated the differences and similarities of the frequently used terms during the conceptualization process of this study.

It was easy to distinguish learning, KM, and KT, despite the tendency that many scholars treated knowledge management and knowledge transfer as a unity in the context of sports events. The main discussions attended to the application of knowledge transfer/transfer of knowledge and knowledge sharing, which have common traits and overlapping content but differentiate themselves with purpose, value, context, and the direction of the knowledge flow (Werner et al., 2015b). However, certain researchers have regarded the two terms as interchangeable (Stadler, 2021). In addition, tacit knowledge, usually embedded in the organizational culture or transferred through know-how, plays an important role in sports. KT/TOK was translated as “知识转让” or “知识转移” in Chinese. Despite there being a certain degree of ambiguity in the terminology, “知识转让” has three distinguishing features: (1) Combining knowledge capitalization; (2) the transfer focuses on the process or value

assessment; and (3) the transfer is targeted. Appropriately, knowledge transfer/transfer of knowledge, knowledge management, and know-how were all selected for our literature search, specifically in the context of international sport mega-events.

Accordingly, our search of electronic journal databases required ("world cup" OR paralympic* OR olympic* OR "sport* mega event*" OR "mega sport* event*" OR "commonwealth games" OR "world championship*") AND ("knowledge transfer" OR "transfer of knowledge" OR "know-how" OR "knowledge manag*") to be presented in the key fields of the title, abstract, or keywords. The truncation symbol * (asterisk) was used to search for multiple word variants simultaneously.

Search strategy and literature sample

The systematic review followed PRISMA, which is a rigorous, transparent, and reproducible process with the least bias in order to synthesize research evidence and to accumulate the best available knowledge on the specific research topic (Becheikh et al., 2010; Cook et al., 1997; Moynihan, 2004; Tranfield et al., 2003). As summarized visually in Figure 5, the final sample included 17 documents, which were arrived at after a comprehensive literature search and rigorous quality assessment of the 302 works. This search and assessment were conducted with the paradigm of PRISMA and transparent criteria.

We primarily searched Scopus, a high-quality database of scholarly literature providing expertly categorized abstracts and citations to support the systematic review of research across numerous topics and disciplines, as well as eight other high-quality international/Chinese databases. The exact keywords were used for each database but adapted to the specific search engine of each database. The secondary search was conducted in correspondence with the official reports, information, and documents from the IOC's website and other related providers. Then, we imported all the reference lists into RefWorks and applied a four-staged strategy to locate the relevant academic works and gray literature. The parameters for inclusion were the

following: (1) non-duplicated documents; (2) having access to the full text and being able to be read; (3) in the social sciences area and highly relevant to the knowledge transfer of sport mega-events; and (4) published in peer-reviewed journals/core journals of a nation or from high-quality databanks/official websites.

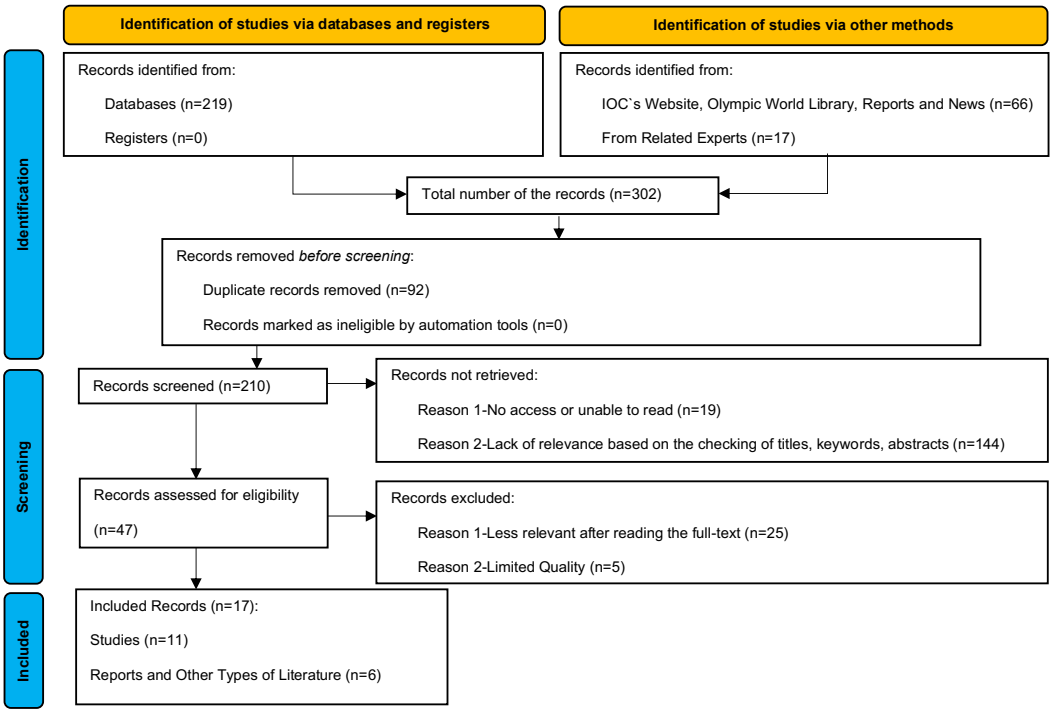

Figure 5. Systematic Review Flow Diagram

Referring to the PRISMA protocols, the data involved in the homogeneous systematic review of knowledge management at sports mega-events were investigated specifically and compared with the research findings based on the analysis of the rest of the 11 academic works engaged in this review.

In the session on research perspectives, enablers, and barriers, thematic analysis and open coding methods were applied with the oversight of two supervisors in order to deduce the texts based on prior studies, frameworks, and induction.

III. Results

1) Authors, growth and methodology of research

The final sample consisted of 11 academic works and 6 non-academic works/gray literature, which were all published between 2011 and 2022.

The earliest study was published in 2011 and the latest literature review was issued in 2022. There was a growing tendency of academic publication from 2012 to 2013, from 2014 to 2017, and from 2020 to 2022. In contrast, there was a downfall in publication from 2013 to 2014, and from 2017 to 2020 (see Figure 6). The publication tendencies of the two types of literature were identical and inconsistent.

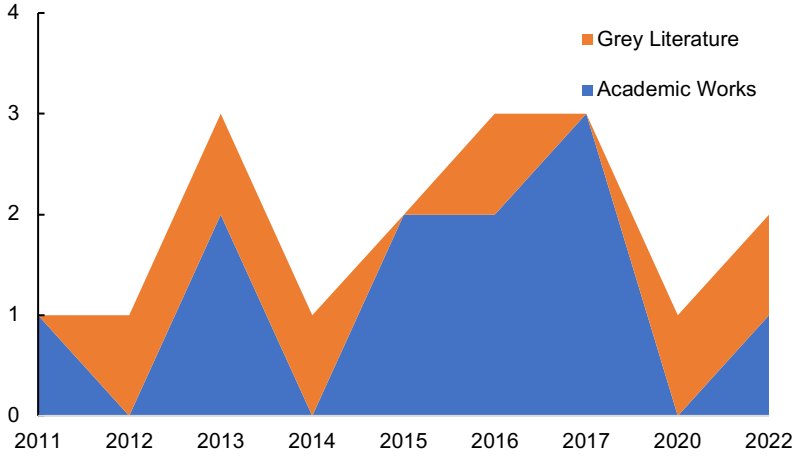

Figure 6. Mapping of Publication Trend

Among the academic works, 90.91% were published in peer-viewed journals, while one thesis was published by the Olympic World Library. Most publications were one-off papers in English, written by 2–3 authors from either Europe and America (in countries where English is the default academic language or is one of the official languages). Meanwhile, the journal outlets were mainly published in sport management branches, which concentrated on the topics of business and administration. Furthermore, the non-academic works were from the Olympic World Library and the official website of the IOC, with 83.33% of them being official reports of past Olympic Games, thus providing confidential evidence and facts (see Table 3).

When referring to the PRISMA framework, as well as the sizeable overlapping area of knowledge management and knowledge transfer in theory, the 16 samples of the prior systematic review from Qin et al. were carefully examined. The engagement of distinguishing databases, especially the World Olympic Library and Chinese databases, created the initial gap between the two sets of samples, whereby there were only three references in common. Moreover, most of the previous scholars focused on the whole process of knowledge management, rather than on one of the components of knowledge transfer in this process.

The two other factors that contributed to the variation were diverse research goals and selection criteria (see Appendix A). However, the massive results of the initial study were in line with this review in terms of methodology and frameworks.

Table 3. Basic Publication Information of the Final Sample

Type of Reference	Source	Authors (Year)	Research Goals	Geographic Distribution (Based on the Location of Authors' Organizations)
Journal Article	International Journal of Sport Management and Marketing	Parent, Kristainsen, and Houlihan (2017)	To identify the relationship between good governance principles and the knowledge management/transfer process through a comparison between YOG and the Olympic Games process.	America and Europe
Journal Article	Event Management	Blackman, Benson, and Dickson (2017)	To identify what were expected of volunteers and organizations in terms of legacy and knowledge transfer.	Europe and Oceania
Journal Article	Journal of Sport Management	Ellis, Parent, and Seguin (2016)	To examine how Olympic ambush marketing stakeholder power, transfer of sponsorship, and ambush marketing knowledge have interacted with governance.	America
Journal Article	Event Management	Werner, Dickson, and Hyde (2015)	To determine the impact of coopetition on knowledge transfer dynamics in a destination marketing and mega-events context.	Oceania
Journal Article	International Journal of Managing Projects in Business	Andersen and Hanstad (2013)	To investigate the mechanisms of knowledge development and transfer in relation to risk management in a mindful organization.	Europe
Journal Article	Tourism Management	Werner, Dickson, and Hyde (2015)	To find out the impact of the World Cup on the knowledge transfer process among organizations.	Oceania
Journal Article	Journal of Capital University of Physical Education and Sports	Yang and Qiu (2013)	To analyze the basic content, operational model, significant value, and practical application of TOK.	Asia
Thesis	Olympic World Library	Browne (2016)	To propose a pilot program of an observers' program for the FIVB events, as well as to create the best practices for the events.	Europe
Journal Article	Shandong Sports Science & Technology	Liu, Liu, Wang, and Luo (2011)	To adapt the Beijing Olympics' experience to the Nanjing Youth Olympics.	Asia
Journal Article	Event Management	Muskat and Deery (2017)	To determine how event organizations transfer knowledge, as well as to identify the characteristics that foster knowledge transfer.	Europe
Journal Article	Frontiers in sports and active living	Qin, Rocha and Morrow (2022)	To review the current state-of the-art position of sport mega-event knowledge management research.	Europe
Report	Olympic World Library	Rio 2016 OCOG (2013)	To provide information and data in support of knowledge management and transfer.	America
Report	Olympic World Library	BOCWOG (2022)	To provide information and data in support of knowledge management and transfer.	Asia

Report	Olympic World Library	Sochi 2014 OCOG (2014)	To provide information and data in support of knowledge management and transfer.	Asia and Europe
Report	Olympic World Library	London 2012 OCOG (2012)	To provide information and data in support of knowledge management and transfer.	Europe
Report	Olympic World Library	Rio 2016 OCOG (2016)	To provide information and data in support of knowledge management and transfer.	America
Web page	Olympics Website	IOC (2014)	To provide information and data in support of knowledge management and transfer.	Europe

The methodology is always coherent with respect to shaping how the respective researchers think and ways in which the results could be compared (Tranfield et al., 2003). The methodology included academic papers that rarely engaged primary sources. This may be in tandem with the general design and choice of the research method, where we identified 54.55% of the studies only applied qualitative research methods. The most frequently presented methods involve document analysis, interview, and case study (see Figure 7). Aided by the manually handled transcripts, previous authors frequently applied NVivo and ATLAS.tl for data analysis.

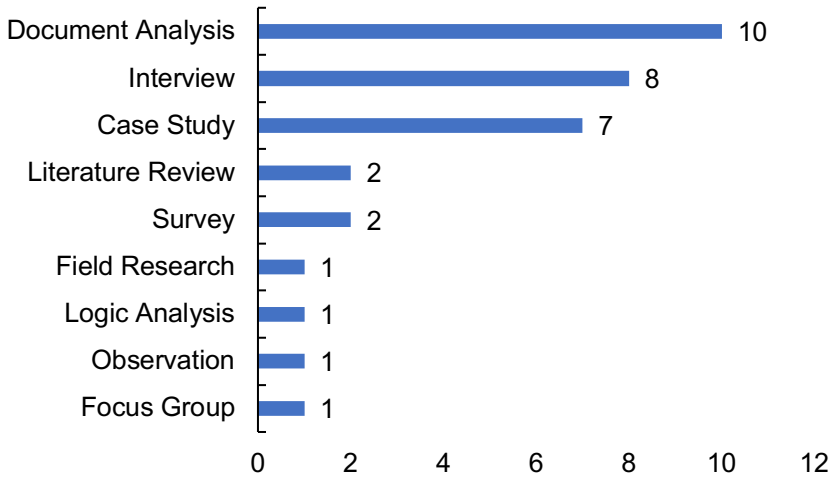

Figure 7. Mapping the Research Methods of the Academic Works

Another dimension reflecting the research methods used is the theoretical approaches or the selection of research frameworks. In our samples, we discovered the diversity of the theoretical approaches. A total of 72.73% of the investigations involved in our literature review adopted or adapted frameworks from organizational theory, operations research, and management information systems (Vitalis, 2005).

Among the 11 frameworks, 6 inspected knowledge management in general. Meanwhile, when knowledge transfer was not emphasized, they were instead regarding the following:

The comprehensive framework from Weidenfeld et al. consisted of six channels (involving labor mobility, knowledge brokers, imitation/demonstration/observation, and inter-firm exchanges) and four systems (including trade, technology, infrastructure, and regulation) (Weidenfeld et al., 2010; Werner et al., 2015b);

The integrated framework of the SECI model (involving socialization, externalization, combination, and internalization) and the KVC (including KM infrastructure and KM process) (Blackman et al., 2017);

The knowledge management framework from Schenk et al., i.e., knowledge identification, acquisition, application, creation, storage, learning, tailoring, and transfer (Parent et al., 2017; Schenk et al., 2015);

The KT process from Schenk et al., consisting of information and knowledge sharing, passing on personal knowledge, as well as transferring best practices and recommendations (Schenk et al., 2015);

The TOK process from UNESCO, involving knowledge acquirement, storage, participation (transfer/sharing), utilization, and innovation (Y. Yang & Qiu, 2013);

The IOC's OGKM 3-element framework, including information, services, and personal experience (BOCWOG, 2022a; IOC, 2014; London 2012 OCOG, 2012; Rio 2016 OCOG, 2013, 2016; Sochi 2014 OCOG, 2014).

Besides these, there were two investigations that applied frameworks focusing on the game hosting process. The rest of the frameworks were explicitly developed for knowledge transfer, including the following:

The Nonaka and Takeuchi SECI model, including socialization, externalization, combination, and internalization for the decisive processing of information in an organization (Nonaka & Takeuchi, 1996);

The three knowledge transfer mechanisms from Söderlund et al., including relating different competences, reflecting upon experiences, and routinizing lessons learned (Andersen & Hanstad, 2013);

The framework developed by Parent et al. (Ellis et al., 2016), consisting of degree centrality, betweenness centrality, and eigenvector centrality.

In general, we verified that previous researchers had not reached an agreement in terms of using a common framework. Regarding the current situation, we identified a need to develop specific theoretical models or conceptual frameworks that enable academic researchers to switch the concentration from the mechanism or whole process of knowledge management to knowledge transfer within the context of sport mega-events specifically.

2) Focus of studies and research gaps

It is essential to consider different research lenses/perspectives in order to identify the limitations and research gaps. Although primary studies demonstrated that there is no golden-standard typology internationally, this review referred to the frequently used categories in knowledge management (Sīle et al., 2021), as well as to the Chinese outline of academic disciplines (Chinese Encyclopedia, 2022).

Most works contained 2–3 research perspectives. Event management, knowledge management, and organizational learning were the three main areas (see Appendix B: Table A2).

For a better orientation, our review also probed the research objectives, questions, results, and discussion of each academic work. The studies were diverse but most of them analyzed knowledge management and transfer from political, organizational management, or economic dimensions. The studies mainly focused on identifying the mechanism/process of knowledge management or in evaluating past events based on existing theories and frameworks.

Compared with the literature review on knowledge management, the rest of our samples excluded any literature that placed a light emphasis on knowledge transfer, while including documents exploring knowledge transfer from the perspective of organizational learning. In addition, this systematic review also covered a range of non-academic works, while the other systematic review only engaged journal articles. Despite the significant differences, the two systematic reviews demonstrate many corresponding results, such as the limited number of preceding investigations.

In this way, the scarcity of studies examining the knowledge transfer from the dimension of social impacts has been confirmed. Besides the aforementioned gaps, the approach to external knowledge transfer remains briefly addressed (see Appendix B).

3) Enablers and barriers of knowledge transfer

Knowledge transfer is a complex phenomenon, and a successful transfer is difficult to achieve (Easterby-Smith et al., 2008). The variables exist at different levels, ranging from macro to micro level. This paper has identified and epitomized three significant barriers as the Accessibility and Availability of Knowledge, the Lack of Absorptive Capacity, and the Dilemma of Knowledge Sharing and Knowledge Protection. Meanwhile, three crucial enablers were identified as Knowledge Identifying and Tailoring Based on Needs, Local Context, and Culture; Improving the Learning Culture and Capacities; and Communication, Cooperation, and Strategic Approach (see Appendix C).

The first barrier, the Accessibility and Availability of Knowledge, refers to both the physical and intellectual accessibility of knowledge (Becheikh et al., 2010; Hemsley-Brown, 2004). Organizing committees must understand what needs to be done and why, as per the requirements for the pedagogical and negotiation approach for successful knowledge transfer, according to Parent et al. (Parent et al., 2017). Hence, Knowledge Identifying and Tailoring Based on Needs, Local Context, and Culture indicates an interactive process between the knowledge providers and the knowledge recipients (Y. Yang & Qiu, 2013), and thus serves as the corresponding enabler. In addition, it determines what to transfer and at which cost.

In practice, we witnessed the problem that new OC failed to thrive on the experience of past OCs and thus repeated their mistakes (Stewart, 2012). For various reasons, the Lack of the Absorptive Capacity was regarded as the main barrier that resulted in failure in terms of bidding (Kassens-Noor, 2019), or for the unsustainable development of local society. The Absorptive Capacity, defined as the ability to absorb external knowledge and diffuse it within its boundary (Easterby-Smith et al., 2008), is interrelated to the organizational culture and power. Former studies identified the organizations that promote and support learning new knowledge, encourage the creation of knowledge (Freiling & Fichtner, 2010; Parent et al., 2013), and increase their competencies. This enabler is thus summarized as Improving the Learning Culture and Capacities.

The Dilemma of Knowledge Sharing and Knowledge Protection was found to be the biggest challenge at all levels. It is rooted in the dialectical relationship between the knowledge providers and knowledge recipients in the transfer, including the legislative concerns, the significant expenses of knowledge transfer, and the common concerns around creating an intimidating competitor (Hamel, 1991). The solution was highlighted as Communication, Cooperation, and Strategic Approach. Communication is defined as the depth of understanding that transpires through two-way communications among individuals, organizations, or between individuals and organizations. Cooperation enables both sides of the knowledge transfer to

transport collaborative knowledge to adjacent or overlapping business performances (Loebecke et al., 1999). Strategic Approach suggests systematic transfer and adaptation based on the demands and plan of the knowledge recipient.

IV. Discussion

1) Factors influence the distribution of literature

Our sample of academic papers revealed an irregular and after events pattern of academic publication on knowledge transfer in the sport mega-events area. This centralization and geographic feature disclosed rare research interests and a relatively opportunistic or reactive research pattern. Most researchers publishing one-off papers on the topic may have been interested in knowledge transfer when an event was hosted in their local context. With respect to this, we observed a slight growth of publications in the 2010s, when Canada, China, and New Zealand became the one-time or multi-timed hosts of certain sport mega-events.

Meanwhile, a small group of authors whose research project was, in some way, connected to the Olympic movement, persisted in exploring the topic with an extended research scope—covering knowledge management, political science, and social science. This phenomenon may be evidence that knowledge management and transfer has penetrated into the sustainable development strategy of international sports governing bodies, within the context of the Fourth Industrial Revolution, the advancement of big data technology, and socio-economic transformations.

Other factors leading to this distribution and the enlarging research scope likely involve the following: (1) The ambiguity of terminology related to language and culture differences among events hosts. In addition, besides the application of controversial terms in English literature, the involvement of Chinese literature added complexity to the definition of KT; (2) the

historical and cross-disciplinary origins of knowledge management and transfer; and (3) the possible language barriers, selection bias, and the small size of our samples.

From the perspective of a research paradigm, more author engagement in the sports events or in accessing the empirical data are required, given that most investigations only applied qualitative research methods and secondary sources. Meanwhile, diverse frameworks were applied in the sampled documents. A total of 54.55% of the studies selected the theoretical frameworks for knowledge management. The frameworks focusing on the game hosting process provided less reference for knowledge transfer at sport mega-events.

The rest of the three frameworks analyzed knowledge transfer from different perspectives. The Nonaka and Takeuchi SECI model explained the creation of knowledge with the context of volunteering. The framework from Söderlund et al. provided general guidelines for internal knowledge transfer concerning organizational learning. The framework developed by Parent et al. focused on the knowledge transfer among Olympic marketing stakeholders. However, this still needs to address the knowledge transfer between prior and future hosts. In conclusion, the previous researchers have yet to agree on a standard framework (Parent et al., 2013) or to develop a specific model for the external knowledge transfer between OCs at international sport mega-events.

Since any method could lead to the construction of epistemological blind spots (Maitland et al., 2015; Ryba et al., 2010), we suggest employing an innovative research design and mixed research methods in order to reduce bias in external knowledge transfer research.

2) Behind the scarcity of literature on knowledge transfer at Olympic Games

In line with the literature review on knowledge management in sport mega-events, this review also diagnosed a scarcity of knowledge transfer literature in the social sciences and humanities area. In assuming that knowledge has been regarded as the most valuable resource to gain or

to maintain lasting competitive advantage (Dwivedi et al., 2011; Nonaka & Takeuchi, 1996; Werner et al., 2015a), numerous entrepreneurs, policymakers, and event organizers have invested various resources into organizational and system-context-based knowledge management research (Dwivedi et al., 2011). However, corporate intelligence, software engineering, and the advancement of information systems have leveraged big-data-based cross-disciplinary studies. Additionally, it has also led to a scaling down of qualitative research on knowledge management and transfer.

Within the limited body of the final corpus, most of the studies highlighted the whole process of knowledge management, featuring competitive advantages and the commercial/political value of knowledge transfer. Compared with the research from an economic perspective, it was only rarely that investigations were conducted from a social perspective, which was, in turn, labeled by ambiguous definitions and benchmarks. Only a few scholars chose the dimension of organizational learning (Muskat & Deery, 2017) and volunteer legacies (Holmes et al., 2016).

Another issue for knowledge transfer research in the context of sport mega-events has been the controversy of whether knowledge could be shared or transferred under the circumstances of different contexts and cultures. Certain investigations have concluded that organizations could learn from each other (Forsman & Solitander, 2003) to create a win–win scenario and to achieve organizational sustainability (Awan et al., 2020). However, there is another theory, whereby crucial knowledge, especially tacit knowledge, cannot be shared (Paulin & Suneson, 2011).

In contrast to the above argument, we also observed that internal knowledge transfer drew more research interest than external knowledge transfer, since internal factors play a prominent role in regard to change. Conversely, external factors accelerate or decelerate the change (Whyte, 1964). According to preceding investigations, internal knowledge transfer was often applied to create best practices within the organization and to train members. Correspondingly, external

knowledge transfer was distinguished as a fast and particular process to equip upcoming event hosts with efficient knowledge (Patel & Patel, 2008), experience, and the past history of the event.

Based on the discussion above, we can see great potential in this area for further research creating opportunities in terms of innovation and sustainability, even though the current body of external knowledge transfer is small.

3) Beyond the enablers and barriers of knowledge transfer

Regarding our research purpose, we scrutinized the three enablers and barriers within the specific context of external knowledge transfer between former and future organizing committees.

The Accessibility and Availability of Knowledge, which highlighted both the physical and intellectual accessibility (Becheikh et al., 2010; Hemsley-Brown, 2004) related to the value assessment, was found to be the first obstacle. In most cases, different local contexts and political systems, the cost of the transfer, or the timing form the barrier were all relevant issues. For example, Huang (2011) and Listiani (2021) revealed difficulties in adapting the previous experience and expertise in a particular territory due to the different language, cultural, and political systems. Stewart (2012) announced that over 95 percent of the OC was disbanded within three weeks after the games are completed, wherein valuable knowledge thus becomes lost. In order to transfer the proper expertise on time at a fair price, we combined the solution as Knowledge Identifying and Tailoring Based on Needs, Local Context, and Culture.

The Lack of Absorptive Capacity was the second barrier related to the learning capacity of organizing committees, the effectiveness of the mediator, as well as the rapport between the knowledge holder and receiver. Many preceding OCs focus on their own games and uniqueness instead of cooperating and working for common goals, which is partially attributed to the need

for more learning culture, trust, and bilateral/multilateral agreement on knowledge assessment. In addition, the lack of absorptive capacity could be an issue created by both the knowledge holder and receiver, where technology plays a role, but human intervention has a high impact. Knowledge hoarding or hiding is likely a consequence of such a negative interaction. As a result of this, the appropriate facilitator is Improving the Learning Culture and Capacities, which may yield significant returns on investment, increase organizational performance, and create a competitive advantage in the marketplace (Cooper et al., 2016; Moustaghfir & Schiuma, 2013; Pantouvakis & Bouranta, 2013). Collectively, learning organizations with solid learning cultures tend to invest more in human development, where internal and external knowledge transfer interact with each other (Holmqvist, 2004) and could contribute to social sustainability.

The most significant barrier was found to be the Dilemma of Knowledge Sharing and Knowledge Protection, which originated from the concept that knowledge is competence and domination (Muskat & Deery, 2017). A typical doubt is found in external knowledge transfer, which can result in losing the competitive advantages of the knowledge providers (Argote & Ingram, 2000), especially in the business context. The competitive positioning induced tension between cooperation and competition (also referred to as “coopetition”) and significantly affected the knowledge transfer processes, primarily when inter-organizational relations were engaged in the effort (Easterby-Smith et al., 2008; Werner et al., 2015a). However, a group of researchers discovered that studying common barriers and antecedents across different cultures, contexts, and disciplines could benefit both the knowledge holder and receiver (Asrar-ul-Haq & Anwar, 2016; Cummings, 2004; Lin, 2007; Mesmer-Magnus & DeChurch, 2009). One of the keys turned out to be Communication and Cooperation that interact with each other and inaugurate Strategic Access (Parent & Ruetsch, 2020).

Regarding the current status of the literature, whereby the corpus demonstrates a significant social value of inspecting the international/cross-border knowledge transfer (Schulenkorf et al.,

2021), the academic works still lack an in-depth analysis of the external knowledge transfer between prior and future sport mega-events' hosts, as based on specific case and facts.

V. Conclusions

This review demonstrated that the body of literature on knowledge transfer at international sport mega-events is at a nestling stage where the mainstream research focus has been on knowledge management. Although a growing number of practitioners and scholars have recognized the crucial value of knowledge transfer, the rapport between knowledge management and knowledge transfer, as well as in their overlapping concepts, contribute to the scarcity of knowledge transfer research at sport mega-events, in general. Within the limited and focused research interest on knowledge transfer at the Olympic Games, we identified a pattern of addressing internal knowledge transfer, which was tied up with organizational learning, political propaganda, and commercial interests. Given the emergent need for realizing sustainable development through international collaboration, we perceived a great potential to conduct a series of investigations on external knowledge transfer between previous and future event organizers, where tacit knowledge and know-how from various organizations and nations play essential roles.

Moreover, this systematic review revealed certain gaps in previous research approaches. Besides the ambiguity of terminology, certain gaps were created by different research objectives, language barriers, and constancy. Many studies borrow theories and models from business management and knowledge management, rather than developing a specific framework for knowledge transfer. Despite an increasing number of investigations involving interviews and case studies, where first-hand data were collected, there is still a requirement for more authors to apply mixed research methods to conduct empirical research, especially

with respect to interventional studies. Furthermore, this review summarized the enablers and barriers of knowledge transfer in terms of building a rigid base for further investigation.

Since knowledge transfer is an interactive process, where knowledge tailoring and adaptation could benefit both the preceding and future hosts in sustainable development, this topic is worthy of receiving more attention. We suggest inspecting the external knowledge transfer between the prior and future sport mega-events' organizers.

Chapter 3 - Critical realism as a lens for analyzing the sports participation legacy

Abstract: Beijing 2022 Winter Olympics and Paralympics were held during the COVID-19 pandemic and created an impressive mass participation legacy. However, less is known about the legacy delivery process and the legacy received polarized comments in the media due to the political and ideological competition between different countries and regions (Boykoff, 2024; He & Huang, 2024; Sugden & Tomlinson, 2011). Critical Realism (CR), a philosophy focused on uncovering underlying realities, could provide a fresh framework to analyze this process. This paper investigates whether Critical realism (CR) (Byers et al., 2019) could contribute to the analysis of China`s winter sports participation legacy of Beijing 2022. We propose an integrated framework by combining CR with the "Three-Source Model" (Liu & Jiang, 2016) focusing on the Chinese context, a "Top-down" non-Western sports development model. This framework is intended to provide a deeper understanding of the legacy delivery process, particularly within the context of the "Juguo Tizhi" system. This paper demonstrates the potential of a new framework combining Critical Realism (CR) and the Chinese-originated "Three-Source Model" to deepen our understanding of winter sports participation legacy. Applying CR to the Beijing 2022 case proves both innovative and valuable references, as it allows for analysis beyond surface appearances to uncover underlying mechanisms. However, it's crucial to acknowledge challenges stemming from cultural contexts, varying statistical systems, and the limited availability of data that accurately reflects the ideal and social realities highlighted within the CR framework. Our proposed framework offers a systematic approach to analyzing legacy delivery, facilitating cross-contextual research with shared criteria. We contribute to existing knowledge by contextualizing CR, bridging gaps, and offering global relevance on the future winter sports mega-event legacy planning, which is highly influenced by the interplay between elite and mass participation.

Keywords: Winter sports participation; impact and legacy; Olympic Games; Beijing 2022 Winter Olympics; social sustainability

I. Conceptual model: critical realism canvas with the "three-source theory"

Critical realism (Byers et al., 2019) highlights the significance of underlying deep social structures, including government policies, values, cultural norms, institutional structures, and consumption structures; in shaping the evolution of winter sports in China. These structural

elements function as causal mechanisms that can either propel or impede the progress of this industry.

Expanding on this perspective, the development of a winter sports sector in China cannot be viewed in isolation from the broader socio-cultural context. Unlike countries with well-established winter sport traditions, China faces the challenge of not only constructing physical infrastructure but also navigating the intricate web of societal values, beliefs, and political directives. These elements constitute the foundational layers of reality, encompassing both the material and ideal dimensions.

At the material layer of critical realism formal plans and organizational structures, often formulated by governmental bodies, lay the groundwork for winter sports development. These blueprints are set in motion irrespective of whether society comprehensively grasps their implications. However, at the ideal and artifactual layers, individual and collective knowledge, attitudes, and perceptions come into play. Personal backgrounds, social networks, and educational shapes stakeholders' roles and influence their interpretation of the "reality" of winter sports, and the understanding of how to foster it.

Moreover, deep social structures act as hidden currents guiding the course of winter sports in China. Value, cultural norms, institutional structures, and consumption structures can either facilitate or hinder the adoption of winter sports as part of the national identity. In the Chinese context, the "Three-Source" Theory, which consisted of human, material and financial sources, plays a fundamental role in Chinese government strategic planning and resource distribution in terms of winter sports development. Government policies, driven by political agendas and societal priorities, play a pivotal role in allocating resources, influencing stakeholder decisions, and setting the overarching tone for the industry's development.

The intricate interplay of these dimensions contributes to the wicked nature of the problem at hand. The expansion of winter sports in China emerges as a challenge that defies straightforward definition and solution. It is symptomatic of broader issues, deeply embedded within the cultural fabric and policy landscape. As solutions are devised and implemented, unanticipated consequences may arise, reshaping the very nature of the problem. This cyclical and evolving nature of the challenge necessitates ongoing scrutiny and adaptive strategies.

In essence, the development of winter sports in China epitomizes the complexity of sport participation legacies when viewed through the lens of Critical Realism. It underscores the need to consider both formal structures and the underlying social dynamics, encouraging collaborative efforts to navigate this intricate terrain effectively.

Given the multifaceted nature of any sport participation legacy of a SME, as discussed above, in this conceptual paper, we create an indicator list combining CR and the "Three-Source" Theory (see Table 4) as a conceptual framework for our research project.

Table 4. Conceptual Model for the Research Project

CR Layer	The Legacy Process	Target Data and Evidence (Integrate the "Three-Source Theory")
Material Reality	Formal legacy plans, organization structures	People (Human Source): Total number of visits to ski resorts and ice rinks in China, Total number of skiers in China, Total number of Chinese kids participating in ice and snow sports` training etc. Facilities/Equipment (Material Source): Strategy and numerical/ conceptual targets appeared in the official documents and plans for Chinese winter sports development etc. Market (Financial Source): Strategy and numerical/ conceptual targets appeared in the official documents and plans for Chinese winter sports development
Ideal Reality	Stakeholder perception of legacy plans and their role	People (Human Source): Stakeholders` role and perception related to China`s winter sports participation legacy of Beijing 2022. Facilities/Equipment (Material Source): Geographical and administrative features of the suppliers. Market (Financial Source): The results of surveys and interviews reflecting suppliers` attitude-changing, motivation, and demographic features.
Artefactual Reality	Stakeholder evaluation: acceptance or resistance to legacy plans	People (Human Source): Data and evidence demonstrating stakeholders` evaluation Facilities/Equipment (Material Source): Number of outdoor and indoor ski resorts in China, Import volume of skis and ice skates in China, Total sales and revenue of winter sports equipment in China etc. Market (Financial Source): Data and evidence reflecting the market growth of Chinese winter sports
Social Reality	Generative mechanisms (Intangible, related to social structure) with explain similarities and differences in stakeholders above	People (Human Source): Social norms and group psychological factors that are corresponding to the Chinese winter sports development system and influence the realization of the "300 Million" goal, and the consumption behaviour. Facilities/Equipment (Material Source): Geographical and administrative features of the consumers. Market (Financial Source): The results of consumption behavior surveys and interviews reflecting attitude-changing, motivation, and demographic features.

Primarily, we divided our project into two sub-studies. Our Study 1 centers on tangible, observable aspects of the winter sports engagement, such as the total number of visits to ski resorts and ice rinks, the total number of participants in ice and snow sports, the volume of ice skates and skating boots, and the market growth of Chinese winter sports. These indicators represent measurable changes in winter sports participation and industry growth over time and, as such, can indicate if there is a positive trend towards achieving the established goals. Besides the factors at 'material layer', our study also touches upon the 'artefactual layer' (Formal Structures) and `social layer` to provide context and potentially explain the quantitative results at the material layer. Since the artefactual layer involves formal structures, plans, and policies that shape reality, we briefly set the stage for the 'artefactual layer' of the Chinese sport system in the following section. This will help us understand the intricate interplay between policy-driven formal structures specific to the Chinese sport system and the tangible outcomes observed in the winter sports industry, providing a comprehensive understanding of the multifaceted legacy landscape. Moreover, the approach to the `social layer` provides us with another instrument to identify the public voice and the development tendency in relation to achieving the "300 million" goal.

While the primary focus is on the factors at material and artefactual layer, our Study 2 explores the critical indicators at `ideal layer` (Stakeholders` Views) and `social layer` through triangulation methods involving document analysis, big data analysis, expert interviews, and survey. The ideal layer includes diverse stakeholder perspectives and capacities corresponding to their roles in legacy creation. By analyzing the fact and evidence at the ideal and social layers, we can gain an in-depth understanding of the elements that have contributed to or hindered the achievement of the 300 million goal. Moreover, the investigation on social reality, reflecting deep connections and generative mechanisms, will enable us to transfer winter sports participation related knowledge among different stakeholders and institutional structures.

II. Feasibility assessment of the framework

1) Use CR to inspect the Juguo system

According to critical realism, the artifactual layer encompasses the formal structures, plans, and policies that shape the reality of sports administration within a country. They provide a critical context for understanding the trajectory of winter sports in China while setting the stage

for the development of infrastructure, the allocation of resources, and the implementation of policies aimed at achieving the "300 Million" goal.

Within the context of our study, a crucial aspect of the actual layer is the distribution of responsibilities among different levels of sports administration. The Chinese Winter Sports Federation (CWSF) emerged as the apex association overseeing all winter sports within the GAS system. This formal structure pointed to the importance of coordinating and regulating winter sports activities across the country. Prior to the successful bid for Beijing 2022, only a few selected Provincial, Urban, and Prefectural Sport Administrations were entrusted with the development of both winter and summer sports. This allocation of duties significantly influenced the distribution of resources and the prioritization of sports development in specific regions, such as Hei Longjiang, Jilin, Liaoning, Beijing, Hebei, Neimeng, Jiangsu, Guangdong, and Xinjiang.

GAS, joined by the Chinese Ministry of Education, the National Development and Reform Commission (NDRC), and the Ministry of Finance developed strategies and programs to advance China's standing in winter sports on a global scale at both elite and mass sports levels. Mass sports aim to promote physical activity and sports participation among the general population. Competitive sports (Also translated as elite sports or professional sports in English academic discourse) are focused on developing and promoting elite athletes for high-level competitions. The dialectic relationship between elite and mass participation is often referred to using the sports pyramid analogy (De Bosscher et al., 2013; Green, 2005; P. Sotiriadou & Shilbury, 2009; van Bottenburg, 2003). Some prior investigations have confirmed that a large base of mass participation is likely to provide a favorable breeding ground for the creation and development of an elite sports system (De Bosscher et al., 2013; Donnelly, 1991; Eady, 1993). In contrast, the great sporting performance at the elite level induces the promotion and evolution of mass sports.

In the winter sports area, divergent stakeholders managed to integrate their interests into the government-commissioned plans from the pre-game stage to the after-game period. BOCWOG, working in collaboration with schools, universities, local governments, and commercial organizations builds various types of talents for the promotion of winter sports. Beyond the realm of medal-winning winter sports disciplines such as figure skating, short-track speed skating, and speed skating, we have observed a significant transformation in the popularity of

ice hockey, skiing, and snowboarding. The priority setting of elite and mass sports significantly impacts the shape of the sports pyramid and its socioeconomic vulnerability and the setting could be discipline-specific or periodic.

The changing social dimension examines and predicts the long-term effects of policies. Government agencies, educational institutions, commercial organizations, and role models can shape attitudes and perspectives toward a sport, inspiring others to participate. In contrast, Mass participation and social inclusion translate public interest in elite sports via media/ social media and attendance at sporting events, as well as purchasing memberships, sporting goods, and other related services (Shilbury et al., 2008). The implementation of a series of strategies and programs, including "promoting ice and snow sports from north to south, east and west", "promoting ice and snow sports on campuses" and so on (GAS, 2016), contributed to the achievement in the sports involvement domain (BOCWOG et al., 2021). The interplay between the formal structures and the deeper social structures within China forms the basis of a comprehensive Critical Realist perspective, shedding light on the complexity of sports participation legacies in this context.

2) Discussion of further application

CR is an evolving philosophical framework, that originated from the post-positivist movement with "Bottom-up" features. It facilitates researchers to gain objective and scientific views on realities, which may be different from the authority`s opinions. Regarding the preceding works, there are rare attempts to apply this ontology in non-Western contexts, especially in a "Top-down" system. Despite the majority of investigations in our final corpus being related to Chinese winter sports development, these pioneering authors applied paradigms at the methodology level, which may have limited knowledge transfer capability. Moreover, only 3 academic works engaged theoretic models and the mainstream studies haven`t established general approaches. To close this research gap, we conceptualize how to apply CR to inspect China`s winter sports participation by constructing an integral paradigm with CR and the “Three-Source Model” (L. Liu & Jiang, 2016), which contains Chinese wisdom of categorizing and allocating resources. Regarding the available data in the official reports and various dossiers, we select crucial indicators that disclose the legacy delivery process and how it relates to the resource engagements/ allocations and CR approach. This new approach enables non-Chinese speaking scholars to gain access and a better understanding of Beijing 2022 Winter Olympics legacy.

In order to test our integral conceptual model, we first inspected Chinese sports system "Juguo Tizhi", which is the essential mechanism behind the successful delivery of the "300 million" legacy. According to CR, we assessed the challenges and opportunities produced by the Juguo Tizhi. Both challenges and opportunities originated from the complex interplay between the commitment to competitive sports and mass participation.

To reshape the substantial negative international image "Sick man of Asia" (J. Yang, 2020), which has been treated as a typical national disgrace caused by opium wars and poor health conditions of the Chinese folk in the old times, the Chinese government initiated the Olympic Glory Plan to resuscitate the national image, further socialist goals, and promote patriotic education. Regarding the scarce resources in the first 30 years of P.R.C., Chinese sports governing bodies used to invest in elite sports heavily and successfully created a big talent pool for increasing competitive advantages at world-class sports events. In contrast, less weight and attention were attached to the development of mass sports, which focused on building a strong and healthy working class at that time. From the 1980s to the 2000s, successful economic reforms, open diplomacy, and globalization have boosted China's burgeoning middle class and stimulated the development of recreational sports (Haugen, 2016). However, the fast economic growth and the barriers in athletes` career paths have widened the gap between competitive and mass sports and even led to unbalanced development of body and mind. Nowadays, the situation has improved. On the one hand, the Chinese government recognized the importance of mass sports participation in promoting a healthy lifestyle, consolidating society, and reducing the burden on the healthcare system. On the other hand, a growing number of people have changed their ideas, aesthetics, and values on physical education and voluntarily participate in leisure sports activities. In addition, the prosperity of recreational sports, such as winter sports for leisure, could close the gap between competitive and mass sports. Following the ontology of CR, we could conclude that there`s a natural competition between mass participation and competitive sports engagement in terms of public opinion, funding, education-pathway, and future careers.

Applying CR to examine Beijing 2022 Sports Participation Legacy is eligible and innovative. However, we shouldn`t neglect the dilemmas related to cultural contexts, different statistic systems/ conceptualization, and the availability of data reflecting the ideal and social reality. Most existing research with CR ontology has taken place in the Western context where the bottom-up system is the mainstream. In contrast, China has a typical top-down system, a heavy

population, and comprehensive regional diversity. We often encounter a mismatch between the bottom-up theoretical approach and the top-down processing mechanism. CR stressed authenticity and confidentiality. A large group of scholars therefore usually question the quality and prudence of authority voices and official reports. At the same time, top-down theory may fail to provide practical guidance to special cases. Accordingly, there`s a great need to integrate the typical Chinese theoretical framework into CR, to close this gap and enable Western scholars who are used to the "bottom-up" system to get an in-depth view of the legacy created by divergent systems.

Based on the integrated framework and accessible secondary data, we can inspect the Beijing 2022 Sports Participation Legacy at the material and artefactual level. Official reports and various commercial data demonstrated that divergent stakeholders managed to integrate their interests into the government-commissioned plans from the pre-game stage to the after-game period. BOCWOG, working in collaboration with schools, universities, local governments, and commercial organizations builds various types of talents for the promotion of winter sports. Thus, empirical data and scientific sampling were required to investigate the changes at ideal and social levels to predict the long-term effects of policies. In summary, the application of CR ontology must be backed up by the Chinese-originated “Three-Source Model”, especially in the case of choosing crucial indicators and making international comparison studies.

3) Compatibility of the CR and Chinese context

The new approach combining CR and the Chinese-originated “Three-Source Model”, facilitates researchers to gain objective and scientific views on realities corresponding to Chinese sports system ("Juguo Tizhi") and the winter sports engagement legacy of Beijing 2022.

The conceptualization also asserts that the new framework can address the legacy delivery process and enable researchers to conduct investigations with the shared approach, objective criteria, and different backgrounds. More specifically, the conceptual model contributes to the existing literature in several ways. First, it provides a systematic and nuanced understanding of how to apply CR in the context of China (Featured by the top-down system, heavy population, and comprehensive regional diversity). Second, it bridges research gaps corresponding to knowledge transfer. By providing references for future international comparison studies, this conceptualization highlights the methodology of inspecting the sports participation legacy

delivery process of Beijing 2022. Meanwhile, it helps Western scholars overcome difficulties in accessing the authenticity and confidentiality of data from “Top-down” systems. Third, it empowers the legacy planning and execution of future winter SMEs globally, by illustrating the dialectic relationship and interaction between elite and mass participation.

For future studies, this conceptual model will enable us to make a valuable contribution towards addressing the chances and challenges posed by the broad and ambitious nature of Beijing 2022's goal, which seeks to inspire 300 million people to engage in winter sports. In pursuit of a suitable methodology, our research engaged triangulation and qualitative quantitative mixed methods to bridge the existing research gap in assessing the achievement of the goal of "346 million Chinese engaged in winter sports", which has been treated as a numerical target by a substantial proportion of scholars, and to investigate the legacy delivery process for the benefits of future hosts.

III. Analysis tool: triangulation and qualitative quantitative mixed methods

Regarding the sketchy and concise information from the official government-commissioned surveys about Beijing 2022`s winter sports participation legacy, we selected triangulation, a research approach that combines multiple data sources or methods, as our instrument to enhance the reliability and validity of findings. In assistance with triangulation, we applied the qualitative-quantitative mixed methods throughout the research with "the explanatory sequential design", to examine the facts and evidence of whether a sports participation legacy was delivered by Beijing 2022 and study the mechanism behind this achievement.

IV. Research steps

1) Study 1: An in-depth examination of China's winter sports participation

Research methods: Triangulation and qualitative quantitative mixed methods, involving statistical, document, and big data analysis methods.

Data sources: Secondary longitudinal data from the official website and policy documents of GAS and CWSF, the Olympic World Library, the IOC official website, NBS, International winter sports industry reports, Statista, Baidu Index and other confidential resources.

Data analysis tools and instruments: Descriptive analytics, Big data analysis tool (Baidu Index), Microsoft Excel, SPSS, Python etc.

Key performance indicators (KPIs) selection with the integral conceptual model:
Material reality- people (Human Source):

- The yearly number of visits to ski resorts and ice rinks
- The annual number of skiers, children participating in winter sports training etc.

Material reality- facilities/equipment (Material Source):

- Numerical/ conceptual targets appeared in the official documents and plans for Chinese winter sports development etc.

Material reality- market (Financial Source):

- Numerical/ conceptual targets appeared in the official documents and plans for Chinese winter sports development etc.

Artifactual reality- people (Human Source):

- Data and evidence demonstrating stakeholders` evaluation on the legacy plans

Artifactual reality- facilities/equipment (Material Source):

- Total amount of outdoor and indoor Ski Resorts
- Total sales and revenue of winter sports equipment
- Import volume of skis and ice skates etc.

Artifactual reality- market (Financial Source):

- Market size of the winter sports industry
- Market size of the skiing training
- Market size of the skiing competitions and events etc.

Social reality- people (Human Source):

- Normal people`s attention and interests on winter sports participation

2) Study 2: Key mechanisms and strategies for the sports participation legacy

Research method: With the Critical Realism (CR) framework integrated with the Chinese traditional "Three-Source" theory, this investigation applied triangulation and the mixed methods involving document analysis, expert interview, survey, big data analysis methods etc.

Data source: Empirical data from expert interview and survey. Secondary data from the official website and policy documents of GAS and CWSF, the Olympic World Library, the IOC official website, NBS, International winter sports industry reports, Statista, and other confidential resources.

Data analysis tool: Thematic analysis, Opening coding, Video recorder, Online survey, Regression, Big data analysis tool (Baidu Index), Microsoft Excel, SPSS etc.

Key performance indicators (KPIs) selection with the integral conceptual model:

Ideal reality- people (Human Source): Stakeholders` role and perception related to China`s winter sports participation legacy of Beijing 2022.

Ideal reality- facilities/equipment (Material Source): Geographical and administrative features of the suppliers.

Ideal reality- market (Financial Source): The results of surveys and interviews reflecting suppliers` attitude-changing, motivation, and demographic features.

Social reality- people (Human Source): Social norms and group psychological factors that are corresponding to the Chinese winter sports development system and influence the realization of the “300 Million” goal, and the consumption behaviour.

Social reality- facilities/equipment (Material Source): Geographical and administrative features of the consumers.

Social reality- market (Financial Source): The results of consumption behavior surveys and interviews reflecting attitude-changing, motivation, and demographic features.

Document analysis

Table 5. List of Essential Documents for the Mechanism of Beijing 2022 Winter Sports Participation Legacy

Genres	Title	Authors/ Publishers	Publication Year
IOC collection	Legacy report of Olympic and Paralympic Winter Games: Beijing 2022 (pre-Games)	BOCWOG, Beijing Sports University, & Centre for Olympic Studies	2021
	Legacy report (post-Games): Olympic and Paralympic Winter Games Beijing 2022	BOCWOG, Beijing Sports University	2022
	Legacy case studies: Olympic and Paralympic Winter Games Beijing 2022	BOCWOG, Beijing Sports University	2022
	The legacy plan of the Olympic and Paralympic Winter Games Beijing 2022	BOCWOG	2019
	Sustainability for the future: Beijing 2022 pre-games sustainability report	BOCWOG	2022
	Sustainability for the future: Beijing 2022 post-games sustainability report	BOCWOG	2023
	Sustainability plan: Beijing 2022 Olympic and Paralympic Winter Games	BOCWOG	2020
Policy and regulation for stimulating winter sports development in China	Plan for Popularising Mass Winter Sports (2016-2020) [群众冬季运动推广普及计划（2016-2020 年）]	GAS	2016
	Ice and Snow Sports Development Plan (2016-2025) [冰雪运动发展规划（2016—2025 年）]	The General Administration of Sport, the National Development and Reform Commission, and two other departments	2016
	Ice and Snow Tourism Action Plan (2021-2023) [冰雪旅游发展行动计划（2021—2023 年）]	The Ministry of Culture and Tourism, the National Development and Reform Commission, and the General Administration of Sport	2021
	Fourteenth Five-Year Plan for Sports Development [“十四五” 体育发展规划]	GAS	2021
	Opinions on Vigorously Developing Ice and Snow Sports by Taking the Beijing 2022 Winter Olympics as an Opportunity [关于以 2022 年北京冬奥会为契机大力发展冰雪运动的意见]	The Central Committee of the Communist Party of China and the State Council	2019

	National Ice and Snow Facilities Construction [全国冰雪场地设施建设规划（2016-2022 年）]	The National Development and Reform Commission, and other departments	2016
	Guiding Opinions of the General Office of The State Council on Accelerating the Development of the Fitness and Leisure Industry [国务院办公厅关于加快发展健身休闲产业的指导意见]	The State Council	2016
	Several Opinions of the State Council on Accelerating the Development of the Sports Industry and Promoting Sports Consumption [国务院关于加快发展体育产业促进体育消费的若干意见]	The State Council	2014
Representative journal articles on Chinese winter sports participation legacy	The Influence of the Beijing Winter Olympic Games on the Demand for Winter Sports: An Empirical Analysis based on the Baidu Index	Wu, P., Zhu, X., Yang, S., & Huang, J.	2023
	The Expected Social Impact of the Winter Olympic Games and the Attitudes of Non-Host Residents toward Bidding: The Beijing 2022 Bid Case Study	Liu, D., Hautbois, C. and Desbordes, M.	2017
	Planning and Implementation of Event Leveraging Strategy: China's Legacy Pledge to Motivate 300 Million People to be Involved in Winter Sport	Chen, S., Xing, X., & Chalip, L.	2022
	Sport Policy Development in China: Legacies of Beijing's 2008 Summer Olympic Games and 2022 Winter Olympic Games	Chen, S., Preuss, H., Hu, X. (Richard), Kenyon, J., & Liang, X.	2019

Big data analysis methods (Including trend and sentiment analysis)

- Target Time Frame

Preparation of the Games (2015-21), During the Games (2022), After the Games (2023-24)

- Indicators
  - Changes in target setting, sports policy, and supply of winter sports facilities/equipment
  - Changes in public attention and opinion on the 2022 Beijing winter sports participation legacy and Chinese winter sports influence on the global market
  - Winter sports participation motivation and preference (Corresponding to the outcomes of Study 1, destination selection, and demographic features, such as educational level, age, income, etc.)

Interview and survey design

Although document and big data analysis provide sufficient facts and evidence at the Macro level, especially in the Game-hosting time and Post-Games period, less is known about the legacy delivery process in the Pre-Games period and the attitude changes before and after the Games at meso and micro level. We launched interviews and surveys to examine our hypotheses and increase the international understanding, credibility, and reliability of our research.

a. Interview design

- Time and Format:
  - Semi-structured expert interview, each interview takes 45-50 min.

- Target Group & Objectives:
  - Sports Governance Perspective (Macro level, 1-2 experts): Leaders/ managers/ experts who developed strategies to support the mass participation legacy.

  - Management & Teaching Perspective (Meso level, 2-4 experts): School rectors/ department managers from Olympic Education Demonstration Schools. Winter sports coaches/ instructors/ teachers in Beijing, Chongli, and Zhangjiakou. Physical education teachers/experts. Scholars for Olympic education and sports social science etc., who played essential roles in promoting winter sports.

- Framework:
  - Experts` Background
  - Key Questions about "Sport Participation", including best program/ practice, barriers, and methods to overcome the difficulties etc.
  - Deep Questions about social sustainability, including what future hosts could learn from Beijing 2022 etc.

b. Survey design

- Time and Format:
  - Semi-structured survey, each questionnaire takes 15-20 min.

- Target Group & Objectives:
  - Consumption Perspective (Micro level, 40-60 people): Students/ athletes/ other types of participants who have practiced winter sports, even had domestic/ overseas training and competition experience (Related to sports education and tourism). We apply survey to examine the efficiency and effectiveness of the crucial tactics and programs that support the achievement of "300 Million" goal.

- Questions:
  - Background information: age, gender, birth date and place, position, education level, year of engage in winter sports
  - Winter sports participation related questions: frequency, discipline, and resorts selection
  - Motivation and preference
  - Attitude towards the “300 million” goal and Beijing 2022`s mass participation legacy

Chapter 4 - Breaking ice: An in-depth examination of China's winter sports participation in the wake of Beijing 2022

Abstract: Is there evidence from secondary data to suggest advancement towards Beijing 2022's objective of "Motivating 300 million individuals to engage in winter sports"? This chapter explored the Beijing 2022 sport participation legacy by adopting a quantitative approach with triangulation. A diverse set of secondary longitudinal data and selected indicators from people, facilities/equipment, and market perspectives, according to the goal of engaging 300 million Chinese in winter sports were scrutinised. The preliminary findings highlight the multifaceted and complex nature of evaluating the sport participation legacy goal of a Sport Mega Event (SME). The broad definition of the goal to "Motivate 300 million people to engage in winter sports," as well as the characteristics of the political mission's cultural and systemic context, were some of the factors that played an important role when trying to assess this target. Moreover, this paper revealed three crucial mechanisms transmitting the passion of winter sports from SME to mass participation legacy, through quantitatively examining the promised target. There were "Beneficial sports policy and economic progression", "Provision of facilities accompanying the integration of sport and education", and "Cooperative stakeholders` alliance strengthened by media power and technology". This paper represents one of the pioneering studies undertaking a comprehensive and extensive analysis in alignment with triangulation. We anticipate that this study will make a valuable contribution towards addressing the challenges posed by the broad and ambitious nature of Beijing 2022's goal, whilst facilitating further investigations on the transformative strategies.

Keywords: Winter sports participation; impact and legacy; Olympic Games; Beijing 2022 Winter Olympics; social sustainability

I. Introduction

As the world turned its gaze toward the historic Beijing 2022 Winter Olympics and Paralympics, the first Olympic Games ever to implement a legacy plan adapting Olympic Agenda 2020/ New Norm and the International Olympic Committee (IOC) Legacy Strategic Approach, one goal stood at the forefront: an impressive and ambitious goal that challenged the boundaries of sport participation. Against the backdrop of a global pandemic, these Games etched their place in history, not only as a testament to human resilience but also as a harbinger of a new era in

winter sports. It was here that Beijing beckoned to the world, daring 300 million individuals to embrace the thrill of ice and snow activities, setting an unprecedented milestone in the Olympic movement. This study centers on the assessment and achievement of this ambitious participation goal, which serves as the primary focus of our research.

The IOC Sport for All Commission Declaration underscores the shared vision of past, present, and future host cities to promote increased sports participation (IOC, 2021a). Scholarly research and practical evidence suggest that hosting sport mega events (SMEs) has the potential to boost sports participation (A. (Sakis) Pappous & Hayday, 2016; Weed et al., 2015) and foster sustainable development (Hindson et al., 1994; Hogan & Norton, 2000). Within this context, the Beijing 2022 Winter Olympics and Paralympics embraced the ethos of 'Sport for All' by setting their sights on attracting 300 million people to engage in the thrills of ice and snow activities. As we delve into this study, our aim is not to definitively assess whether the "300 million" goal, which originated from the promise "Developing a winter sports market for more than 300 million people" in the bid document" (Beijing 2022 Olympic Winter Games Bid Committee, 2014), has been fully achieved, as it is an ongoing endeavor. Instead, we aim to assess the progress made towards realizing this ambitious goal and gain insights into the challenges.

Official sources now report that over 346 million Chinese people have actively engaged in winter sports since 2015 (BOCWOG et al., 2021). During IOC sessions. workshops and Observer Programs concerning legacy and sustainability, some international experts have raised questions about the precise delineation of participation in winter sports, as well as the origin and validity of the reported number of "346 million", possibly due to the limited availability of supporting literature, linguistic barriers, systemic configurations, and cultural distinctions. This numerical milestone of over 346 million people engaged in winter sports was based on the results of an official survey conducted by the General Administration of Sport of China (GAS) and the National Bureau of Statistics of China (NBS). Employing stratified random sampling, this survey involved 12,340 respondents across 31 provinces and autonomous regions in China. Its findings from 2015 to 2021 indicate that 24.56% of Chinese residents directly or indirectly engaged in winter sports (GAS, 2022a). This largescale engagement involves people who practice ice and snow sports, such as athletes and coaches, but also covers the spectrum of people who indirectly engage in winter sports, such as

participants in winter experiential events and the working staff of the Chinese winter sports industry (Chen et al., 2022a).

Overall, the findings of this survey suggest that the Chinese winter sports market is growing, with a diverse range of contributors. While official government-commissioned surveys provided beneficial perspectives, it's essential to acknowledge the advantage of triangulation. Triangulation, a research approach that combines multiple data sources or methods, enhances the reliability and validity of findings. Therefore, in complementing the official survey results with a wide range of secondary data, this study aims to offer a more comprehensive and nuanced understanding of the complex landscape of winter sports engagement in China.

Moreover, future editions of the Games such as Milan-Cortina 2026 envisioned "Games for All" also emphasize sport participation, in light of the same Olympic sustainable strategy and legacy framework. Attempting to inspire the legacy planning and execution of future winter SME globally and contributing to the further development of the scaling up Chinese winter sports industry, we engaged in triangulation to inspect the facts and evidence of whether a sports participation legacy was delivered by Beijing 2022.

The mainstream literature suggests that additional indicators and longitudinal data are necessary to empower researchers to examine the sport participation legacy of major sporting events. Regarding the research gap, this study is guided by the research question of whether there are facts and evidence suggesting the advancement towards Beijing 2022's objective of motivating 300 million individuals to engage in winter sports. We then select additional indicators, which reflect annual fluctuations in winter sports participation, from people, facility/equipment, and market perspectives. Examining these indicators not only facilitates international observers in studying the sustainability and legacy of Beijing 2022 in detail but also provides references to researchers conducting international comparison studies to bridge the gaps corresponding to knowledge transfer.

II. Literature Review

1) The definition of winter sports participation in prior investigations

The definition of sport participation in prior investigations has varied, often based on the context of grassroots sports, where physical activity and engagement by ordinary people are monitored. Some studies have not distinguished between random and regular sport participation (Scheerder et al., 2011), with random participation referring to joining sports festivals or events (Gau et al., 2022) and regular participation referring to committing to physical training and sports education (Wicker et al., 2013). Other investigations have identified sport participation with physical activity engagement during the previous four weeks (England, 2022), while many investigations have operationalized a more precise quantitative concept, such as the proportion of adults aged 16 or older who engaged in sports at moderate intensity for 30 minutes or more at least once in the past week (Sports Science Research Center, 2022). Additionally, the sport participation concept has referred to both mass and elite sports participation in some contexts, and different age criteria or discipline-specific definitions have been suggested in other studies (Breuer et al., 2011; Downward & Riordan, 2007; Humphreys & Ruseski, 2009; Leslie et al., 2004). In the context of winter sports, there needs to be an explicit definition and clear indicators to measure the winter sports participation.

2) Preceding work on sports participation legacy

The current body of literature on sports participation at international SMEs is at a developing stage where there were 5 preceding literature reviews providing periodical evidence for a cluster of research questions, and the mainstream research focus was on the efficiency and effectiveness of the leverage policies. Within the limited and focused research interest in the social science area, which typically includes education, training, destination branding, volunteering, etc. (Mair & Smith, 2021), we identified a pattern of addressing the public participation legacy of London 2012 OG and PLG with multiple attempts to develop gold standard theories and research frameworks to inspire future generations.

Besides, the selected literature in the social science area demonstrated interdisciplinary characteristics penetrating medicine, administrative management, and business management branches. Based on the PRISMA-ScR paradigm, we carefully examined 62 peer-reviewed journal articles, coming from preceding works. Based on the characteristics of the selected investigations, we divided the samples in the final corpus into 3 groups based on the events`

features and motivations: (1) Case study of Olympic Games and Paralympics, (2) Non-Olympic Games case study or comparison study focusing on practice, and (3) Theory development-centric study.

The majority of previous investigations have focused on examining whether the host nations have successfully increased physical activity participation through hosting international SMEs (Shi & Bairner, 2022), such as the Summer and Winter Olympics, Paralympic Games, and World Cup. A small number of researchers, represented by Kim & Kaplanidou (2024) and Ribeiro et al. (2022), discussed how would sports participation benefit international sporting success. At the same time, it is worth noticing that research on the legacy creation mechanism and delivery process has gained popularity in the past decades. In many cases, governments use the 'demonstration effect' or 'trickle-down effect' to promote physical activities and improve national brands (Hindson et al., 1994; Weed et al., 2015). By contrast, the autonomous approach has been suggested by a group of pioneering scholars, for example, Brown, Gérard, and Pappous.

Regarding the various attempts and needs to figure out a path leading to the sustainability, we carefully inspect the research paradigm, methods, and essential outputs of the preceding academic works in each group. The analysis results highlight the scarcity of empirical studies with mixed research methods while revealing a need for further research to fully understand sports participation in different contexts.

In general, we identified critical research gaps in scrutinizing the sports participation legacy and its delivery process of the latest three Olympics held in Asia. Moreover, the limited application of theoretical paradigms indicates a need for more continuous studies after the Games with international comparative frameworks to examine sports participation, targeting establishing gold standard theories and protocols for social sustainability.

III. Methods

1) Overview

This study aimed to achieve a triangulation perspective by examining a wide variety of quantitative indicators, including secondary data from 2015 to 2021, the official timeframe for

the winter sports participation legacy. The sources for this study include publicly available quantitative data related to sports participation before and after Beijing 2022. These data sources encompass government reports, official event records, surveys conducted by relevant sporting organizations, and market reports from companies or non-profit institutions. Moreover, Baidu index has been engaged to examine Chinese internet users` interests in winter sports. On the one hand, the index is an effective tool similar to Google Trend for trend analysis indicating changes in information query behavior through search volume at the Chinese popular search engine "Baidu". On the other hand, it more purposively reflects the searching behavior and sentiment of the Chinese netizens. We aimed to include data that would reflect changes over those 7 years, to provide a comprehensive analysis of any potential changes in sport participation levels.

2) Data collection

The cumulative data from the telephone survey conducted by GAS and NBS does not depict the changes during the seven years. Therefore, we collected longitudinal data from the official website and policy documents of GAS and CWSF, the Olympic World Library, the IOC official website, NBS, International winter sports industry reports, Statista, and other confidential resources.

3) Data selection and analysis

Several indicators that directly or indirectly reflect winter sports participation were selected. These indicators were selected based on the following criteria:

Relevance: The indicators must be relevant to the research question, which is to examine the impact on the Beijing 2022 Winter Olympics on winter sports participation in China.

Availability: The indicators must be available from 2015 to 2021, the same period as that of the official survey.

Reliability: The indicators must be valid measures of winter sports participation.

For data analysis, we independently examined each category of variables and performed descriptive analysis. Then, we examined China's crucial facilitators and featured sports to achieve the "300 Million" goal.

IV. Results

1) Dynamics of winter sports in China

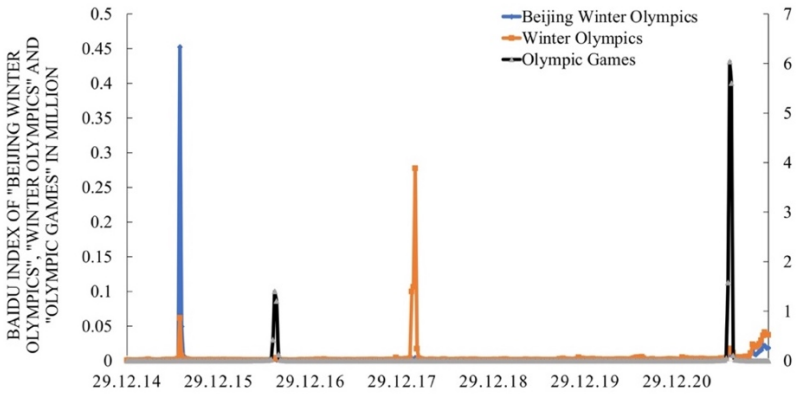

Figure 8. Search Volume of Beijing 2022, Winter Olympics and Olympics from 2015 to 2021

Figure 8 demonstrates the change in Chinese internet users` interest in Beijing 2022, the Winter Olympics, and the Olympic Games in general during the preparation for Beijing 2022. The peak search volume of the Beijing 2022 Winter Olympics appeared in July 2015, one year after Beijing won the bids. And the next rise started in July 2021, 7 months ahead of the hosting of Beijing 2022. Meanwhile, the peak search volume for the Winter Olympics emerged in February 2018 when the PyeongChang 2018 Winter Olympics were held by South Korea, and the Tokyo 2020 Olympics, which started in July 2021, created a boom in the search for the Olympic Games in Baidu. In contrast, our results show lowest search volumes in all the 3 keywords in January and February 2015. The average search volume (per week) was around 3000 for Beijing 2022 in the Pre-Game phase, around 4300 for the Winter Olympics, and more than 47000 for the Olympic Games.

Winter sports not only attracted Chinese internet users but also those who took action to embrace the joy of ice and snow sports activities, although the online tendency doesn`t always correlate to sports participation behaviors. According to the ice and snow sports industry reports and popular Chinese news media, the number of site visits (In some literacy written as the number of winter tourists) reflects the development of ice and snow sports tourism, facilitating winter sports participation. Figure 9 shows that the number of visits to ski resorts and ice rinks in China generally increased from the 2016/17 season to the 2021/22 season. However, there was a sharp drop of 49.27% in visits from the 2018/19 season to the 2019/20

season due to COVID-19 and related policies (Worldbank, 2021). From the 2019/20 season to the 2020/21 season, the number of visits increased from 94 million to 254 million, representing a pre-Games increase of 170.21%.

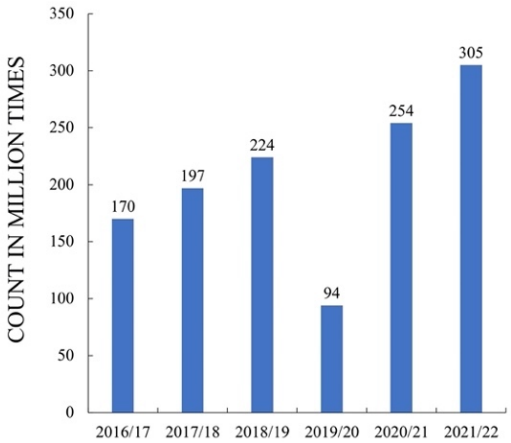

Figure 9. Total Number of Visits to Ski Resorts and Ice Rinks in China (In Millions)

Note. Each season is divided based on the fiscal year of Chinese ice and snow sports industry, which begins from 01. May of the same year and ends on 30. Apr. the next year.

Source: Forward the Economist (Forward the Economist, 2022)

From the dimension of sports discipline, the medal winning disciplines such as figure skating (23.23%), short track speed skating (13.31%) and curling (19.63%) received the most attention. While ice hockey (12.89%), luge (8.31%) and snowboard (7.24%) caught eyes of Chinese netizens according to the historical Baidu Index from the beginning of 2015 to the end of 2021 (see Figure 10).

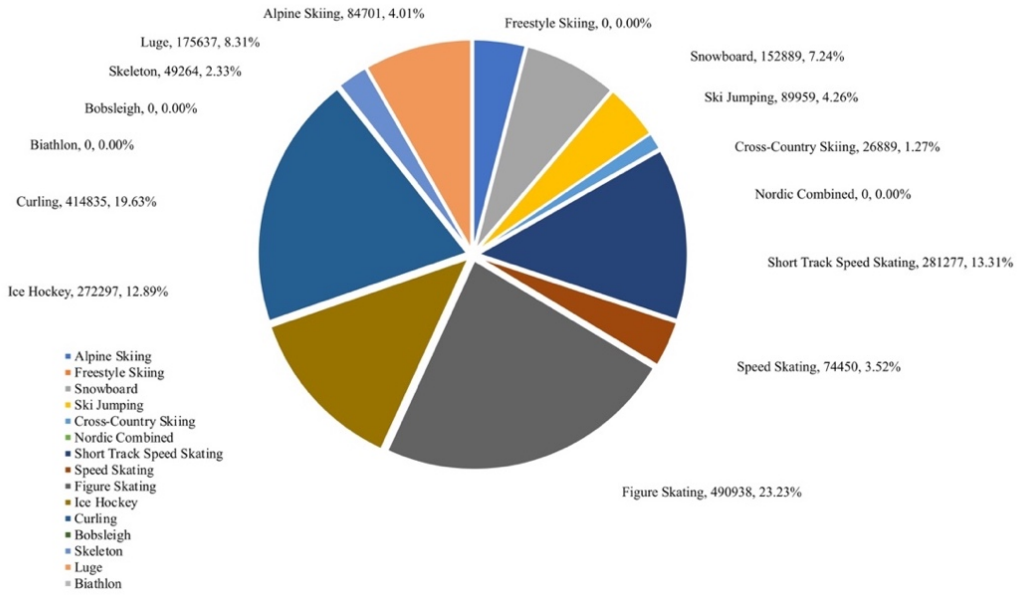

Figure 10. Baidu Index per Winter Sports Discipline from 2015 to 2021

Besides, online stakeholders in different regions voluntarily respond to Chinese winter sports promotion strategies and programs, such as "promoting ice and snow sports from north to south, east and west". Figure 11 displays the geographic distribution of Chinese winter sports enthusiasts corresponding to their information query behaviors. Beijing, Guangdong, and Jiangsu provinces ranked in the top 3 in the search volume of Beijing 2022 WOG from 2015 to 2021. In contrast, OG attracted many Chinese netizens from Guangdong, Zhejiang, and Jiangsu, 3 non-hosting provinces with high-speed economic and social development in China.

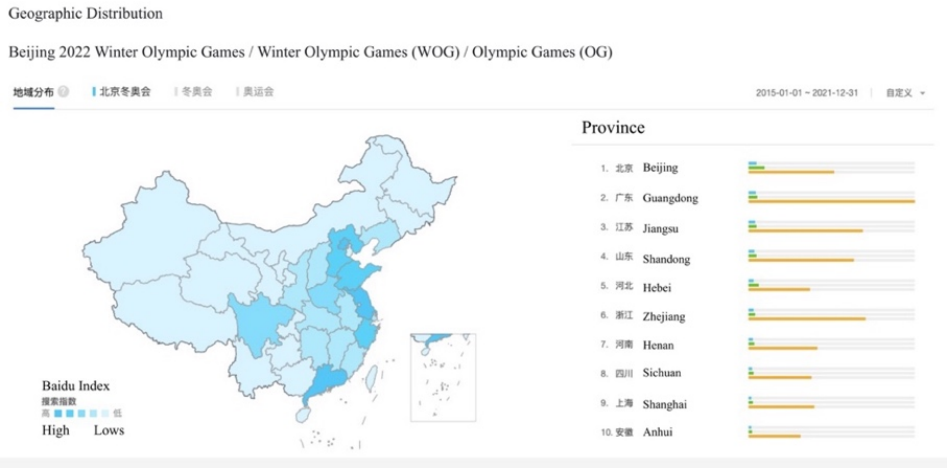

Figure 11. Geographic Distributions of Chinese Winter Sports Enthusiasts in the Pre-Games Phase

In the process of expanding the scale of winter sports from north to south, China reported that the combination of training and education has been another critical enabler of Chinese winter sports participation (BOCWOG & Beijing Sports University, 2022). Table 6 depicts that the number of skiers and children participating in ice and snow sports training was higher in the 2020/21 season than in the 2014/15 season. In the 2014/15 season, 11.95 million Chinese people (8.57% of China's total population; United Nations, n.d.) participated in skiing activities. This number reached 20.76 million in the 2020/21 season, accounting for 14.56% of the Chinese population. The maximum penetration rate was found in the 2020/21 season, after the sudden drop in the 2019/20 season, which saw a loss of 10.45 million skiers.

Table 6. Total Number of Participants in Different Types of Ice and Snow Sports in China

Season	Total Number of Skiers in China	Total Number of Chinese Kids Participating in Ice and Snow Sports` Training	Total Number of Youth Ice Hockey Players in Beijing
2014/15	11,950,000	2,410,000	1,205
2015/16	14,450,000	2,460,000	1,545
2016/17	16,900,000	2,540,000	2,350
2017/18	19,150,000	2,630,000	2,619
2018/19	20,600,000	2,700,000	3,308
2019/20	10,450,000	2,740,000	3,701
2020/21	20,760,000	2,780,000	3,127

Note. Each season is divided based on the fiscal year of Chinese ice and snow sports industry, which begins from 1. May of the same year and ends on 30. Apr. the next year.
Source: Statista (W. Zhang, 2023), Legacy Case Studies (BOCWOG & Beijing Sports University, 2022) and The 2022 Report on Trend Development of China`s Snow and Ice Industry (Forward the Economist, 2022).

In contrast to the number of skiers, the number of Chinese children participating in ice and snow sports training increased steadily from 2.41 million in the 2014/15 season to 2.78 million in the 2020/21 season. The penetration rate followed the same trend, increasing from 1.73% to 1.95% of the Chinese population (United Nations, n.d.). The ice and snow sports training market for Chinese children grew relatively rapidly in the 2015/16 and 2016/17 seasons, with an average annual growth rate of 3.40%. However, the market growth slowed down from the 2018/19 season to the 2020/21 season.

In addition to skiing, the promotion of youth ice hockey has been seen as a significant achievement in sports participation. In the 2014/15 season, the number of youth ice hockey players in Beijing reached a record high of 1205. This number continued to rise and tripled by the 2019/20 season. After a sudden drop in the 2020/21 season, Beijing youth ice hockey continued to grow and evolve (BOCWOG & Beijing Sports University, 2022). Furthermore, the results also show the growth of children participating in ice and snow sports training across China is related to the expansion of youth ice hockey in Beijing.

2) Facilities & equipment

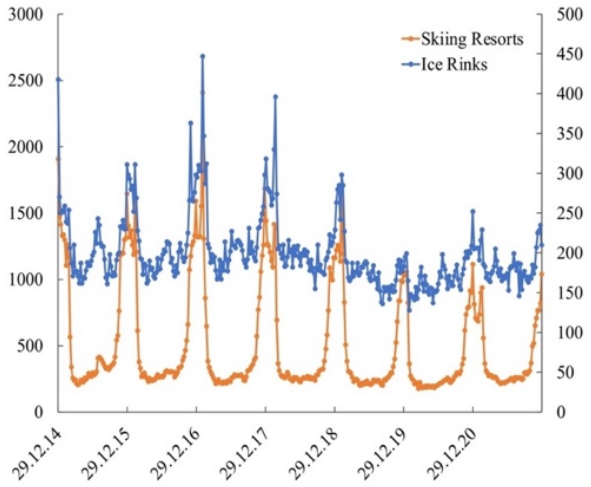

Figure 12. Search Volume of Ice Rinks and Snow Resorts in Baidu

Figure 12 displays the pattern of Chinese netizens` behavior change in terms of searching ice rinks and skiing resorts. From 2015 to 2021, the high volume of searching appears in the period starting from October the previous year to February the following year. Compare with ice rinks, Chinese netizens paid less attention to skiing resorts, where seasonal volatile is more obvious. And the gaps between ice rinks and skiing resorts remain at the same level in the pre-Game period.

By 2022, the number of ice skating venues and skiing fields in China had reached 2,261 (W. Zhang, 2023), 2.23 times more than that in 2015. Although annual statistics on all ice and snow sports venues in China are not available, the data we collected shows that the number of ski resorts increased from 568 in the 2015 season to 770 in the 2019 season. The growing tendency of indoor and outdoor ski resorts are similar. The average growth rate of indoor ski resorts was 22.07%, and the average growth rate of outdoor ski resorts was 7.54% (see Figure 13).

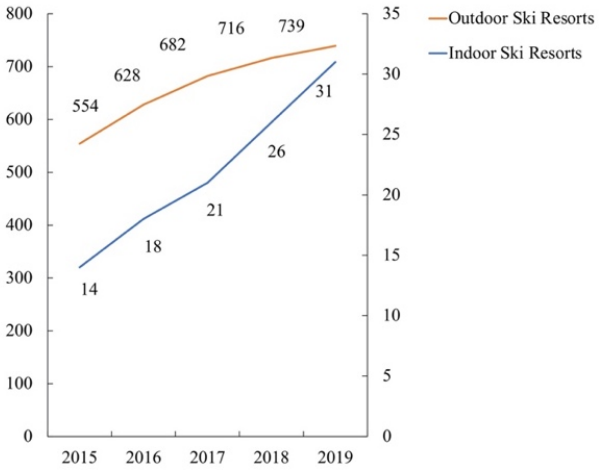

Figure 13. Number of Outdoor and Indoor Ski Resorts in China from 2015 to 2019

Source: Forward the Economist (Forward the Economist, 2022)

From a winter sports equipment perspective, our analysis results showed that the gap between total sales and revenue widened each year from 2015 to 2020. The winter sports equipment market expanded, but the growth rate slowed down after 2017. Meanwhile, revenue from winter sports equipment grew marginally from 2015 to 2020 (see Figure 14). There is a strong positive linear correlation between total sales and revenue of winter sports equipment.

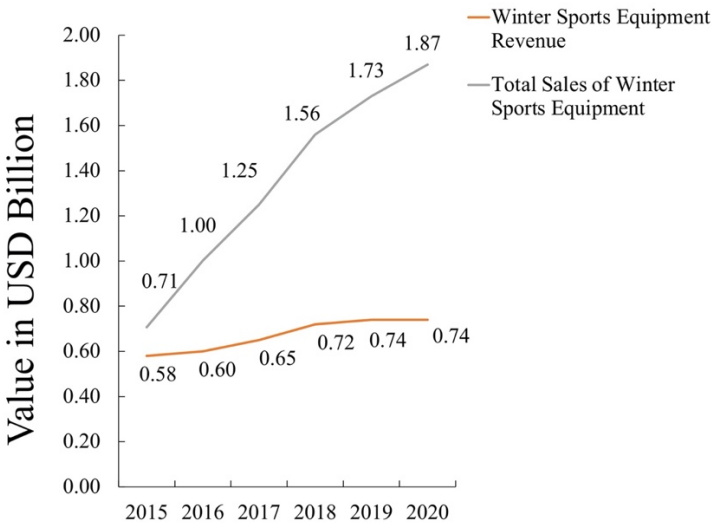

Figure 14. Total Sales and Revenue of Winter Sports Equipment in China from 2015 to 2020

Source: Statista (W. Zhang, 2023) and Forward the Economist (Forward the Economist, 2022)

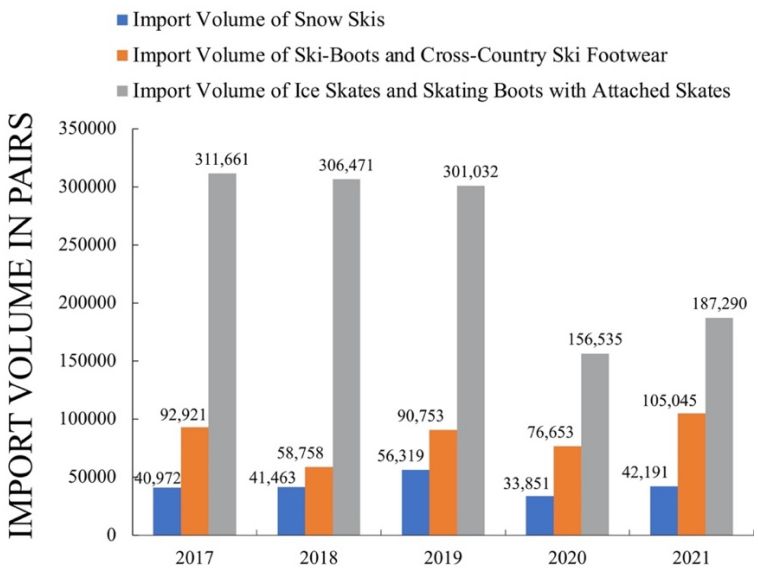

Figure 15. Import Volume of Skis and Ice Skates in China from 2017 to 2021

Source: Statista (W. Zhang, 2023)

To compare the growth of ice and snow sports, we examined the volatile changes in the import volume of skis, ski footwear, and ice skates from 2017 to 2021. Despite the decrease in 2020, the import volume of ice skates and skating boots was higher than that of snow skis and boots. In contrast, the import volume of snow skis and boots showed an increasing trend with volatility (see Figure 15). However, the enlargements of the import volume are not correlated, judging from the graphic.

3) Market growth of the Chinese winter sports industry

Based on government policies and plans, the Chinese winter sports market covers three sectors: design and equipment, operation and services, and final consumption (Interesse, 2023). The market size is calculated by the total sales of all three sectors related to winter sports activities.

In 2015, the total sales of Chinese winter sports was CNY 27 billion. This number reached CNY 48.75 billion in 2019, but fell to CNY 44.52 billion in 2020 due to the impact of COVID-19. The skiing industry has shown similar growth trends. The market size of the Chinese skiing industry includes operating income, sales of skiing clothing and equipment, investment in ski resort construction, and investment in skiing training (MobTech, 2020). In 2015, the market size was CNY 12.75 billion. After hitting a record of CNY 26.75 billion in 2019, the total sales dropped 16.86% in 2020.

Winter sports training and competitions/events have had a clear leveraging effect in motivating more Chinese people to participate in winter sports, according to IOC legacy reports. The skiing training market witnessed rapid growth from 2015 to 2020. In 2015, the size of the skiing training market was CNY 5.01 billion, which had increased by 1.38 times by 2020 (see Figure 16). Moreover, the results also confirmed that skiing training and skiing competitions/events advanced the Chinese skiing industry and created one of the world's largest beginner markets.

Figure 16. The Market Growth of Chinese Winter Sports from 2015 to 2020
Source: Statista (W. Zhang, 2023), Forward the Economist (Forward the Economist, 2022), and White Book of Chinese Ski Industry (MobTech, 2020)

Regarding the leverage effects of popular Chinese winter sports events, Table 7 reveals that the amounts of events within the flagship program "National Public Ice and Snow Season" increased in general, despite the collision of the COVID-19 pandemic. From 2015 to 2021, over 1,000 competitions and events were organized annually. These events, exemplified by names such as the "National Public Ice and Snow Season," "Red Bull Nanshan Open," and "Harbin Ice Festival," attracted nearly 100 million individuals, both directly and indirectly, into the fold of winter sports (BOCWOG & Beijing Sports University, 2022).

Table 7. Details of Chinese National Public Ice and Snow Season

Year		Place of Launching Ceremony	Number of Events Held	Number of Provinces, Autonomous Regions and Municipalities Involved	Number of Participants
1st	2014	Beijing	80	10	Around 10 million
2nd	2015	Beijing	100+	15	Around 15 million
3rd	2016	Beijing	100+	25	30 million
4th	2017	Shijiazhuang	1,000+	25	50 million
5th	2018	Shanghai	1,500+	27	90 million
6th	2019	Tianjin	800 (most planned events were not held due to the pandemic)	27	70 million
7th	2020	Changchun	1,200 (less events were held due to the pandemic)	31	Nearly 100 million

Source: Legacy case studies: Olympic and Paralympic Winter Games Beijing 2022 (BOCWOG & Beijing Sports University, 2022)

V. Discussion

1) The leverage effects of sports policy and economic progression

The findings presented in this chapter provide preliminary evidence that Beijing 2022 has played a pivotal role in increasing the engagement of the host population in winter sports participation in the period leading to the Games. The Baidu index revealed that most Chinese pay great attention to the Olympic Games at game time, partially confirming the demonstration effect of elite sports events in China. Moreover, both our data and Beijing 2022 Pre-Games Sustainability Report highlighted that in the period 2015-2021 mass participation in winter sports flourished. Chinese winter sports participation widened considerably from 2016 to 2018, while another fast growth appeared one year ahead of the Beijing 2022 Winter Olympics. Although attitude and behavior changes are often intertwined, our results haven`t demonstrated a significant correlation between the search volume and the visits to ice rinks and skiing resorts in China.

Regarding the geographic location of Chinese netizens who searched for ice rinks and skiing resorts, we investigated that there was a high percentage of people coming from the provinces

with economic progression, such as Jiangsu, Shandong, and Zhejiang besides those provinces appointed with winter sports development tasks, for instance, Beijing, Guangdong, and Hebei. Meanwhile, some traditional winter sports provinces, for example, Hei Longjiang, Jilin, and Liaoning reported a great number of winter sports participation, whilst holding a relatively low Baidu index. From the dimension of winter sports discipline, our results revealed that medal-winning disciplines and popular sports, such as skiing and snowboarding, drew lots of attention from Chinese internet users. The demonstration effect of elite sports success could be one of the reasons. Other factors may involve social identity, exclusivity, learning enthusiasm, and so on. Referring to sports policies and the relevant guidelines, such as the Ice and Snow Sports Development Plan 2016-2025 and the Mass Winter Sports Promotion and Popularization Plan 2016-2020 (Interesse, 2023) that served as a solid foundation for the growth of winter sports in China, we examined multi-level and purposive policy-driven features of the increment. This positive outcome can be attributed to a multifaceted approach that combines effective policy strategies and targeted initiatives.

Moreover, the disconnection between attitude and behavior changes may be attributed to the Chinese sports system, consumption habits, and diverse models of Chinese winter sports development in the selected region. Corresponding to the "Juguo Tizhi" characterized by the "Top-down" mechanism, the "bottom-up" approach stimulated facilities development, talent identification, and social advancement in the non-traditional winter sports regions.

2) Provision of facilities accompanying the integration of sport and education

Our results strengthened the argument that sports education and training emerged as a critical factor in fostering a culture of winter sports participation among the younger generation. This integration extends beyond theoretical classroom sessions, encompassing practical hands-on experiences. Elementary, middle, and high schools acted as beacons for young talents` development. Universities have played a determining role in popularizing winter sports and fostering sustainable development by nurturing winter sports instructors, basic-level trainers, volunteers, and various other types of talent essential to the sport. The resulting program has laid the foundation for a sustainable, cyclical winter sports heuristic system, whose resilience has been exemplified amidst the challenges posed by the COVID-19 pandemic.

This promotion strategy is a tangible element of the broader social context that influences individuals' understanding and engagement with winter sports, aligning with the artefactual

layer's focus on formal structures and policies by integrating winter sports into the curriculum and offering accessible training opportunities, this approach not only introduced a vast number of students to winter sports but also ensured their continued involvement beyond the Games.

Accompanying the soft-power building program, the proliferation of winter sports facilities nationwide has played a pivotal role in popularizing ice and snow sports in China. From 2015 to 2022, the number of ice and snow sports venues increased by 1.43 times. Notably, our results demonstrate a significant difference in the growth of outdoor and indoor ski resorts. And the winter sports participation rate largely depends on the geographical distribution of the venues, in terms of southern-northern China (GAS, 2022a). Furthermore, our research has established clear reciprocity between the growth in the number of Chinese children participating in ice and snow sports training and the rapid construction of ski resorts, regardless of their types.

Given its substantial infrastructure requirements, skiing was less prevalent in many regions of China compared to ice sports. As a result, ice rinks attracted more public attention than skiing resorts in general, and the expansion of ski resorts emerged as a sensitive indicator to gauge market trends. Our findings reveal that the growth in the number of ski resorts reached its peak (exceeding 10%) between 2015 and 2016, driven by winter sports-friendly policies and a surge in participation. While outdoor ski resorts remained predominant in China, the development of indoor ski resorts has been instrumental, particularly in non-traditional winter sports provinces and cities lacking natural snow, in fulfilling sports policy objectives and realizing participation goals.

Besides government policies and cultural factors, conditional change (such as increasing health consciousness triggered by the COVID-19 pandemic) contributes to the extension of mass participation and influences consumption behaviors. The successful bid for Beijing 2022 initially prompted a surge in the import of ice and snow sports equipment. The fluctuation in the import volume of items such as skis, ski footwear, and ice skates reflects customer preferences for ice and snow sports equipment with foreign brand names. The rise of Chinese domestic products and advancements in related technologies have reshaped the market landscape and altered revenue distribution. Furthermore, the rapid rebound observed after 2020 could be linked to two driving factors within the Chinese winter sports industry—first, the phenomenon of "revenge consumption," (Hong & Oh, 2021) which signifies rapid economic progress driven by psychological and emotional factors following a period of stagnation

consumption, and second, government-led initiatives in the market.

3) The vast novice sports market and stakeholder alliance

The growth of participants per year in different ice and snow sports and the increase in the market for Chinese winter sports indicate that China is becoming a vast novice winter sports market. From 2015 to 2021, the amounts of visits doubled while the size of the Chinese winter sports industry grew 181%. The speed of augmentation attracted lots of queries about the number and mechanisms.

Referring to the official legacy report, the stakeholders involved in Beijing 2022, including BOCWOG, host governments, sports organizations, media and social media outlets, a wide array of sponsors and suppliers from different sectors, and local communities (Ferkins & Shilbury, 2015; Naraine et al., 2016; Oh et al., 2018), managed to collaborate closely with a shared vision: `Motivate 300 million people to winter sports` (Beijing 2022 Olympic Winter Games Bid Committee, 2014). This collaborative mechanism can be delineated as a multi-centric network, underpinned by the principle of equal stakeholder responsibilities and rights (Q. Zhang et al., 2023) . Besides the formal structure, the autonomous collaboration among stakeholders often took place through various training programs, and the hosting of events and competitions, infused with the cultural values and beliefs of local communities.

Our results suggested that government policies and formal structures have a great impact on shaping the collaborative landscape and creating an effective mechanism to balance organizational interests and demands. However, there`s still limited information about whether the collaborative efforts among stakeholders encountered challenges in conjunction with goal alignment, strategies, and specific tactics (Chalip et al., 2017), as well as with which methods Chinese organizers resolved the conflicts.

VI. Limitations and directions for future research

In assessing the promise to engage 300 million people in winter sports through the Beijing 2022 Winter Games, our study analysed a wide range of secondary quantitative data. This approach offered several advantages and limitations. Utilizing secondary data allowed us to access a wealth of information on participation rates, infrastructure facilities development, and

government initiatives, enabling a comprehensive evaluation. It also facilitated the analysis of trends and changes over a seventh time period, which provided insights into the effectiveness of various strategies employed. However, the use of secondary data poses challenges, including different conceptualizations, potential data quality issues, inconsistencies across sources, and the inability to capture nuanced aspects of individual experiences. Furthermore, establishing causality in our study remains a challenge, despite that the validity and reliability of the official data provided by the Chinese government and the selected research institutes/commercial organizations are interdependent, convergent, and complementary.

While the Beijing 2022 Winter Games undoubtedly played a significant role in promoting winter sports, numerous confounding factors could influence participation rates. Socioeconomic variables, regional disparities, cultural preferences, and the presence of other sporting events or initiatives could all impact engagement in winter sports. Additionally, our study focused mainly on the phase leading up to the Games and this makes it difficult to ascertain the long-term effects. This temporal lag between the event and the realization of its impact legacy makes it challenging to assess the effectiveness of initiatives aimed at promoting a durable sports engagement. To address these complexities, future research should incorporate qualitative data and conduct in-depth interviews or surveys to gain a deeper understanding of individuals' motivations and experiences, thereby shedding more light on the cultural and societal factors that might have played a crucial role in shaping sport participation patterns.

VII. Conclusion and practical applications

This chapter represents one of the pioneering studies that has undertaken a comprehensive and extensive analysis of a carefully selected set of quantitative indicators in alignment with triangulation. Meanwhile, this investigation provided references to understand the complex nature of winter sports participation legacy. Our objective has been to shed light on various dimensions, including the perspectives of individuals, facilities, equipment, and the market, to closely monitor progress toward the targeted sport participation goal. We anticipate that this study will make a valuable contribution towards addressing the challenges posed by the broad and ambitious nature of Beijing 2022's goal, which seeks to inspire 300 million people to engage in winter sports.

In our pursuit of a suitable methodology to bridge the existing research gap in assessing the achievement of engaging 300 million Chinese in winter sports, which has been treated as a numerical target by a substantial proportion of scholars, our study has contributed significantly by employing a wide array of indicators and comprehensive longitudinal data. The secondary data originate from both national and international sources, including reputable organizations such as BOCWOG, IOC, and GAS. In addition, it should be noted that our study not only includes data from sources that can be considerably challenging for Western academics to access, as they are primarily rooted in the Chinese language or domain. Thus, this research endeavor has yielded critical insights, not only shedding light on the success of the sport participation legacy but also serving as a source of inspiration for future investigations on a global scale into the strategic planning and implementation of legacy programs and their facilitators. Regarding transformative strategies, our study has identified three crucial mechanisms that stakeholders leveraged to realize the sport participation goal. These mechanisms include "Leveraging sports policy", "Provision of facilities accompanying the integration of sport and education", and "Cooperative stakeholders` alliance strengthened by media power and technology".

In conclusion, our comprehensive investigation highlights that evaluating the legacy of the Beijing Winter Olympics necessitates an understanding of systemic context, culture norms and methodologies. It is worth further investigation to assess if the transformative strategies are acquisitive and could maintain the sport participation legacies after the Games.

Chapter 5 - Insight of the "300 Million" strategy with the integrated conceptual framework

Abstract: Beijing Winter Olympics has evolved for over a century, while new challenges and threats including human rights violation, discrimination and their impacts on social sustainability appear (Jackson & Dawson, 2021; Theodorakis et al., 2024). It is important to learn from the past of the Olympic movement regardless of the geographical and cultural distances among host nations. China impressed the world by hosting another splendid Olympics, the Beijing 2022 Winter Olympics, after the Beijing 2008, and keeping its promise of "Engaging 300 million individuals in winter sports". Besides curiosity about the number, many researchers have turned their eyes to the strategies, programs, and legacy delivery mechanisms behind them. More important, how Beijing 2022`s sports engagement legacy has benefitted public health by improving life quality (Song, 2022; Xiaoyan, 2023)? To answer the research question "How did Beijing 2022 motivate 300 million people to engage in winter sports?", we applied the integrated conceptual framework to close the aforementioned research gaps and inspect the legacy delivery process from the Pre-Games to the After-Games period. Primarily, we searched in Scopus and CNKI to review the preceding literature on the topic of the Beijing 2022 Winter Olympics. In Scopus, there were 40 documents related to the Beijing 2022 Winter Olympics. Most studies were in the branches of medicine, engineering, environmental science, and social science, written in English by Chinese scholars between 2015 and 2024. In CNKI, there were 3290 Investigations on the subject the Beijing 2022. The mainstream research is located in the branch of applied research, society development, and technical research written in Chinese by domestic academia between 2015 to 2024. The amount of publication increased fast from 2020 to 2022. National image, international communication, opening and closing ceremonies, security, and strategy analysis were the main focus of the prior studies. At the same time, there is a trend of conducting research on media and social media with the assistance of big data technology. Only 10 articles are closely related to winter sports participation, and the main discussions were in the area of physical education, while fewer investigations highlighted methodology. With the integrated conceptual model combining Critical Realism (CR) and the "Three-Source" Theory, this paper analyzed the efficiency and effectiveness of the "300 Million" strategy`s execution from the dimension of ideal and social reality. By adopting a qualitative approach with triangulation, we carefully examined how the three essential mechanisms, which we had identified in the previous study, impact the legacy delivery process and its relevant social sustainability before and after the Games. More specifically, we applied document analysis, big data analysis methods, surveys, and interviews to examine the change in Chinese netizens` attitudes and consumption behaviors over the past 9 years about winter sports participation. One of the highlights of this paper is the combination of big data analysis methods and traditional

qualitative analysis methods. It largely improved the accuracy, authenticity, and objectivity of data, and closed the knowledge gap created by big-data-based research concerning the tailoring of facts and truth due to different value assessments, researchers' entrusted theories, and demands (McFarland & McFarland, 2015). The results reveal that the pre-game legacy benefits not only the crucial stakeholders of Beijing 2022 but also the general public, while the long-term leverage effects are unpredictable due to changing conditions. Moreover, our findings strengthen the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable. This study recommends an ice-breaking attempt to develop bilateral paths (Profitable and Non-profitable) to facilitate the legacy delivery and to maintain the heat of winter sports development after the Games. We anticipate that this study will bring significant inspiration to IOC`s Knowledge and Games Learning (IKL) program, while providing some references to international collaboration in terms of improving social sustainability and stimulating regional development.

Keywords: Beijing 2022 Winter Olympics; integrated conceptual model; social sustainability; Critical Realism; Knowledge and Games Learning

I. Introduction

Winter Olympics has evolved for over a century, while new challenges and threats including human rights violation, discrimination and their impacts on social sustainability appear (Jackson & Dawson, 2021; Theodorakis et al., 2024). It is important to learn from the past of the Olympic movement regardless of the geographical and cultural distances among host nations. China impressed the world by hosting another splendid Olympics, the Beijing 2022 Winter Olympics, after the Beijing 2008, and keeping its promise of "Engaging 300 million individuals in winter sports". Besides curiosity about the number, many researchers have turned their eyes to the strategies, programs, and legacy delivery mechanisms behind them. One of the essential queries is how Beijing 2022`s sports engagement legacy has benefitted public health by improving life quality (Song, 2022; Xiaoyan, 2023).

At the material and artefactual level, the "Two Implementation Outlines and Three Plans", consisted of "Implementation Outline of `Encouraging 300 Million Chinese to Engage in Winter Sports` (2018-2022)", "Implementation Outline for Beijing 2022 Winter Olympics and Paralympics", "Work and Service Plan for Beijing 2022 Winter Olympics and Paralympics", "Technology Support Service Plan for Beijing 2022 Winter Olympics and Paralympics" and

"Anti-doping Work Plan for Beijing 2022 Winter Olympics and Paralympics", provide guidelines to the 7 years` preparation work. At the same time, 29 crucial official sports policy documents at national and provincial levels have been published to guarantee the progressive accomplishment of the "300 Million" goal.

Different from the understanding of influential international media, the "300 Million" goal has been specified as encouraging 50 million people to directly engage in ice and snow sports for sports competitions, fitness, and recreation. Meanwhile, the "300 Million" also involves large amounts of people indirectly engaging in winter sports, such as people who participate in winter tourism festivals, work in the related industry, and watch ice and snow sports events (Winter Sports Development Plan (2016-2025), 2016).

With the Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART) goals, the Chinese government gave a strategic hard push to the "300 Million" program in the preparation phase of Beijing 2022 and invested large amounts of human, financial, and material resources into education and infrastructure (GAS, 2016). To reach this ambitious goal, China released the geographic strategy "promoting ice and snow sports from north to south, east and west". The strategy highlighted the leading power of winter sports development in the Beijing-Tianjin-Hebei region while emphasizing the importance of the training base in the three northeastern provinces. Besides, China also put weight on expanding the talent pools in Xinjiang, Inner Mongolia, and other northwest and north China regions, which could inspire the coordinative development between north and south in terms of the dynamic growth of ice and snow sports (Winter Sports Development Plan (2016-2025), 2016).

Another essential strategy targeting maintaining winter sports enthusiasm is "promoting ice and snow sports on campuses". Until the end of 2020, China planned to establish 2000 primary and secondary schools integrating ice and snow sports into their normal curriculum. This number will reach 5000 by 2025. Besides figure skating, ice hockey, and alpine skiing, several traditional Chinese ice and snow sports, such as sled, ice skating, ice dragon boat, and ice soccer, have been prioritized in developing mass sports.

Although we have found the three crucial mechanisms in Study 1, less is known about the legacy process and deep mechanism. To answer the research question "How did Beijing 2022 motivate 300 million people to engage in winter sports?", we applied the integrated conceptual

framework to close the aforementioned research gaps and inspect the legacy delivery process from the Pre-Games to the After-Games period.

II. Literature review

1) Prior research on the topic Beijing 2022 winter Olympics

Primarily, we searched in Scopus and CNKI to review the preceding literature on the topic of the Beijing 2022 Winter Olympics. In Scopus, there were 40 documents related to the Beijing 2022 Winter Olympics. Most studies were in the branches of medicine, engineering, environmental science, and social science, written in English by Chinese scholars between 2015 and 2024. Medical achievement, technology advancement, and environmental sustainability have been addressed in the preceding investigations, while only Ainsworth and Sallis (2022) inspected the Beijing 2022 Olympic Winter Games` leverage on the mass sports participation of Chinese youth.

In CNKI, there were 3290 Investigations on the subject the Beijing 2022. The mainstream research is located in the branch of applied research, society development, and technical research written in Chinese by domestic academia between 2015 to 2024. The amount of publication increased fast from 2020 to 2022. There was an obvious decrease in 2023 and a quick bounce back in 2024 reached 1132 articles. National image, international communication, opening and closing ceremonies, security, and strategy analysis were the main focus of the prior studies. At the same time, there is a trend of conducting research on media and social media with the assistance of big data technology. Only 10 articles are closely related to winter sports participation, and the main discussions were in the area of physical education, while fewer investigations highlighted methodology.

Despite the large difference in the publication volume in Scopus and CNKI, most articles were issued in 2022. The events and technology-driven pattern has been inspected along with the influence of publication date and place. Moreover, the studies from Western scholars, especially on the mass participation legacy of the Beijing 2022 Winter Olympics remained minor.

Moreover, there has been a growing number of prior research on Beijing 2022`s "300 million" goals since 2019. Applied research and society development were the main research directions, where physical education is the niche that received the most research interest. However, the mass sports legacy delivery process still needs to be addressed. Most of the preceding research lacks the conceptual framework and quantitative data for an international comparison study.

2) Definition of sustainable winter sports participation legacy

The concept of sustainability emerged in the 1960s due to environmental degradation concerns (McKenzie, 2004). It was set as a goal for governments when the International Union for the Conservation of Nature (IUCN) proposed that economic growth could be harmless to the environment (Adams, 2006; Opp, 2017). Then this concept evolved into one concept with three major policy dimensions: environment, economics, and social well-being (Opp, 2017; Paehlke, 2013); in 1970. Social sustainability, which has been recognized as one of the three pillars of sustainability (The other two pillars were: economic and environmental sustainability), received relatively less research attention (McKenzie, 2004; Polèse & Stren, 2001). The mainstream former investigations on social sustainability addressed it from the perspective of improving quality of life, social integration, etc.

In the context of SMEs, sports participation legacy, which could be used as one of the crucial indicators of social sustainability, has been studied often. Although Gratton & Preuss (2008) provided a comprehensive concept of legacy as `planned and unplanned, positive and negative, intangible and tangible structures created through a sports event that remain after the event`, the complexity and diversity of winter sports activities (Brownill et al., 2013; Byers et al., 2019) made it difficult for scholars to define and measure winter sports participation legacy. Should we count on the number of visits to ski resorts and ice rinks? Or the length of time spent at the spot and the type of winter sports activities should also be taken into consideration? Moreover, the majority of prior research concerning sports participation legacy focuses on the outcomes (For example: the increased numbers of people engaging), rather than the methods, instruments, and mechanisms.

III. Methods

1) Overview

Since the last chapter has focused on intangible, observable aspects of the winter sports engagement of the Beijing 2022 Winter Olympics, this chapter inspects the attitude-changing, motivation, and demographic features of Chinese who participated in winter sports activities and highlights the applicable knowledge stemmed from the three crucial mechanisms "Beneficial sports policy and economic progression", "Provision of facilities accompanying the integration of sport and education", and "Cooperative stakeholders` alliance strengthened by media power and technology".

Following the conceptual model developed in Chapter 3, we engaged triangulation, and the Qualitative Quantitative Mixed Method to study the legacy delivery process at the `ideal layer` and `social layer`. More specifically, we applied document analysis, big data analysis methods, survey, and interview to examine the change in Chinese netizens` attitudes and consumption behaviors over the past 9 years concerning winter sports participation.

Big-data-based research enables academia to tailor the facts and truth according to their value assessment, entrusted theories, and demands. However, pioneering researchers, such as McFarland (2015), have revealed that the application of the found data and standard statistical processes tends to create many statistically significant effects for what may be a non-representative subpopulation. Moreover, the increasing social and political polarization could facilitate cognitive manipulation based on big data and challenge the fundamental value of science and truth.

Regarding the characteristics of Chinese winter sports development and the bias created by big data analysis methods, we also conducted surveys and interviews in the "Big Health Industry" to improve the accuracy, authenticity, and objectivity of the data. The survey and interview with a small sample size, selecting a part from a whole, addressed the importance of scientific sampling and offered additional inferences to improve public health and life qualities through winter sports participation.

2) Data collection and selection

The cumulative data from the official survey and prior investigations haven`t provided an in-depth view of the legacy delivery process and the internal mechanisms that determine the sustainability of this legacy after the Games. Therefore, we collected empirical and secondary data from 2015 to 2024, covering the official timeframe from the Pre-Games to After-Games legacy. For document and big data analysis, secondary data have been retrieved from the official website and policy documents of GAS and CWSF, the Olympic World Library, Scopus, CNKI, Statista, and so on. In contrast, we collected empirical data through 3 expert interviews and 60 questionnaires. The interviews and surveys aim to scrutinize the collective features, priority settings, and winter sports participation patterns of people working or studying in Chinese education, sports, and medicine who have practiced or experienced winter sports during the past 9 years.

Different indicators have been selected based on the requirements of the integrated conceptual framework and the following criteria:

Relevance: The indicators must be relevant to the research question, which is to inspect the critical mechanisms of the mass participation legacy of the Beijing 2022 Winter Olympics.

Availability: The indicators must be available from 2015 to 2024.

Reliability: The indicators must be valid measures of winter sports participation.

3) Data analysis

Firstly, we independently examined each category of variables and performed descriptive analysis and thematic analysis. Then, we compared the tendencies and features of Chinese ice and snow sports engagement that have been identified by applying big-data technology and the traditional social science research method. During the process, we launched regression analysis to inspect the attitude and behavior changes before and after the Beijing 2022 around Chinese winter sports participation. Meanwhile, we engaged the Pearson r test to examine the impact of different variables on mass participation. All cut-off values followed Thomas et al.'s (2005) guidelines for small sample sizes, with statistical significance set at the 0.05 level.

IV. Results

For the secondary data analysis, 44 documents and relative data sets have been inspected. To investigate how different stakeholders and Chinese society interacted with the winter sports policy for Beijing 2022, We collected and analyzed empirical data through 3 interviews and 60 questionnaires following the same scientific sampling concept and design.

It is worth noticing that the results of our interview and survey demonstrate the same features as the official survey conducted by the General Administration of Sport of China (GAS) and the National Bureau of Statistics of China (NBS). The interviews collected the opinions of decision-makers and senior managers on the social sustainability of Beijing 2022`s sports participation legacy and the answer rate of our survey is 58.33%, where people in the Chinese education and medicine industry gave more attention to the topics (With the answer rate of 63.33% and 66.67%). The attention distribution pattern and high answer speed of each survey (5 minutes on average, 3 times faster than expected) demonstrated the same pattern and features as we figured out through big data analysis methods. In addition, the empirical data provide more precise information about the attitude and behavior changes at ideal and social layers, fulfilling the information gaps created by media bias, population bias, and activity bias (McFarland & McFarland, 2015).

1) The beneficial sports policy and economic progression

Referring to the demographic data, the official survey conducted by the GAS and NBS revealed the multi-factor interactions among beneficial sports policy, educational background, winter sports atmosphere, infrastructure, and economic and social status. From the dimension of social reality, BOCWOG submitted the final report to the IOC in 2023 indicating that the participation rate of Chinese women is higher than men at indoor skating or skiing centers. Most Chinese participants used to experience ice sports (Wu et al., 2023), while China has been considered as one of the biggest beginners` markets at the global level with a strong policy-driven feature and significant events' leverage effects. The majority of participants were in the age group of 18-30. At the same time, the 46 million young Chinese under the age of 18 (IOC, 2023), were the new power to leverage the winter sports consumption. Regarding the participation frequency, most of the interviewees (38.43% of the total) participated in winter sports 1 to 2 times per year (GAS, 2022b). Furthermore, 85.21% of interviewees held a positive attitude towards the holding of Beijing 2022, while 57.04% of people were satisfied with the current

atmosphere and supply in support of winter sports activities (GAS, 2022). However, Xinhua News, China Ski Industry, White Book, and some foreign scholars expressed their concerns about the Chinese ski business in terms of the learning process influenced by the one-off consumption pattern (Vanat, 2022) and some popular fast fashion products in the Chinese winter sports market, represented by the 2-4 hours skiing package (Bin et al., 2023).

In contrast, our survey, targeting people in the "Big Health Industry" with all ages and educational backgrounds, revealed that most of them participated in winter sports during their stay at university since 2020. Skating, skiing, and snowboarding were the top 3 sports, chosen by the participants aged from 19 to 36. It is worth noticing that ice sports remained the major winter sports despite snow sports grew popularity. Despite the gender differences, the tendencies to experience diverse winter sports were the same (See Table 8).

Table 8. Gender Difference in Relation to Sports Selection

	Ice skating	Skiing	Snowboarding	Curling	Ice Hockey	Others
Men	**7**	**11**	**3**	**0**	**1**	**1**
Women	**14**	**9**	**3**	**0**	**0**	**1**

After the hosting of Beijing 2022, BOCWOG issued new strategies and plans guiding the post-games legacy. Without the hard push from the government, maintaining and increasing mass participation largely depends on the power of the market and society. The commercial report from CHNCI first reported that 57.35 million Chinese directly engaged in ice and snow sports in 2024 (CHNCI, 2024). The behavior adjustments started from the changes in public opinions, aesthetic sense, and value assessment.

Table 9 displays that 74.29% of the participants felt happy when they first heard the "300 Million" goal, while 34.29% expressed their surprise about the target setting. After Beijing achieved the goal, the ratio of happiness increased, and the number of people feeling surprised decreased, while the most emotional changes were found in the group with bachelor's or master's degrees.

Table 9. Participants` Reaction of Hearing the "300 Million" Goal

First Hearing the "300 Million" Goal							
Emotion / Age	Happiness	Sadness	Disgust	Fear	Surprise	Anger	Others (Please Describe)
Kindergarten	0	0	0	0	0	0	0
Primary School	0	0	0	0	1	0	0
Secondary Vocational School	0	0	0	0	0	0	0
High School	0	0	0	0	0	0	0
Tertiary and Higher Education School	0	0	0	0	0	0	0
Bachelor	13	0	0	0	5	0	2
Master	6	0	0	0	3	0	0
PhD	7	0	0	0	3	0	0
Post-doc	0	0	0	0	0	0	1
Fellow	0	0	0	0	0	0	0
Noticed the Achievement of the "300 Million" Goal							
Kindergarten	0	0	0	0	0	0	0
Primary School	1	0	0	0	0	0	0
Secondary Vocational School	0	0	0	0	0	0	0
High School	0	0	0	0	0	0	0
Tertiary and Higher Education School	0	0	0	0	0	0	0
Bachelor	14	0	0	0	3	0	2
Master	7	0	0	0	1	0	1
PhD	7	0	0	0	3	0	0
Post-doc	1	0	0	0	0	0	0
Fellow	0	0	0	0	0	0	0

Corresponding to the opinions` change, Figure 17 displays the actions taken by Chinese winter sports consumers. The target groups participated in ice and snow sports activities 2 times per season on average, and the enthusiasts practiced the selected sports more than 4 times each season. More important, our survey identified no significant changes in behavior in terms of participation frequency, before and after the host of Beijing 2022 among the target groups working or studying in the Chinese education, sports, and medicine industry. And the target groups in the Chinese “Big Health Industry” have comparatively higher levels of continuity after the hosting of Beijing 2022.

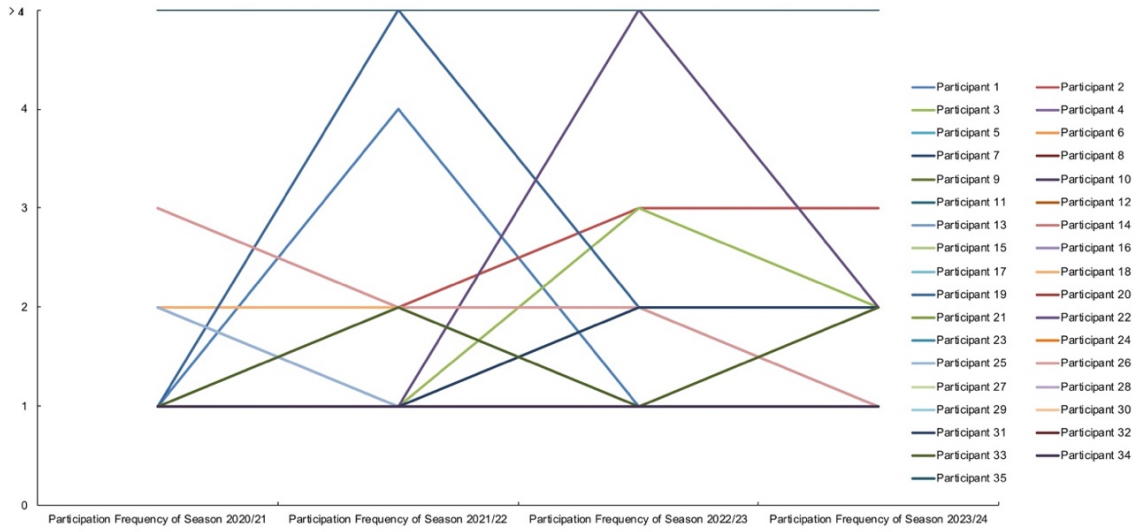

Figure 17. Participation Frequency per Season Two Years Before and After the Beijing 2022 Winter Olympics and Paralympics

Furthermore, we identified that at the ideal reality level, the pre-game legacy benefits not only the crucial domestic stakeholders of Beijing 2022, such as Chinese national authorities, host cities, social organizations, public institutions, and enterprises, but also the international stakeholders following IOC TOP program and IOC`s Knowledge and Games Learning (IKL) program (See Table 10).

Table 10. Stakeholders` Role and Perspectives for the Realization of the "300 Million" Goal

Stakeholder	**Role and Function**	**Perspective and Reflects to the Sports Policy and Regulations**
General Administration of Sport and Sub-Organizations	Formulate strategies, goals, and overall plans for the development of winter sports, build a national training team for ice and snow events and provide strong support in terms of talent, funds, and materials.	Reflect and evaluate, formulate and revise relevant policies and regulations.
National Development and Reform Commission and Sub-Organizations	Special inspections to meet the energy supply needs of the Winter Olympics and promote the resolution of related issues. According to the division of labor of the Beijing Winter Olympics Organizing Committee, as a member of the Winter Olympics Leadership Group, the National Development and Reform Commission has a total of 22 supporting tasks. Report and issue a policy document on building a higher level of public service system for national fitness, propose to strengthen the construction of infrastructure related to ice and snow sports, and support the construction of the Ice and Snow Silk Road Belt.	Actively cooperate, supervise and complete relevant tasks in accordance with the division of labor of the Beijing Winter Olympic Organizing Committee.
Education Ministry and Sub-Organizations	Jointly formulate policies and actively promote education-related activities such as ice and snow sports entering campuses, and provide policy, talent and funding support for the popularization of winter sports.	Co-lead the Winter Olympic-related talent training work with the sports authorities. The overall response is positive.

Industry and Information Ministry and Sub-Organizations	Strengthen communication with the Sports Bureau, promote the formation of the ice and snow sports industry alliance, the development of the ice and snow equipment industry, and highlight the leading role of 5G applications to integrate scientific and technological elements into the Winter Olympics.	Co-lead the Winter Olympic-related science, technology and information work with the sports authorities. The overall response is positive.
Civil Affairs Ministry and Sub-Organizations	Formulate relevant policies and standards with other ministries and commissions. Promote mass winter sports. Improve the government's mechanism for purchasing public services from social forces.	The overall response is positive.
Finance Ministry and Sub-Organizations	Include eligible winter sports venues and facilities in the scope of free or low-cost opening subsidies for public sports venues; encourage financial institutions to expand financial services in the field of mass winter sports on the basis of controllable risks and sustainable business; encourage social capital to increase investment in mass winter sports through sole proprietorship, joint ventures, cooperation, joint ventures, leasing and other channels, and adopt franchise, public-private partnership, private-public collaboration, and other methods.	The overall response is positive.
Personnel/ Human Resource Ministry and Sub-Organizations	Provide support for the Winter Olympics in terms of human resources.	The overall response is positive.
Land and Resources Ministry and Sub-Organizations	Coordinate with the State Sports General Administration and other relevant departments to jointly issue relevant policies, regulations and standards. Land development and use authorization. Cooperate in providing service and guarantee work for the land use of facilities related to major sports events such as the Winter Olympics.	The overall response is positive.
Ministry of Housing and Urban-Rural Development and Sub-Organizations	Provide guidance, support, and service to guarantee the success hosting of Winter Olympics throughout the whole process. Ensure safe production during the Winter Olympics, participate in the work of the urban environment and logistic systems` advancement. Strictly prevent accidents, to create a safety production circumstance in the whole Winter Olympics area.	The overall response is positive.
Water Resources Ministry and Sub-Organizations	Coordinate and ensure the water supply for the Winter Olympics.	The overall response is positive.
Agriculture Ministry and Sub-Organizations	Guarantee the steady, high-quality, and safety supplies of agricultural products in the cities of the Winter Olympics and the competition area. Appoint specific personnel to implement on-site supervision on the basic supply to the Winter Olympics, form an expert team to strengthen technical support, supervise the scientific and standardized application and allocation of input resources. Strictly implement the full-process control and encourage self-inspection. Coordinate and control of agricultural product quality, prevent risks from food stimulants etc.	The overall response is positive.
Culture Ministry and Sub-Organizations	Provide guidance and services related to the Winter Olympics culture and tourism, create brand effect of the Winter Olympics, and let the development results benefit more people.	The overall response is positive.
People's Bank of China and Sub-Organizations	Provide financial service to guarantee the delivery of Games and support the development of ice and snow sports industry.	The overall response is positive.
General Administration of Customs and Sub-Organizations	Serve the Beijing Winter Olympics effectively and provide a solid service to guarantee the customs clearance.	The overall response is positive.

State Administration of Taxation and Sub-Organizations	The tax department has carried out various forms of guidelines and policies of tax and fee to support the Winter Olympics. The Beijing Taxation Bureau, cooperating with the Finance Department of the Beijing Winter Olympics Organizing Committee, has conducted joint research in 10 Beijing districts, including Chaoyang and Haidian, and address the key issues, such as the implementation of the Winter Olympics tax policy and evaluation criteria for the Winter Olympics. The Winter Olympics tax policy for overseas entities and individuals were released on a bilingual basis. For the consultant, the critical documents were translated accurately and co-ordinately. The "Winter Olympics Tax Service Hotline" opened online service to answer questions in English. Besides, multilingual consulting services, including Japanese, Korean, Russian, French, German, etc. were provided.	The policy and service fully support the Winter Olympics.
State Administration for Industry and Commerce and Sub-Organizations	Take the preparation of the Winter Olympics as an opportunity to advance the winter sports industry and other related industries, implementing new development concepts, continuously improving the level of openness and transparency, and actively building a new pattern of domestic and international dual circulation. Assist the Winter Olympics Organizing Committee by coordinating fund, strengthening financial management, implementing frugal games, and ensuring the sufficiency of Games funding.	Active response. And provide comprehensive guarantee to the Games.
State Forestry Administration and Sub-Organizations	Lead the reform of green and low-carbon technology, together with the Olympic Committee. Be responsible to environmental sustainability, and forestry ecological construction.	The response is positive and the results are obvious.
National Tourism Administration and Sub-Organizations	Focusing on young people, the administration guided the public to participate in ice and snow sports, for the promotion of fitness and leisure time events. The activities and events meet the public's multi-level and diversified needs. At the same time, it highlighted the market-led and government-guided winter sports evolving pathway. It made great efforts in the supply-side structural reform of ice and snow sports, expanding the scope of the sports, improving the quality of events, and strengthening the market mechanism. Besides, It targeted at good-governance, formulated policies, and created a social atmosphere that highly values and supports the engagement of winter sports. To enhance ice and snow sports industry, it encouraged the interactive integration of ice and snow sports and other related industries, such as healthcare. With the innovate methods, the administration and sub-organisations played a radiating and driving role in facilitating regional economic and social development.	Active response, and the feedback from various regions is different.
China Insurance Regulatory Commission and Sub-Organizations	Encourage insurance institutions to grow winter sports insurance products to attract enterprises, schools, and individuals to purchase liability insurance and insurance related to sports injuries. Encourage insurance institutions to create comprehensive ice and snow tourism insurance service packages, and evolve products in the area of venue liability and facility property etc. Promote the liability insurance, insurance of sports injuries, and travel rescue insurance to business entities and individuals. Strengthen risk management and provide toolbox for risk management. Establish and improve the volunteer service and rescue system. Improve the knowledge and awareness of	Active response, and the feedbacks from various regions are different.

	tourists in safety publicity, safe ice and snow sports, and injury/ risk prevention. Besides, the Beijing Banking and Insurance Regulatory Bureau guided institutions to leverage the integration of digital RMB and Winter Olympics.	
Labor and Social Security and Sub-Organizations	Cultivate various talents for the Winter Olympics and related industries. Strengthen the linkage of the "four industries" (industry, enterprise, entrepreneurship, and employment) to promote employment and increase income. Innovate training ideas and enhance employment skills. Continuously optimize services and improve the social security system.	Active response, and the feedbacks from various regions are different.
Communist Youth League of China	Carry out the "Charming Winter Olympics" cultural program. Promote "Sharing the Winter Olympics" youth ice and snow sports program. Deepen the "Protect the Mother River" action, with the theme of "Assisting the Winter Olympics". Vigorously carry out the "Beijing-Tianjin-Hebei-Shanxi-Inner Mongolia Youth" joint action to increase greening and reduce haze, build a "Green Beijing-Zhangjiakou Railway Youth Demonstration Forest". Assist the achievement of the "Green Winter Olympics" goal with practical actions, such as planting and protecting green, "Clean Plate" action, water conservation and protection, green travel, etc. Promote "Dedicate to the Winter Olympics" program to encourage the volunteering. Carry out the "Meet at the Winter Olympics" youth international exchange campaign.	Active response, and the feedbacks from various regions are diverse.
All China Women's Federation	Promote women's development, gender equality, and the protection of women's rights in terms of winter sports.	The survey report of commercial platforms such as Tmall shows that women have made significant contributions to China's ice and snow sports, as well as the related consumption.
The China Disabled Persons' Federation	Promote the development of disabled sports. Protect the human rights of disabled people through the promotion and dissemination of winter sports.	Active response, and the feedbacks from various regions are divergent.
IOC and Stakeholders from Olympic Partners Programme	Provide essential guidelines and resources based on Olympic charters and host city contract.	Different stakeholders have dissimilar feedback based on their real contribution and benefits from the activities.
Stakeholders from IOC`s IKL Programme	IKM developed a top-level framework for all kinds of talents. IOC took main responsibility to the knowledge management and knowledge transfer to Organizing Committee (OCOG) and the OGKM integrated into the Games from the Games planning stage to the after Games legacy stage.	The feedbacks from stakeholders are at variance, corresponding to their real contribution and benefits from the activities.

For the Post-Games consumption tendency, we interviewed leaders and experts at the decision-making level and management level for the sustainability and legacy of the Beijing 2022 Winter Olympics. An expert from GAS shared his personal view on the changing of winter sports participation after the Games, saying "After the Beijing 2022 Winter Olympics, the development of ice and snow sports will not increase rapidly in a straight line, nor decrease fast... While the development of competitive sports and mass sports tend to reach a balance…

Some factors contribute to the fluctuation of ice and snow sports development… Economic development is the foundation, of course… Through the development and examination of the 2 Olympics, the amount of 300 million people involved in ice and snow sports won`t decrease." A professor in the physical education and training area from one of the main partner universities of BOCWOG remarked that the high-risk nature and some traditional senses have been the main barriers preventing Chinese consumers from directly participating in ice and snow sports.

Some leading scholars examined whether Beijing 2022 stimulated Chinese customers' needs for winter sports facilities, equipment, and services. For instance, the results of expert interviews and commercial surveys confirmed the efficient and temporary leverage of the demands in the Pre-Games period. At the same time, the previous investigations examined that time availability, economic factors, and the living value assessment significantly influence Chinese winter sports enthusiasm after the Games. Moreover, cultural norms, consumption structures, and educational programs can either facilitate or hinder the adoption of winter sports as part of Chinese culture and national identity (Han & Zhao, 2024).

In line with the mainstream voice, our outcomes also indicate that the choices and consumption patterns have been shaped by sports policy and related strategic goals expanding winter sports throughout China. Despite the comparatively higher levels of participation and continuity, we diagnosed that lack of time, suitable facilities in the range, and socioeconomic conditions prevent Chinese customers from recruiting and retaining in winter sports. And there is a correlation between each barrier before and after achieving Beijing 2022`s "300 Million" goals (see Figure 18).

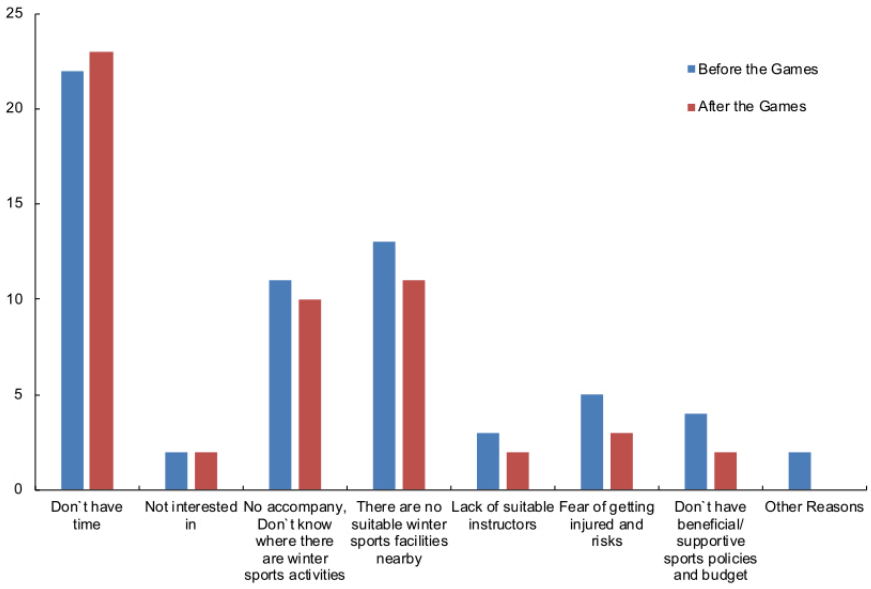

Figure 18. Barriers Deter Chinese Winter Sports Participation Before and After the Achievement of the "300 Million" Goal

Note. In the regression analysis, the r= 0.99, p= 0.01< 0.05, the coefficients= 1.73

In short, our results indicate that the sports policy benefits not only the crucial stakeholders of Beijing 2022 but also the general public, while the long-term leverage effects are unpredictable due to changing socioeconomic conditions and the market equilibrium.

2) Impact of winter sports education, facilities and events

Beijing 2022 fully mobilized all sectors of society to participate in the Games and took advantage of establishing training bases inside schools and universities, providing professional and international talent training, and deepening collaboration through the evolution of education and IOC`s Knowledge and Games Learning (IKL) program (Fourteenth Five-Year Plan for Sports Development, 2021).

For the short-term leverage, we identified that the "festival effect" and "demonstration effect" heavily impact public opinions and Chinese winter sports development. Figure 19 displays a strong correlation between the Olympic Games schedule and the concentration of public attention.

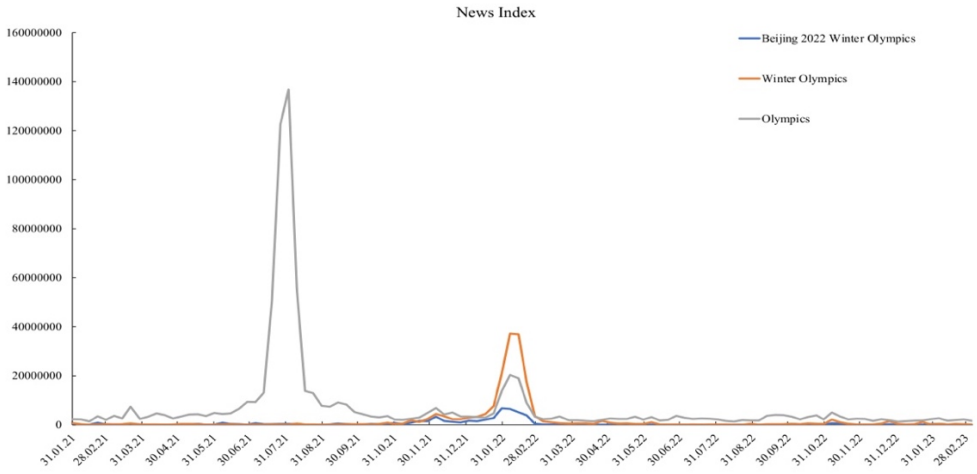

Figure 19. Change of Public Attention on the Topic One Year Before and After the Games

According to our survey, the majority of participants attended winter sports festivals and took part in one-off experience, while master's and bachelor`s students took more diverse methods to engage in winter sports, including committing to regular courses and autonomous practice and competing for excellence (See Figure 20).

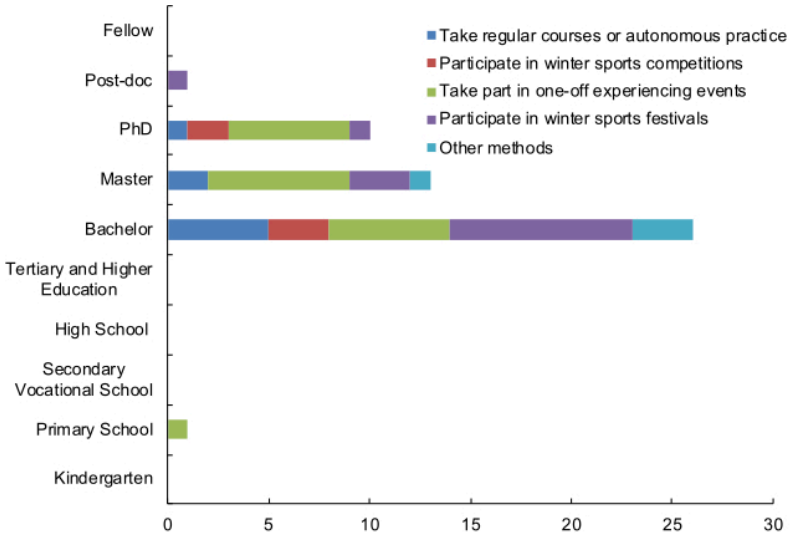

Figure 20. Methods of Participating in Winter Sports

For the continuous engagement, many universities, schools, and other types of stakeholders organize science tours, educational events, industrial forums, academic conferences, exhibitions, and cultural events in the famous winter sports facilities, especially those in competition zones (BOCWOG, 2022b) to inspire young people, their families, and celebrities. We verified that ice and snow sports kept catching Chinese attention after the Beijing 2022 not

only in the province that undertook the mission to develop winter sports, but also in other cities, such as Henan, Hubei and Shandong (see Figure 21).

Figure 21. Distribution of Chinese Netizens Interested in Ice and Snow Sports

The spreading of Chinese winter stimulated the construction of commercial ice rinks, indoor skiing areas, and the application of ski simulators. The stakeholders cooperate to build public and commercial winter sports facilities with domestic or international standards. there are non-profit venues with low access barriers, leisure facilities with various qualities owned by profit-making companies, as well as high-end facilities funded by different types of organizations for training and competition. At the same time, the Chinese government also facilitated winter sports development by offering educational and training opportunities, deduction in taxation and operating costs, and support in finance and technology (National Construction Plan for Ice and Snow Sports Venues (2016-2022), 2016). Accompanying the construction of winter sports venues, the Beijing 2022 advanced the infrastructure and public services in the areas of telecommunications, accommodation, catering, medical care, education, etc. (BOCWOG & Beijing Sports University, 2022).

The supply of sports facilities should meet public demands. Our results of document and big data analysis reveal that Catering, Medicine & Health Care, and Education & Training were the main concerns influencing the consistent Chinese winter sports participation (see Figure 22). Whilst recreational motivation, fitness and well-being intention, and hobby and lifestyle ranked as the Top 3 motivations according to the official survey from GAS and NBS (GAS, 2022b)

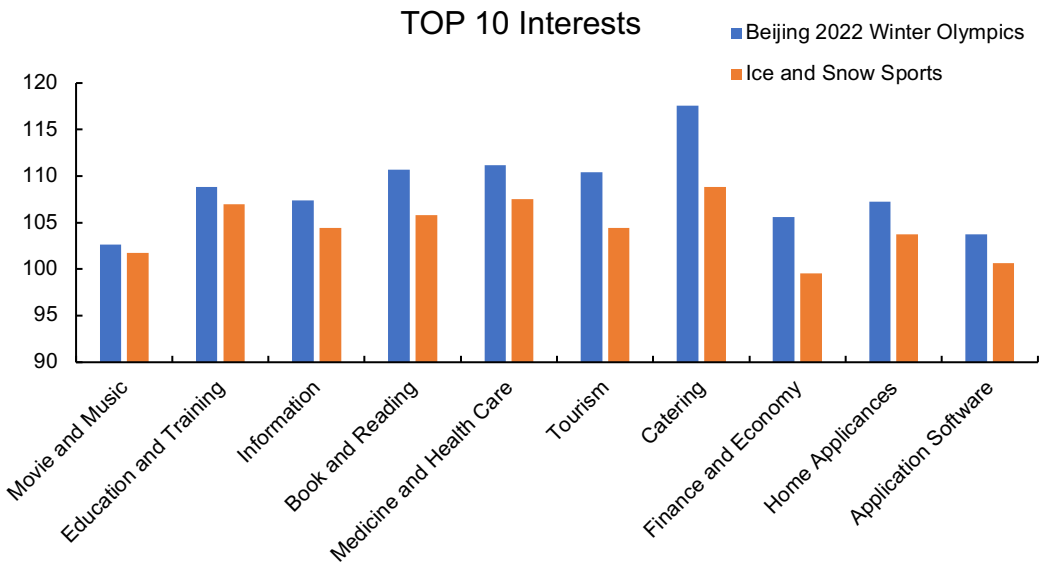

Figure 22. Top 10 Motivation Drives Chinese Winter Sports Participation (Post-Games)

Note. TGI reflects consumer attitudes, habits, motivations and behaviors.

In contrast, our survey strengthened the argument that most Chinese engaged in winter sports for happiness, well-rounded development, and well-being. 80% of participants prefer to go ice and snow sports with family and friends, while about 22.86% of respondents used to practice the sports by themselves (see Figure 23). Most Chinese women were motivated by their family and friends, while the percentage of autonomous engagement was higher among the men.

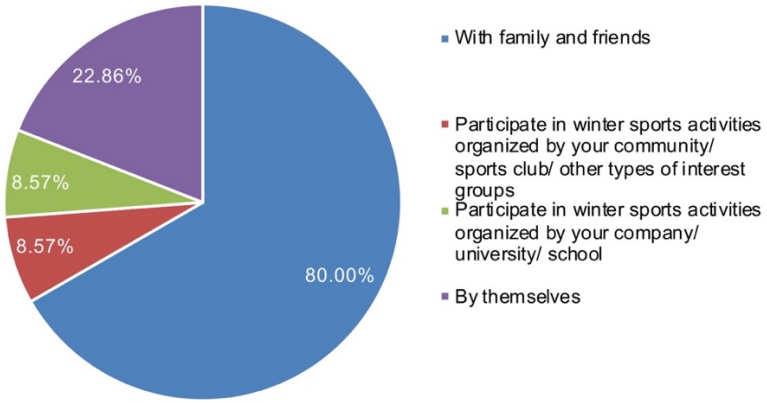

Figure 23. Social Interaction and Winter Sports Engagement Situation in China

In the post-Games phase, we identified that the decrease in winter sports participation frequency is corresponding to the individual time, resources availability, and the conditions of sports facilities (see Figure 24). Besides, the most changes took place among the enthusiasts

with bachelor`s and master`s degrees, where the Chinese 00s and Generation Z lead this fashion.

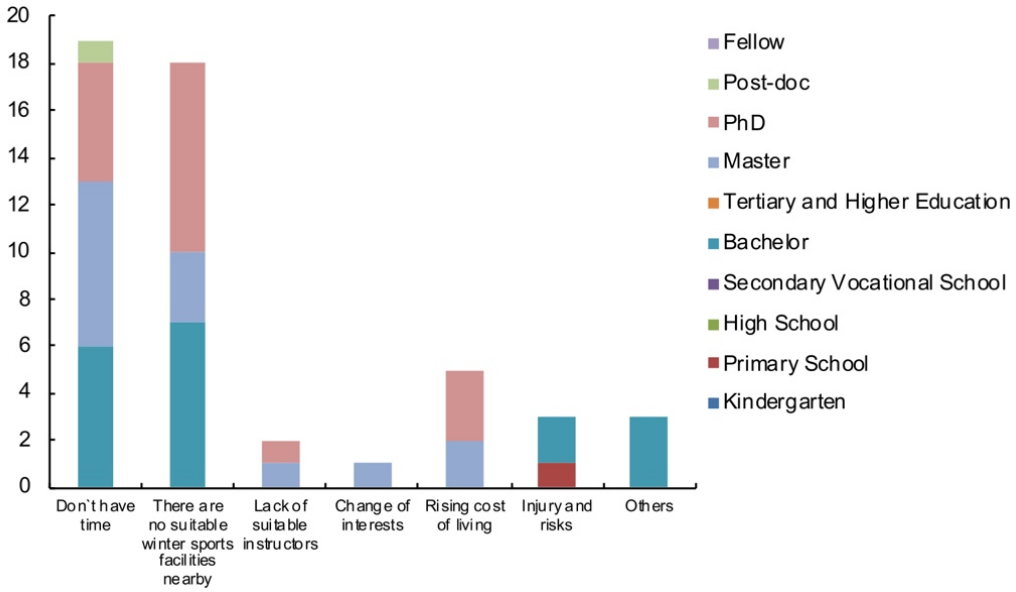

Figure 24. Reasons Behind the Frequency Change after Achieving the "300 Million" Goal

As the target group of winter sports consumption, 00s and Generation Z caught more public attention. Big data analysis revealed that Chinese young generations hold a more positive attitude towards winter sports participation after the Games (See Figure 25).

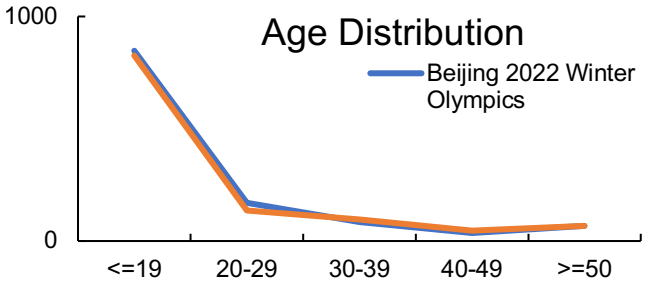

Figure 25. Chinese Netizens Interests on Beijing 2022 Winter Olympics and Winter Sports Categorized by Age

Note. TGI reflects consumer attitudes, habits, motivations and behaviors.

Regarding the gender difference, Chinese women netizens show more interest in winter sports and the Beijing 2022 Winter Olympics than men (see Figure 26). This consumption tendency has also been confirmed by several international and domestic commercial reports on Chinese ski market.

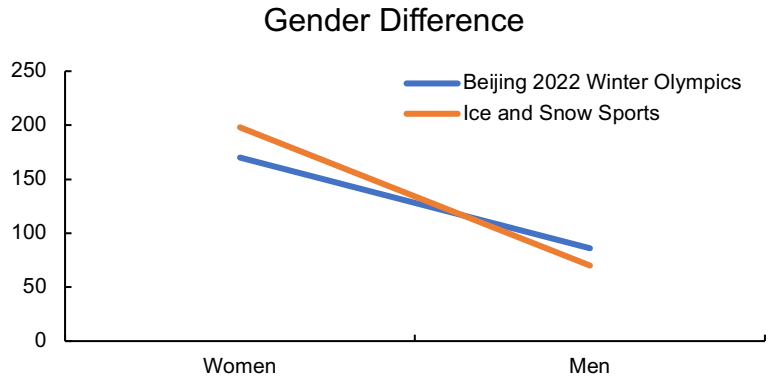

Figure 26. Chinese Netizens Interests on Beijing 2022 Winter Olympics and Winter Sports Categorized by Gender

Note. TGI reflects consumer attitudes, habits, motivations and behaviors.

3) Media and social media forge the stakeholders` alliance

The host cities, such as Beijing, actively explore the "winter sports +" mode and drive the systematic upgrade of the ecological environment, sports tourism, winter sports culture and technology etc. The Beijing 2022 also incubated new sponsorship models closely related to branding and media presence, such as the "Joint Exclusive". PetroChina and Sinopec reached an internal agreement and became the official oil and gas partner for the Winter Olympics, together. Good initial progress in the attraction of foreign investment and introduction of technologies were achieved in the process (BOCWOG, 2020).

The majority of stakeholders took Beijing 2022 as an opportunity to gain or maintain market shares, accelerate their organizations' development, and take social responsibility through organizing educational programs and sports events at winter sports spots. The knowledge management and transfer programs strengthened the stakeholders` alliance covering the scope of all three sectors, through the share of a common vision, the communication in the supply chain, as well as the engagement of diverse cooperation partners. Know-hows offered expertise through IOC`s knowledge transfer and management programs in the area of competition organizing, track building, and Games services, etc. While international experts and foreign talents helped to establish relations with organizations in Russia, Finland, and other countries (BOCWOG, 2019). With their contribution, BOCWOG selected 2,878 National Technical Officers (NTOs), built more than 322 snow sports specialists and 140 ice sports specialists, and trained 1,700 experts for the Game devoted to comfortable accommodation, secured transport

logistics, and medical service. At the same time, BOCWOG has created numerous job positions and recruited 36 domestic and international experts, who have been working across its 10 departments.

In cooperation with sports policy and the official knowledge management and transfer programs, media and social media provide open platforms for communication and negotiation between decision-makers and society. To have an insight view of the social demands, we use sentiment analysis assisted by the Baidu index to inspect Chinese news on the topics of the Beijing 2022, Winter Olympics, and Olympic Games (see Appendix D). The preferences of celebrities and the government have investigated.

Table 11 demonstrated that from the Pre-Games period to the After-Games period (More specifically, from Season 2015/16 to Season 2023/24) Chinese netizens pay more attention to the specific event- Beijing 2022 than the Winter Olympics in general. Compared with Summer Olympics, Winter Olympics received less public attention. The reason was that most provinces in China have no winter sports tradition and culture.

Table 11. Search Index on the Winter Sports Participation Related Topics from 2015 to 2024

Search Index		
Keywords	**Overall Daily Average**	**Daily Average (Mobile Client)**
Beijing 2022 Winter Olympics	21,307	18,266
Winter Olympics	12,296	9,765
Olympics	38,236	24,429

Note. The Season has been divided based on the fiscal year of Chinese ice and snow sports industry, which begins from 01. May of the same year and ends on 30. Apr. the next year.

For the mass participation legacy after the Games, our research highlighted that social media (Especially short video and vertical App), social networks, and E-commerce platforms empower the promotion of Skisport in China and strengthen the stakeholders` alliance (see Figure 27). Compared with the Pre-Games legacy, driven by sports policy, the After-Games winter sports participation is most likely to depend on the power of the market and society. The most popular platforms Chinese used to share their skiing experience, techniques, and tourism information are Xiaohongshu, Wechat, and Douying/Tiktok, according to big data analysis (Analysys, 2024).

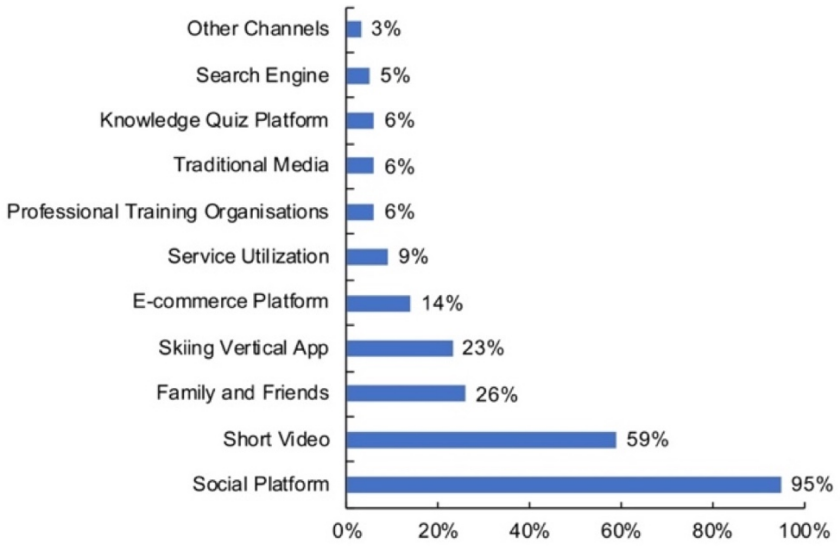

Figure 27. Main Channels that Chinese Enthusiasts Applied to Capture the Skiing Related Information

Source. Insight of Chinese Skisport`s Development 2024 (Analysys, 2024)

V. Discussion

1) The double-edged swords: Beneficial sports policy and resource concentration

China has successfully increased the winter sports participation rate through "promoting ice and snow sports on campuses" and "promoting ice and snow sports from north to south, east and west" programs etc. The programs strengthened the foundation of mass participation by creating 835 model schools and 2,062 winter sports featured schools (BOCWOG, 2022b). According to an external evaluation from Statista Research Department, the Chinese government and various stakeholders have poured around 38.5 billion U.S. dollars into the Beijing 2022, where infrastructure construction work took the biggest share (Statista Research Department, 2023). The mass participation leverage highlighted efficient sports policy and sufficient supply in the Pre-Game phase and the hosting time.

From the supply dimension, the Beijing 2022 organizers closely collaborated with stakeholders making great efforts to guarantee the success of the event and stimulate the host city's development. From the demand perspective, the general public has responded positively to the "300 Million" goal and related programs. However, the results also demonstrate an obvious

gap between supply and demand regarding changes in sports policy and tangible social demands in the post-Games period.

Chinese central government is more likely to give power to the market and society for the winter sports engagement accompanying the further development of the winter sports industry after the successful hosting of Beijing 2022. Without the hard push of government, some tangible social demands may decrease due to unpredictable market conditions, consumers` preferences, and time/resource management strategy.

Thus, it can be summarized that the dialectic nature of beneficial sports policy, in coordination with the centralized resource allocation method, acts as a double-edged sword for the long-term leverage of winter sports participation.

2) Sports facilities and high-tech to tackle the growing wealth gap

The mainstream reports and research supported the argument that the success of Beijing 2022 satisfied people's expectations for a better life by improving infrastructure and promoting winter sports education. The national education system was the primary implementation pathway for increasing winter sports participation among young people, featuring thousands of schools and universities in urban or rural areas, and providing direct communication platforms, financial resources (Chen et al., 2022), and training facilities. Besides the training bases inside schools and universities, there were indoor and outdoor commercial ice rinks and snow resorts across China. In coordination with regional development strategy, social and economic advancement, and the vision of stakeholders, different winter sports facilities choose either a profit or non-profit model.

The non-profit model has been represented by the three northeast provinces, including He Longjiang, Jilin, and Liaoning, which have a long tradition of winter sports. Despite the advantages of public funding, they faced the common challenge of rejuvenating old industrial areas. For future development, multi-channel investment and social support have been encouraged to stimulate winter sports tourism and high-tech equipment manufacturing. The profit model grew popular in some Tier 1 Chinese cities, such as Beijing, Shanghai, and Guangzhou prioritizing the preeminent and high-end development of winter sports. With the dual-complementary modes, China obtains the great potential to maintain winter sports participation and create new socially sustainable legacies after Beijing 2022.

Besides the integration of winter sports and education, the combination of tourism and high-tech also facilitates the engagement of winter sports. Yanqing district of Beijing actively explores the "winter sports +" mode and drives the interconnected development of ecology, education, technology and other sectors. Moreover, the guesthouse industry witnessed rapid and orderly growth, creating a large number of jobs. More importantly, knowledge is the driving force that enables young people to close the wealth gaps. BOCWOG has worked closely with the IOC Olympic Games Knowledge Management team to use digital technologies and information platforms for Games knowledge management, staff training, and education (BOCWOG, 2022). These actions leave a rich legacy of volunteering and Chinese winter sports expertise after the Games.

However, several field studies indicated that there is a shortage of skiing resorts approach Western standards, despite the Beijing 2022 accelerated construction of ice and snow sports venues and the upgrade of related infrastructure. Some studies criticized that most ski areas were badly equipped and could only satisfy the needs of beginners (Vanat, 2022). Thus, GAS in cooperation with the National Development and Reform Commission and the other two national-level governing bodies issued the Winter Sports Development Plan (2016-2025) (2016) addressing the standardization of winter sports facilities` construction, service provision, license, and training program, and event and equipment management.

Meanwhile, winter sports education faced some challenges due to the dialectic relationship between mass and elite sports. The "Top-down" resource allocation methods and the public sector dominant legacy delivery process have unbeatable advantages in the Pre-Game period to increase winter sports engagement, especially in combat against COVID-19 (Liu et al., 2022). However, fewer studies have measured the Chinese people`s demands of winter sports in the Post-Games period, despite leaders and experts claiming that the total number of winter sports participants kept growing during the interviews.

Regarding the official plans and reports from different provinces, we identified a pattern of the localization of the stakeholders, and the decentralization of winter sports resources, represented by the training camps and winter sports curriculum in southern cities. Moreover, some local governments of non-host cities, for example, Jiangsu, Hubei, and Tianjin put weight on multi-source funding, inter-regional collaboration, and youth/ leisure sports development; while the

3 northeastern provinces kept their elite sports orientation and stimulated the regional development with winter sports tourism and events hosting.

3) Coopetition among stakeholders and their strategic communication

China has the world's fastest-growing consumer market and its largest manufacturer (Armour, 2022; Boykoff, 2024), which served as the base of the autonomous development of the Chinese winter sports industry. Meanwhile, government guidance and resource distribution plans remain the dominant powers in the development process. In the post-game period, long-term strategic plans, such as Winter Sports Development Plan (2016-2025) continually contribute to the enhancement of winter sports participation. From SMART goals setting to the execution protocols at the central or provincial level, Beijing 2022 left various experiences in creating social sustainability benefitting from multi-layer collaboration among organizations in the public sector, private sector, and the third sector.

The platform provided by international sports mega-events attracted diverse stakeholders working together through upper and lower linkage, internal and external collaboration, expert support, and joint advancement (BOCWOG, 2022). Several Chinese enterprises, like Alibaba and China Mengniu Dairy Company, increased their global influence and competition advantages by committing to the IOC's TOP program and joining the elite network (IOC, 2024).

Besides, the stakeholders` alliance and the balance of interests guaranteed the delivery of the winter sports participation legacy, while the coopetition relationship among companies in the same branches facilitates or deters individual engagement in winter sports. For example, winter sports participation is highly dependent on facilities and equipment. No matter whether services are government-purchased services or private-purchased, the 4Ps (Referring to price, product, place, and promotion) impact the tangibility of the mass participation legacy. After the Games, some stakeholders, such as venue and technology providers, continued to invest in winter sports. In contrast, other stakeholders turned their focus on different projects and opportunities. At the same time, the power and relations among stakeholders changed along with enterprises` sustainable development strategies, innovation capacities, and vulnerabilities.

Media and social media provided a broad platform for the communication and negotiation among different stakeholders and the Games host while enabling the observation and comments from the domestic and international public. We figured out a phenomenon of attitude

polarization towards the Beijing 2022 Winter Olympics in both domestic and international media and social media. Chinese scholars in communication and information branches, represented by Han S. and Hou H. (2022), remarked that mainstream media delivered positive messages about Chinese people`s support of Beijing 2022. However, Hou H. (Hou, 2022) identified that foreign netizens have more negative sentiment toward the Beijing Winter Olympics corresponding to non-Olympic issues, such as China's territorial issues and other sensitive topics.

Moreover, our findings support the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable.

VI. Conclusion, limitation, and future research

This chapter represents one of the evolving investigations that has taken a mixed research approach analyzing the efficiency and effectiveness of the "300 Million" strategy`s execution with an integrated conceptual model. With the combination of Critical Realism (CR) and the "Three-Source" Theory, we managed to inspect the critical mechanisms from the dimension of ideal and social reality by systematically analyzing a selected set of qualitative and quantitative data in alignment with triangulation, which employed document analysis, expert interview, survey, and big data analysis methods.

The research on ideal reality interprets stakeholders` roles and perspectives on realizing the political promise of "Creating a winter sports market with the involvement of more than 300 million people". The investigation of social reality, reflecting deep connections and generative mechanisms, will enable us to transfer winter sports participation-related knowledge among different stakeholders and institutional structures. Moreover, our findings strengthened the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable. However, the data availability is still a discussion in this study. The current document and big data analysis provide sufficient facts and evidence at the Macro level, especially in the Game-hosting time and post-Games period. However, less is known about the legacy delivery process in the Pre-Games period and the attitude changes before and after the Games at the meso and micro level.

In the continual pursuit of an in-depth study of Beijing 2022`s "300 Million" legacy and mechanism, we identified three general laws that could either enhance or decrease winter sports participation. The three laws involve "The Double-Edged Swords: Beneficial Sports Policy and Resource Concentration", "Sports Facilities and High-tech to Tackle the Growing Wealth Gap", and "Coopetition among Stakeholders and Their Strategic Communication".

Regarding the general laws working in any circumstances, we recommend an ice-breaking attempt to develop bilateral paths (Profitable and Non-profit) to facilitate the legacy delivery and to maintain the heat of winter sports development after the Games.

Chapter 6 - Bilateral mode to achieve a sustainable winter sports participation legacy

The whole investigation is one of the pioneering works using an integral framework and critical indicators to examine the results and process of Beijing 2022`s winter sports participation legacy. Besides the context-adherent experience, we have validated some innovative, repeatable, and transferable knowledge.

The dialectic relationship of elite and mass participation exists in any context and influences the sustainability and resilience of a sports system. In China, a chronic problem is the broad gap between elite and mass sports. In winter sports, this gap is narrower since winter sports have features of "middle-class consumers" and "cross-discipline talent development". Besides, the performance of youth athletes from professional teams and commercial sports clubs was at a similar level, for some sports disciplines, such as ice hockey and alpine skiing.

Moreover, China doesn`t have a long tradition of winter sports, and many disciplines haven`t received sufficient attention and investment before the successful bids of Beijing 2022. Compared with summer sports, China has a limited number of domestic athletes and more foreign-born athletes in elite sports areas. At the same time, there was a large percentage of amateur athletes and young practitioners in the mass sports area. This social reality shapes the winter sports market and suggests the bilateral paths (Profit and Non-profit) to invest in competitive and grass-roots sports. Learning from the contrasting but interdependent nature of elite and mass participation, the future hosts could consider the bilateral paths when they make legacy plans.

To create the bilateral paths, we raised further discussions about accumulating and allocating financial, human, and material resources in well-developed and underdeveloped regions. Referring to the process of the legacy delivery and value chain, we cautiously suggest investing in tangible and intangible demands, distinguishing festival effects and long-term commitment, as well as calculating the opportunity cost. For example, Heilongjiang was the winter sports center for years and the government took the main responsibility to allocate resources and to provide public facilities and services at relatively lower prices, especially in the case of

developing elite sports. This traditional mode brought high performance in short-track speed skating, ice skating, and speed skating. However, it also limited the market potential and the scope of winter sports.

In contrast, Beijing gave more power to the market while many winter sports schools play important roles in providing public/collective goods in cooperation with commercial clubs for mass sports development (BOCWOG & Beijing Sports University, 2022). In short, the choice of winter sports development models is in correlation with the regional economic and societal development status. From a macro perspective, the winter sports development also follows the Fourteenth Five-Year Plan for Sports Development (2021) fitting with the domestic and international dual-cycle pattern to satisfy Chinese people`s pursuit of high-quality development and life.

Dual-cycle is the best solution for creating and maintaining the mass participation legacy since the traditional government-dominant winter sports development mechanism has a major defect of bureaucratic sickness. At the same time, the free-market mechanism faces great danger of market dysfunction. Through consistent research, we confirmed that the efficiency and effectiveness of delivering a mass participation legacy correspond to the "Big Sports Society" concept. Thus, we suggest coordinating regional development with the hosting of the Winter Olympics through sports education, public fitness programs, and the application of high technology. Such experience not only works in the Chinese context but is also suitable to other circumstances. For future studies, we recommend conducting continual research in the area of knowledge-sharing and transfer strategies.

Chapter 7 - Limitation and future research

I. Limitations

Applying the integrated model to examine Beijing 2022 Sports Participation Legacy is one of the successful and promising attempts in the social sustainability area. However, we shouldn`t neglect the dilemmas related to cultural contexts, different statistical systems/ conceptualizations, and the availability of data.

There is no gold standard definition of winter sports participation at the international level. Moreover, the "300 million" social sustainable legacy has been named after the term "engagement," which extended the scale of sports participation. The direct engagement included people who practice ice and snow sports, such as athletes and coaches. The indirect engagement included participants in winter experiential events, the working staff of the Chinese winter sports industry, and so on (Chen et al., 2022a).

Regarding the methodology, our conceptual model could make an empirical contribution toward identifying the chances and challenges posed by the broad and ambitious nature of Beijing 2022's goals, but international comparison studies are required to examine whether this framework could be applied in other contexts. Furthermore, the use of secondary data led to potential problems, such as inconsistencies, ranging quality, and difficulties in collecting data reflecting implicit knowledge.

In terms of data analysis and interpretation, our data support the discussions and provide sufficient facts and evidence at the Macro level. However, less is known about the legacy delivery process and the attitude changes at the meso and micro levels.

II. Implications and future research

In summary, this investigation objectively evaluates what Beijing 2022 has achieved in terms of winter sports engagement and the legacy delivery process. Our integrated conceptual

framework could contribute to the diagnostics of mechanisms, opportunities, and difficulties led by the "300 million" goal. Moreover, we covered a broad range of data and enabled Western researchers to access this comparatively challenging information, which originated from Chinese literature or domain. By applying the secondary and empirical data, we gained access to abundant information on various types of engagement, infrastructure advancement, and sports policy implementation.

Besides the three critical mechanisms, we identified three general laws that could either enhance or decrease winter sports participation. The three laws involve "The Double-Edged Swords: Beneficial Sports Policy and Resource Concentration", "Sports Facilities and High-Tech to Tackle the Growing Wealth Gap", and "Coopetition among Stakeholders".

By summarizing the discussions, we highlighted the lessons, we could learn from Beijing 2022 in terms of winter sports engagement. The suggestions include: 1) Set SMART goals at the legacy planning stage. 2) Use an integral framework and critical indicators to inspect the legacy delivery process. 3) Maintain the mass participation legacy after the Games through sports education and public fitness programs, coordinating with regional development and the "dual circulation" reality.

More importantly, our findings strengthened the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable. Thus, we anticipate that this study will bring significant inspiration to IOC`s Knowledge and Games Learning (IKL) program, while providing some references to international collaboration in terms of improving social sustainability and stimulating regional development, through the enhancement of winter sports participation.

Last but not least, we perceive that the efficiency and effectiveness of delivering a mass participation legacy corresponds to the "Big Sports Society" concept. Future studies concentrating on social reality could inspire the coming game hosts to adapt Beijing 2022's experiences at the meso and micro level, while facilitating the transmission or sharing of winter sports participation-related knowledge among different stakeholders under diverse institutional structures.

Conclusion

I. Inspiration and solution package for future hosts

Our research project investigated whether Beijing 2022 achieved its goal of "Motivating 300 million individuals to engage in winter sports" and how did Beijing 2022 achieve this goal? What were the key mechanisms that influenced the outcomes of Beijing 2022`s winter sports participation strategy?

By conducting literature reviews on two essential topics "Sport Participation Legacy of International Sport Mega Events" and "Knowledge Transfer at International SMEs", we identified the need for a comprehensive understanding of sport participation in different contexts, supported by empirical data and international comparative methodology. Moreover, there were limited research attempts enable game experience and knowledge to be shared or transferred from previous hosts to future holders. Only a small group of scholars conducted empirical studies applying mixed research in this area.

II. Research findings

Our investigation is one of the pioneering works developed an international comparison framework to analyze winter sports participation legacy with Chinese context. The critical outcomes include:

1) Initiative research approach and qualitative quantitative mixed method. It provides a nuanced understanding of applying CR within China's unique top-down system, large population, and regional diversity. Meanwhile, the integral framework addresses knowledge transfer, enabling researchers to adopt CR for legacy studies in various settings.

2) Examine whether there are facts and evidences suggest that Beijing 2022 has achieved the "300 million" goal. And identify the critical mechanisms, including "Beneficial

sports policy and economic progression", "Provision of facilities accompanying the integration of sport and education", and "Cooperative stakeholders` alliance strengthened by media power and technology".

3) By inspecting the three crucial mechanisms, we identified that pre-game legacy benefits not only the crucial stakeholders of Beijing 2022 but also the general public, while the long-term leverage effects are unpredictable due to changing conditions.

4) Furthermore, our findings strengthen the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable. For example, we certified that a general regulation in resource distribution: the dialectic relationship between elite and mass participation, which offers insights for future winter sports mega-event legacy planning.

Appendix

Appendix A. Table A1 of Study 1

Table A1. Comparing the Samples with the Similar Prior Literature Review.

	Review of Knowledge Transfer (The Rest of 16 Samples of Current Review)	**Review of Knowledge Management (Prior Review)**	**Resemblance and Differences**
Number of Records	This review started with 301 records and the final sample of 16 documents consisted of 10 academic works and 6 non-academic journal articles.	This review started with 1751 records and the final sample included 16 academic works.	The prior review included more records.
Engaged Databases	Nine high-quality international/Chinese databases, involving two high-quality Chinese databases, including the following: CNKI and Wanfang Data; seven specialized international databases, including Scopus, Web of Science, PubMed, ERIC, EBSCO, ScienceDirect, and DOAJ, as well as the IOC's website and the Olympic World Library.	Focus was on the social sciences and humanities databases, and on academic works. The seven international databases included the following: Web of Science, Scopus, Sport Discus, ProQuest, SocIndex, Public Affairs Index, and Political Science Complete.	The commonly applied databases were Scopus and EBSCO (including Sport Discus, SocIndex Public Affairs Index, and Political Science Complete). The two reviews were built on different databases.
Searching Methods	Searched for the terms in the title, abstract, or keywords by using the search term ("world cup" OR paralympic* OR olympic* OR "sport* mega event*" OR "mega sport* event*" OR "commonwealth games" OR "world championship*") AND ("knowledge transfer" OR "transfer of knowledge" OR "know-how" OR "knowledge manag*"). The search in each database was slightly adapted and adjusted through regarding the diversity of the searching engine.	Searched for the terms in the title (TI), abstract (AB), keywords (KW), and subject (SU) by using the search terms of the following: [TI (knowledge management OR knowledge transfer OR knowledge creation OR knowledge application OR knowledge storage OR knowledge identification OR knowledge acquisition OR knowledge adoption OR knowledge tailoring OR knowledge dynamics OR tacit knowledge OR explicit knowledge) OR AB ("same terms as in TI") OR KW ("same terms as in TI") OR SU ("same terms as in TI")].	Both literature reviews covered knowledge transfer and knowledge management, but had different focuses and scopes.
Chronological period	From 2011 to 2022	From 2008 to 2021	The current literature review covered a wider time range.
Inclusion and exclusion criteria	The parameters for inclusion were (1) non-duplicated documents; (2) having access to the full-text and being able to read it; (3) the studies were in the social sciences area and were highly relevant to the knowledge transfer of sport mega-events; and (4) published in peer-reviewed journals/core	The inclusion criteria were as per the following: (1) The terms in the title, abstract, keywords, or subject were in English; (2) the study were published in either journal articles, academic books, academic book-chapters, theses, gray literature, and empirical studies. The exclusion criteria were as per the following: conceptual papers; conference abstracts; works that discuss KM but are not related to sport	The inclusion and exclusion criteria of the two reviews were diverse. The current review contains gray literature, especially the official game reports, which contribute greatly to knowledge transfer both in theory and in practice. Moreover, the inclusion

	journals of a nation or from high-quality databanks/officialevents; and works that associate sport mega-events with education orcriteria, which were related to organizational websites.	learning but are not related to KM.	learning, were the exclusion criteria of the prior review.

Appendix B. Table A2 of Study 1

Table A2. Mapping the Research Methods of the Academic Works

Authors (Year)	Term	Qualitative/Mixed Research Method	Research Framework	Research Methods
Parent, Kristainsen, and Houlihan (2017)	Knowledge Management and Transfer	Qualitative Research Method	Schenk et al. (2015): Knowledge identification, Acquisition, Application, Creation, Storage, Learning, and Tailoring and transfer. KT process: Information and knowledge sharing, Passing on personal knowledge, and Transferring best practices and recommendations.	Case Study, Interview, and Document Analysis
Blackman, Benson, and Dickson (2017)	Knowledge Transfer, Transfer of Knowledge	Mixed Research Method	Integrated model of Nonaka and Tacheuchi's SECI model, as well as Lee and Yang's knowledge value chain (KVC).	Case Study, Interview, Focus Group, and Document Analysis
Ellis, Parent, and Seguin (2016)	Knowledge Transfer	Mixed Research Method	The concept of trustworthiness (Guba, 1981): credibility, transferability, dependability, and confirmability. The degree centrality, betweenness centrality, and eigenvector centrality were measured to provide insight into stakeholder (actor) power and the potential for knowledge transfer within the Olympic ambush marketing network.	Document Analysis, Case Study, and Interview
Werner, Dickson, and Hyde (2015)	Knowledge Transfer, Knowledge Management and Transfer, Transfer of Knowledge	Mixed Research Method		Interview, Survey, and Document Analysis
Andersen and Hanstad (2013)	Knowledge Development and Transfer, Knowledge Transfer	Qualitative Research Method	Søderlund et al. (2008, p. 518): three main mechanisms, as per the following: (1) Relating different competences; (2) Reflecting upon experiences; (3) Routinizing lessons learned.	Document Analysis and Interview
Werner, Dickson, and Hyde (2015)	Knowledge Transfer/KT, Transfer of Knowledge	Qualitative Research Method	Weidenfeld et al.'s model (2010): Six channels (Labor mobility, Knowledge brokers, Imitation/demonstration/observation, Inter-firm exchanges) and four systems (Trade, Technological, Infrastructural, and Regulation).	Interview, Document Analysis, and Case Study
Yang and Qiu (2013)	OGKM/TOK (知识管理/转让)	Qualitative Research Method	OGKM with three main elements: Services, Personal experiences, and Information TOK process (UNESCO): Knowledge acquirement, Storage, Participation (Transfer/ Sharing), Utilization, and Innovation	Document Analysis, Logic Analysis, Case Study, and Field Research

Browne (2016)	Knowledge Transfer, Transfer of Knowledge	Mixed Research Method	Tacit and explicit knowledge interaction: 1. From tacit knowledge to tacit knowledge (Socialization); 2. From tacit knowledge to explicit knowledge (Externalization); 3. From explicit knowledge to explicit knowledge (Combination); 4. From explicit knowledge to tacit knowledge (Internalization).	Document Analysis, Literature Review, Observation, Case Study, and Survey
Liu, Liu, Wang, and Luo (2011)	VTOK (奥运影像知识转让)	Qualitative Research Method	Game Organizing Key Elements: 1. Key milestones; 2. Torch relay; 3. Progress of construction of Venues; 4. Activities in City/ China; 5. Operation of the Olympic Games; 6. Volunteers Activities; 7. Olympic Education.	Document Analysis, Case Study, and Interview
Muskat and Deery (2017)	Knowledge Transfer, Transfer of Knowledge	Qualitative Research Method	(1) Pre-event; (2) Event operations; (3) Post-event.	Interview and Document Analysis
Qin, Rocha and Morrow (2022)	Knowledge Management, Knowledge Transfer, Transfer of Knowledge	Mixed Research Method	PRISMA	Literature Review

Appendix C. Table A3 of Study 1

Table A3. The research Perspectives, Enablers, and Barriers of Knowledge Transfer

Authors (Year)	Research Perspectives	Barriers of Knowledge Transfer	Induce the Barriers of Knowledge Transfer	Enablers of Knowledge Transfer	Induce the Enablers of Knowledge Transfer
Parent, Kristainsen, and Houlihan (2017)	Decision-Making and Management, Event Management, Knowledge Management	Pedagogical and negotiation approach, as such challenges demonstrated that the organizing committee understood what needed to be done and why.	Accessibility and Availability of Knowledge, Lack of the Absorptive Capacity.	1. Knowledge timing, types of knowledge; 2. Knowledge transfer processes were primarily affected by accountability (all forms), authority, and performance/cultural aspects of governance (democratic governance); 3. Communication, a type of knowledge tool.	Knowledge Identifying and Tailoring Based on Needs, Local Context, and Culture, Knowledge Transfer Timing and Suitable Methods, Accountability (Democratic Governance), Communication.
Blackman, Benson, and Dickson (2017)	Volunteer Legacy, Knowledge Management	1. Knowledge transfer sessions create some new knowledge, but this was not shared with volunteers; 2. There was no guidance to harness such human capital post-games. Knowledge thus may become lost.	Accessibility and Availability of Knowledge, Dilemma of Knowledge Sharing and Knowledge Protection.	1. The formal reports and more in-depth informal discussions; 2. Convert tacit knowledge into an understandable and interpretable form; 3. Debriefing sessions facilitate the transfer of knowledge from one OCOG to the next.	Convert Tacit Knowledge into Interpretable Form via Formal Reports, In-depth Informal Discussion, Debriefing.
Ellis, Parent, and Seguin (2016)	Marketing Networks, Knowledge Transfer	1. There still appears to be some challenges and issues to overcome, which are related to trust, coordination, international context, and the breadth of focus; 2. Some OCOGs appeared to be reluctant to take guidance and advice from a central body, such as the IOC. It was suggested this lack of trust may partially stem from differences and suspicions with regard to common purpose and goals. Other stakeholders were uninterested in voluntarily gathering and passing on knowledge;	Dilemma of Knowledge Sharing and Knowledge Protection (Issues related to Trust, Coordination, International Context, and Breadth of Focus); Accessibility and Availability of Knowledge, Lack of the Absorptive Capacity, Difficult in Adapt Knowledge into Local Context, Culture, Specific Teams, etc.	1. This suggests that, given the context, knowledge transfer should be tempered with an understanding of the unique character of the host country and the games; 2. We also suggest that the discussed knowledge transfer tools are the practical vehicles through which the beliefs, knowledge, opinions, and practices of those actors with influence are transferred to the rest of the network. This facilitates their becoming institutional logics and	Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture; Cooperation & Strategic Approach (Set Norms inside the Knowledge Sharing Network Focusing on Common Beliefs, Knowledge, Opinions, and Practices of Those Actors).

		3. Although the ability to pass on information did not seem to be in danger due to the international context, the usefulness of that knowledge could, at times, be questioned.		their diffusion through the network, as well as their acceptance as norms.	
Werner, Dickson, and Hyde (2015)	Organization Management, Tourism	A high risk that knowledge shared for cooperation may also be used for competition.	Dilemma of Knowledge Sharing and Knowledge Protection.	1. An essential element of successful knowledge transfer is communication. Additionally, knowledge may be transferred, but it is only successfully adopted if it generates new ideas; 2. Collaboration can positively enhance interorganizational learning and knowledge transfer.	Communication, Collaboration, Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture.
Andersen and Hanstad (2013)	Knowledge Management and Transfer, Organizational Learning			1. Knowledge tailoring resulted in a higher likelihood of subsequent application; 2. We found that information technology and media were a significant part of the knowledge management and transfer process; 3. The individual is still, arguably, the most important piece of the process of knowledge management and transfer. Experience is important for knowledge creation and application; 4. Moreover, flexibility and openness were critical components for a successful knowledge management and transfer process.	Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture; Engagement of Information Technology and Media, Know-How and Experience, Cooperation and Strategic Approach (Flexibility and Openness).
Werner, Dickson, and Hyde (2015)	Organizational Learning, Knowledge Development and Transfer, Risk Management	1. Project organizations often fail to develop and transfer the knowledge necessary to bridge the gap between earlier shortcomings and new challenges. They do not take the time, or instead lack the capabilities, to systematically reflect upon experiences, draw lessons, identify gaps, as well as do not develop knowledge and new ways to more efficiently transfer and thus use it in preparations and operations;	Accessibility and Availability of Knowledge, Lack of the Absorptive Capacity, Time Stress, Problems in Relation to the Vehicle of Knowledge Transfer (Logistics, Living Conditions), Dilemma of Knowledge Sharing and Knowledge Protection.	1. Creation and transfer of knowledge in projects is often discussed in relation to companies operating complex technological systems, involving a variety of specialized knowledge domains; 2. The reliable experience-based knowledge is critical for the organization's success; 3. In both businesses and in elite sport actors, we have to develop organizational capabilities to	Engagement of Technological System, Know-How and Experience, Improving the Learning Culture and Capacities (Especially the organizational capabilities to manage complexities and uncertainties).

		2. Practical problems related to logistics and living conditions may also, to a certain extent, be corrected there and then; 3. Competitions take place in new settings, introducing new and unique challenges.		manage complexities and uncertainties relating to problems, especially regarding the ability to relating different competences of the organizations and to routinize the lessons learned as critical capabilities in knowledge creation and transfer.	
Yang and Qiu (2013)	Knowledge Management and Transfer, Event Management, Organizational Learning	1. KT can be informal, spontaneous and unstructured; 2. Small and medium-sized organizations, which are characterized by activity fragmentation and poor human resource practices, and which also act as a barrier to knowledge transfer and acquisition; 3. Difficulties to deliver projects involving complex, stakeholder relationships under considerable time pressures.	Accessibility and Availability of Knowledge (Informal, Spontaneous and Unstructured Knowledge Transfer), Lack of the Absorptive Capacity, Time Stress.	1. For an effective transfer to occur within a network, all partners must participate, as each partner controls access to certain types of knowledge; 2. Knowledge may be transferred but it is not successfully adopted unless it leads to the generation of new ideas and concepts. Network analysis, documents from previous events, the infrastructural system and the regulation system were the most important KT systems; 3. Receivers must apply thought or reasoning to it and incorporate it into their individual knowledge networks; 4. The degree to which it has been transferred largely depends on the communication processes; 5. Effective coordination between the organizing committee (a temporary organization) and the destination marketing organization (that are not of a temporary nature) is essential.	Involvement of All Stakeholders, Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture; Improving the Learning Culture and Capacities, Communication, Cooperation, and Strategic Approach, Effective Coordination between the Sender and the Receiver.
Browne (2016)	Organizational Learning, Event Management, Knowledge Transfer and Decision-Making and Management	Communication problems among different departments; lack of strategic decision-making ability due to cooperation problems among companies; change in functions and responsibilities (i.e., repeated work); software outsourcing; the right to use new knowledge, which has been redeveloped, as well as related	Problems in Communication, Coordination and Cooperation; Accessibility and Availability of Knowledge, Lack of the Absorptive Capacity (Related to the Nature of OC, Change and the Game Pattern).	1. Transfers the most useful knowledge at the most correct time to the entities in the greatest need for future OCOGs and candidate cities, as well as assists them to make the best decision; 2. The transformation of tacit knowledge to explicit knowledge is essential.	Transfers the Most Useful Knowledge at the Rightest Time to the Entities in Greatest Need; Transfer of Explicit Knowledge.

		questions regarding cost-sharing, pricing, contracts, etc.		
Liu, Liu, Wang, and Luo (2011)	Decision-Making and Management, Event Management, Knowledge Management & Transfer		1. Adapt the program according to the needs and culture of the participants. Organize the guided visits outside of the peak time; 2. Try to influence as much as possible on who will be the participants, as well as what operational roles they will have in terms of being related to the program offered. Promote more the transfer of knowledge, avoiding a focus on networking.	Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture; Extend the Scope and Influence of Knowledge Transfer.
Muskat and Deery (2017)	Decision-making and Management, Knowledge Management and Transfer, Event Management	Although Beijing won the bidding on 13 July 2001, the news and media sector were only established by Beijing Sports University's publishing house in 2017 due to the domestic bidding.	Accessibility and Availability of Knowledge (Late Start of Knowledge Storage).	1. Learn from Beijing VTOK program: start preparation earlier, learn the related requirements and standards from IOC; Obtain support, focus on the most important issues. 2. Be active to coordinate various things based on reality and local context.	Improving the Learning Culture and Capacities; Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture.
Qin, Rocha and Morrow (2022)	Event Management, Knowledge Transfer and Organizational Learning	(1) Issues around the transferred knowledge: Ongoing staff may be more competitive and less willing to share knowledge; (2) Issues around the source of knowledge: Making tacit and experience-based knowledge mobile and accessible; (3) Issues around the recipient of knowledge: A heterogeneous team structure may pose challenges; (4) Issues related to the context: Event organizations are different in terms of the external and internal environment they are operating in, the dynamics of knowledge, and capabilities, as well as in team composition.	Accessibility and Availability of Knowledge, Lack of the Absorptive Capacity, Difficult in Adapt Knowledge into Local Context, Culture, Specific Teams, etc. Communication tools, usage of electronic data, shallow hierarchies, self-management, decision making, and an overall innovative culture.	1. Event staff would have preferred the inclusion of face-to-face briefings on "how to do things."; Apply Face-to-Face Briefings; 2. Event managers need to consider different levels of learning. Establish organizational memory. At the same time, they should be held accountable in terms of providing evidence of the establishment and management of an organizational memory; 3. Event operation: Firstly, the pairing of the inexperienced with more experienced event staff.	Improving the Learning Culture and Capacities; Knowledge Identifying and Tailoring Based on Needs, Local Context and Culture; Communication, Cooperation, and Strategic Approach.

Knowledge Management and Mega-sports events	Trust and coordination between stakeholders; an imbalanced distribution of knowledge; and the context differences between host destinations.	Trust and Coordination between Stakeholders, An Imbalanced Distribution of Knowledge, The Context Differences.

Appendix D. Table B1 of Study 2

Table B1. Lists of News on the Topic of Beijing 2022, Winter Olympics and Olympic Games for Study 2

Keywords	News Date	News Source	News Title
Beijing 2022 Winter Olympics	Saturday, 1 August 2015	Tencent News	The Beijing 2022 Winter Olympics will open on the fourth day of the Chinese New Year of the Tiger
Beijing 2022 Winter Olympics	Sunday, 2 August 2015	Phoenix Network	What does the Beijing Winter Olympics mean to the old Shanxi people
Beijing 2022 Winter Olympics	Saturday, 1 August 2015	Tencent Sports	The Beijing Winter Olympics may bring 300 billion yuan in revenue to promote the development of ice and snow sports
Beijing 2022 Winter Olympics	Wednesday, 3 August 2016	Xinhua Network	(Rio Olympics) Olympic volunteer "Old guns (A person volunteered Olympics for multiple times)" look forward to serving the Beijing Winter Olympics in 2022
Beijing 2022 Winter Olympics	Monday, 1 August 2016	Hubei Online Radio and Television Station	Beijing Winter Olympics: Global collection of emblem design plans
Beijing 2022 Winter Olympics	Thursday, 4 August 2016	Popular Network	Olympic volunteer "Old guns (A person volunteered Olympics for multiple times)" look forward to serving the Beijing Winter Olympics in 2022
Beijing 2022 Winter Olympics	Thursday, 8 February 2018	NetEase	Bach: The Beijing Winter Olympics will set a benchmark for the new Olympic rules
Beijing 2022 Winter Olympics	Wednesday, 7 February 2018	NetEase	The International Olympic Committee announced new standards for organizing the Olympics The Beijing Winter Olympics has taken the lead in demonstration implementation
Beijing 2022 Winter Olympics	Thursday, 8 February 2018	Tencent Network	The "most cost-saving" new rules in Olympic history, the Beijing Winter Olympics has become the pioneer
Beijing 2022 Winter Olympics	Friday, 6 December 2019	Sohu	Official details of the recruitment of volunteers for the Beijing Winter Olympics
Beijing 2022 Winter Olympics	Monday, 2 December 2019	Phoenix Network	Global recruitment of volunteers for the Beijing Winter Olympics and the Winter Paralympics is about to start
Beijing 2022 Winter Olympics	Friday, 6 December 2019	Lanzhou News Network	CCTV will launch an 8K channel before the Beijing Winter Olympics, and Samsung TV will help popularize 8K
Beijing 2022 Winter Olympics	Monday, 9 August 2021	NetEase	When will the Beijing 2022 Winter Olympics tickets go on sale? Where can I buy them? Attached is the ticket purchase process
Beijing 2022 Winter Olympics	Monday, 9 August 2021	China Economic Network	Tokyo Olympics: There are many things to learn from the Beijing Winter Olympics
Beijing 2022 Winter Olympics	Monday, 9 August 2021	Sina	How beautiful are the venues of the Beijing Winter Olympics? Take a look at the style of the venues in 5 minutes, and see you in Beijing in 180 days!
Beijing 2022 Winter Olympics	Friday, 29 October 2021	NetEase	More than 30 licensed products are newly launched Wei Ya supports the Beijing Winter Olympics
Beijing 2022 Winter Olympics	Friday, 29 October 2021	Northeast News Network	The 100-day countdown concert for the Beijing Winter Olympics is held
Beijing 2022 Winter Olympics	Friday, 29 October 2021	Tencent	The Beijing Winter Olympics is coming soon. Will the accommodation and meals of the contestants from various countries be free during the competition?
Beijing 2022 Winter Olympics	Tuesday, 7 December 2021	China Military Network	Ministry of Foreign Affairs: The United States should stop interfering with and disrupting the Beijing Winter Olympics

Beijing 2022 Winter Olympics	Tuesday, 7 December 2021	Hexun	The White House announced a "diplomatic boycott" of the Beijing Winter Olympics, and the Chinese Ministry of Foreign Affairs has responded before
Beijing 2022 Winter Olympics	Tuesday, 7 December 2021	China Information Industry Network	[Winter Olympics in progress] The information and communication industry has completed the Beijing Winter Olympics series of test matches for network security...
Beijing 2022 Winter Olympics	Friday, 11 February 2022	NetEase	Watch the Winter Olympics together The Beijing Winter Olympics creates a new dual Olympic legacy
Beijing 2022 Winter Olympics	Friday, 11 February 2022	Xinhua News Network	Beijing Winter Olympics: green, low-carbon, sustainable (Winter Olympics concentric circles)
Beijing 2022 Winter Olympics	Friday, 11 February 2022	CNR	Multinational athletes: The Beijing Winter Olympics is well organized and the Chinese people are warm and friendly
Winter Olympics	Friday, 31 July 2015	NetEase News	Will the 2022 Winter Olympics come to Beijing?
Winter Olympics	Saturday, 1 August 2015	Xinhua Network	Beijing wins the right to host the 2022 Winter Olympics
Winter Olympics	Friday, 31 July 2015	Legal Network	Beijing wins the right to host the 2022 Winter Olympics, Xi Jinping sends a letter to the bid delegation to express warm congratulations
Winter Olympics	Friday, 12 August 2016	China Youth Network	The shape of the Beijing Winter Olympics Five Ring Bridge is exposed, shaped like DNA and a large net bag
Winter Olympics	Tuesday, 9 August 2016	People's Daily Online	Zhang Qingwei: Strictly follow the time node and vigorously and orderly promote the preparations for the Winter Olympics
Winter Olympics	Friday, 12 August 2016	Driver Home	The shape of the Beijing Winter Olympics "Five Ring Bridge" is exposed: very cool
Winter Olympics	Wednesday, 6 December 2017	Xinhua Network	The Russian delegation missed the Pyeongchang Winter Olympics, "clean" athletes can be invited to participate
Winter Olympics	Wednesday, 6 December 2017	NetEase	Russian state television said it will not broadcast the PyeongChang Winter Olympics, and the five rings were crossed
Winter Olympics	Tuesday, 5 December 2017	Xinhua Network	Can Russian athletes participate in the 2018 PyeongChang Winter Olympics? The International Olympic Committee Executive Committee will soon make a decision...
Winter Olympics	Saturday, 24 February 2018	Sina News	The PyeongChang Winter Olympics is coming to an end, and Chinese ice and snow athletes have achieved breakthroughs in multiple events
Winter Olympics	Thursday, 22 February 2018	Xinhua Network	Troubled! Lee Myung-bak may be summoned by the South Korean prosecutors after the Winter Olympics
Winter Olympics	Friday, 23 February 2018	China Government Network	Winter Olympics | Short track speed skating - men's 500 meters: Wu Dajing won the championship
Winter Olympics	Friday, 6 December 2019	Sohu	Official details on the recruitment of volunteers for the Beijing Winter Olympics
Winter Olympics	Monday, 2 December 2019	ifeng.com	Global recruitment of volunteers for the Beijing Winter Olympics and Paralympics is about to start
Winter Olympics	Thursday, 5 December 2019	Beijing Local Treasure	Live viewing portal for the Beijing 2022 Winter Olympics and Paralympics
Winter Olympics	Tuesday, 27 July 2021	NetEase	...With the support of the Tokyo Olympics, the enthusiasm for watching the games online remains unabated. Are broadcasters more interested in the Beijing Winter Olympics?

Winter Olympics	Tuesday, 27 July 2021	Tencent	South Korean Winter Olympics champion Lim Hyo-jun joins Chinese nationality and is expected to represent China in the Winter Olympics next year
Winter Olympics	Tuesday, 27 July 2021	NetEase	...Olympics | Tokyo Olympics | Olympics | Tokyo Olympics | Shinzo Abe | Winter Olympics_Mobile NetEase
Winter Olympics	Friday, 29 October 2021	NetEase	Judicial assistance for the Winter Olympics
Winter Olympics	Friday, 29 October 2021	Xinhua News Network	Beijing Winter Olympics venue construction documentary "Dream of the Winter Olympics"
Winter Olympics	Friday, 29 October 2021	People's Daily Online Finance Channel	Optimize the tax business environment The designated tax service hall for VAT refunds for the Beijing 2022 Winter Olympics is unveiled
Winter Olympics	Friday, 11 February 2022	NetEase	The coolness of the Winter Olympics is beyond your imagination
Winter Olympics	Friday, 11 February 2022	People's Daily Online	The Winter Olympics spread friendship
Winter Olympics	Friday, 11 February 2022	Northeast Network	The Beijing Winter Olympics in my heart
Olympics	Friday, 31 July 2015	Xinhua Network	The Tokyo Olympics emblem was accused of plagiarism, suspected to be the logo of the Belgian theater
Olympics	Friday, 31 July 2015	Sina Sports	Japan said that there was no problem with the design of the Olympic emblem and denied the "plagiarism" theory from the outside world
Olympics	Friday, 31 July 2015	NetEase News	The International Olympic Committee announced that Beijing won the right to host the 2022 Winter Olympics
Olympics	Wednesday, 10 August 2016	Sina Sports	At the Olympics, Alian alone supported the Chinese men's basketball team, and the rest were like a vain
Olympics	Monday, 8 August 2016	Xinhua Network	China's first gold medal in all Olympic Games
Olympics	Friday, 12 August 2016	China Economic Network	Ma Long won the gold medal in the men's singles final of the Olympic table tennis, achieving a Grand Slam
Olympics	Tuesday, 12 June 2018	Sina News	The price range of tickets for the Tokyo Olympic Games has been expanded, with the highest price planned to be 300,000 yen
Olympics	Thursday, 14 June 2018	Sina News	To prevent congestion and strengthen security at the Tokyo Olympic Games, Japan has enacted legislation to regulate Japan
Olympics	Monday, 11 June 2018	Sina News	Zhong Man, the champion of the Olympic men's fencing, attended a new car launch of a certain brand
Olympics	Wednesday, 26 February 2020	China News Network	International Olympic Committee member: Affected by the epidemic, the Tokyo Olympic Games may be cancelled
Olympics	Thursday, 27 February 2020	Sina Sports	To fight the epidemic, the Tokyo Olympic Games torch relay is considering reducing its scale
Olympics	Wednesday, 26 February 2020	Xinhua Network	With the shadow of the epidemic, can the Tokyo Olympic Games still be held as scheduled?
Olympics	Tuesday, 27 July 2021	NetEase	Cool knowledge of the Olympic Games
Olympics	Tuesday, 27 July 2021	Interface News	The most unprofitable Olympic Games in history, Japan's "great power dream" has been shattered
Olympics	Tuesday, 27 July 2021	Sina News	Tokyo Olympic Games comprehensive news: China won three gold medals, and four "post-00s" won the championship Women's volleyball team loses to women's soccer team...
Olympics	Friday, 11 February 2022	NetEase	Nenghuanbao: China and the Olympic Games

Olympics	Friday, 11 February 2022	Sina	Sina interviews Malaysian officials for the Winter Olympics: China hosting the Olympic Games makes people feel safe
Olympics	Friday, 11 February 2022	Tencent	The 5-time Olympic champion is about to add a new member, his wife shows her 9-month pregnancy photo, holding her pregnant belly and smiling so gently
Olympics	Friday, 25 November 2022	NetEase	...Walk into the "host country media center" that is so realistic that it leaks that Qatar will win the 2032 Olympic Games...
Olympics	Friday, 25 November 2022	Tencent.com	After watching the Guangxi Ethnic Games, the World Cup and the Olympic Games have become a compromise
Olympics	Friday, 25 November 2022	NetEase	Find your "double Olympic memory" in the Beijing Olympic Museum | City Experience Officer
Olympics	Monday, 25 September 2023	NetEase	(Hangzhou Asian Games·Character) Return to the dream of youth, "old gun" starts again
Olympics	Monday, 25 September 2023	Xihai Metropolis Daily	17-year-old Huang Yuting "shot down" two gold medals and has the opportunity to impact the first gold medal of the Paris Olympic Games
Olympics	Monday, 25 September 2023	Guangxi News Network	Guangxi athletes won bronze in the Wrestling World Championships and won tickets to the Paris Olympic Games

Source: Baidu Index. https://index.baidu.com/v2/main/index.html#/trend/%E5%8C%97%E4%BA%AC%E5%86%AC%E5%A5%A5%E4%BC%9A?words=%E5%8C%97%E4%BA%AC%E5%86%AC%E5%A5%A5%E4%BC%9A

Appendix E. Interview and Survey Design for Study 2

I. Interview Design

- Time and Format:
  - Semi-structured expert interview, each interview takes 45-50 min.

- Target Group & Objectives:
  - Sports Governance Perspective (Macro level, 1-2 experts): Leaders/ managers/ experts who developed strategies to support the mass participation legacy. The interviews aim to exploring how did the 3 mechanisms, especially " Leveraging sports policy" facilitate or deter the realization of the "300 Million" goal.

  - Management & Teaching Perspective (Meso level, 2-4 experts): School rectors/ department managers from Olympic Education Demonstration Schools. Winter sports coaches/ instructors/ teachers in Beijing, Chongli, and Zhangjiakou. Physical education teachers/experts. Scholars for Olympic education and sports social science etc., who played essential roles in promoting winter sports. The interviews aim at inspecting how did the second mechanism "Provision of facilities accompanying the integration of sport and education" and the third mechanism "Cooperative stakeholders` alliance strengthened by media power and technology" influence the achievement of the "300 Million" goal.

- Experts` Background
  - Please give us an overview of your role and responsibilities in relation to the strategy "Motivate 300 million people to engage in winter sports". How did you engage in winter sports (Through your organisation for work/ study, an interests group, friends circle, family, or yourself)? Which relevant activities did you participate in?

  - Please introduce the role and responsibilities of your organization or yourself in relation to the strategy "Motivate 300 million people to engage in winter sports". How did you/ your organisation engage in the relevant programs and activities?

- Key Questions about "Sport Participation"
  - How would you describe your feeling when you heard the target/ strategy "Motivate 300 million people to be engaged in winter sports" the first time? How about when you heard that the goal "Motivate 300 million people to engage in winter sports" has been achieved? *(This question examines experts` attitudes about the target of 300 million by analyzing changes in attitudes, moods, and thoughts.)*

  - How do you understand "Engage in winter sports"? What are the criteria for "Engage in winter sports"? Could you please map the different types of people engaged in winter sports? *(This question aims at inspecting "How realistic was the achievement?" by understanding the differences in the fundamental concept of "Sports engagement" in the context of Beijing 2022.)*

  - Which is the best program/ practice for promoting winter sports based on your experience?
    1) From the perspective of sports policy, what have you/ your organization done to motivate people to engage in winter sports?
    2) From the perspective of sports tourism, what have you/ your organization done to motivate people to engage in winter sports?
    3) From the perspective of education and training different talents, what have you/ your organization done to motivate people to engage in winter sports?
    4) From the perspective of sports facilities, what have you/ your organization done to motivate people to engage in winter sports?

  - What barriers do you witness or experience to engaging in winter sports?
    1) From the perspective of sports policy, what problems have you seen?
    2) From the perspective of sports tourism, what problems have you seen?
    3) From the perspective of education and training different talents, what could people do better?
    4) From the perspective of sports facilities, what should be improved?

  - How did you/ your organization overcome such difficulties? *(From the perspective of sports tourism, education & training, and sports facilities)*

- Deep Questions about Social Sustainability
  - How does the "300 Million" legacy impact winter sports' sustainable development? Will this heat of winter sports be sustained after Beijing 2022? *(This question aims at inspecting the sustainability of this legacy.)*

  - Is there any existing/ undergoing study or research explaining how the target has been measured besides the official survey conducted by Chinese national bureau of statistics and GAS? Please give us an in-depth view of the research paradigm, such as the sampling process and data evaluation methods. *(This question scrutinizes whether the success has been measured effectively.)*

  - IOC works with the Host City to measure the sport participation legacy. If some researchers are interested in the evaluation, where do they have more opportunities? What kind of suggestions do you have for them, according to your knowledge and the current research gaps? *(This question aims at identifying the research gaps.)*

  - Italy will hold Milan-Cortina 2026 Winter Olympics & Paralympics. What can the organizing committee of Milan-Cortina 2026 learn from Beijing 2022`s winter sports participation strategy? *(This question aims at identifying KPIs of increasing winter sport participation with the context of the next Winter Olympics.)*

  - What influence and benefit could the knowledge management and knowledge transfer program between Beijing 2022 and Milan-Cortina 2026 bring to the sustainability of winter sports and legacy? *(This question explores what experience & knowledge Milan-Cortina 2026 could adapt from Beijing 2022, while paving the way for study 3.)*

II. Survey Design

- Time and Format:
  - Semi-structured survey, each questionnaire takes 15-20 min.

- Target Group & Objectives:
  - Consumption Perspective (Micro level, 40-60 people): Students/ athletes/ other types of participants who practice winter sports continually, even have domestic/ overseas training and competition experience (Related to sports education and tourism). We apply survey to examine the efficiency and effectiveness of the crucial tactics and programs that support the achievement of "300 Million" goal.

- Questions:
  - Background information: age, gender, birth date and place, position, education level, year of engage in winter sports

  - Frequency, discipline and resorts selection:

1) Which of these sports do you engage in?
   a) Ice skating, b) Skiing/ Snowboarding, c) Curling, d) Ice hockey, e) Others__

2) How did you engage in that winter sports discipline?
   a) Take regular courses or practice it by yourself,
   b) Participate in winter sports competitions,
   c) Take part in one-off experiencing events,
   d) Participate in winter sports festivals,
   e) Other methods__

3) Number of times you participated in the sports in the last 12 months (Season 2023/24)?
   a) 1 time, b) 2 times, c) 3 times, d) 4 times, e) More than 4 times

4) Number of times you participated in the sports in Season 2022/23?
   a) 1 time, b) 2 times, c) 3 times, d) 4 times, e) More than 4 times

5) Number of times you took part in the sports 1 year ahead of Beijing 2022 (Season 2021/22)?
   a) 1 time, b) 2 times, c) 3 times, d) 4 times, e) More than 4 times

6) Number of times you participated in the sports in Season 2020/21?
   a) 1 time, b) 2 times, c) 3 times, d) 4 times, e) More than 4 times

7) Where did you practice this sport?
   a) Indoor venue, b) Outdoor venue, c) In China, d) Abroad__

- Motivation and Preference:

1) How did you take part in the sports?
   a) With family and friends,
   b) Participate in winter sports activities organized by your community/ sports club/ other types of interest groups,
   c) Participate in winter sports activities organized by your company/ university/ school,
   d) By yourself

2) What motivated you to take part in the sports:
   a) Recreational, b) Improve your fitness and health conditions, c) Hobby and lifestyle, d) Follow the mainstream and fashion, e) Competitive/ racing, f) Team building, g) Others__

3) Did the motivation change before the Beijing 2022 and after the Beijing 2022? Why?
   a) Yes, b) No

The reason behind the change____

4) Did the frequency of your participation change from Season 2020/21 to Season 2023/24?
   a) Yes, b) No

5) Why the frequency change?
   a) Don`t have time,

b) There are no suitable winter sports facilities nearby,
c) Lack of suitable instructors,
d) Change of interests,
e) Rising cost of living,
f) Injury and risks,
g) Others__

6) Did the place where you practice this sport change? Why?
a) Yes, b) No

The reason behind the change____

- Attitude towards the “300 million” goal and Beijing 2022`s mass participation legacy:

1) How would you describe your feeling when you heard the target/ strategy "Motivate 300 million people to be engaged in winter sports" the first time?
a) Happy, b) Sad, c) Disgust, d) Fear, e) Surprise, f) Anger, g) Other__

2) How about when you heard that the goal "Motivate 300 million people to engage in winter sports" has been achieved?
a) Happy, b) Sad, c) Disgust, d) Fear, e) Surprise, f) Anger, g) Other__

3) How would you describe your feeling when people discuss about the Beijing 2022`s mass participation legacy and related sports policy now?__

- Barriers to participating in winter sports and plan:

1) Is there any difficulty you came across when you participate in winter sports? If yes, what are the barriers?
a) Don`t have time,
b) Not interested in,
c) No accompany, Don`t know where there are winter sports activities,
d) There are no suitable winter sports facilities nearby,
e) Lack of suitable instructors,
f) Limited budget,
g) Fear of getting injured and risks,

h) Don`t have beneficial/ supportive sports policies,
i) Others__

2) Are the factors you selected above still preventing you from participating in winter sports activities?

3) Do you intend to continually practice the discipline you selected or try other winter sports? Why?

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Figures and Tables

How to Create Sustainable Winter Sports Participation Legacy? A Case Study of Beijing 2022 Winter Sports Participation Legacy with Critical Realism Ontology

Jingfan Zhou

Summary

The Olympic culture "Sport for All" (IOC, 2021b) propagates the shared vision of previous, present, and future hosts to increase sports participation. Evidence has been found in both academia and practice that hosting sports mega events (SME) has the potential to increase sports participation (A. Pappous, 2011; Weed et al., 2015) and facilitate sustainable development (Hindson et al., 1994; Hogan & Norton, 2000). Thus, it is important to learn from the past of the Olympic movement regardless of the geographical and cultural distances among host nations.

Beijing 2022 Winter Olympics and Paralympics were the first Games to implement a legacy plan shaped by Olympic Agenda 2020/New Norm and the Legacy Strategic Approach of International Olympic Committee (IOC) (BOCWOG et al., 2021). The cornerstone of this plan was the ambitious "300 million" goal (IOC, 2022), a hard push to increase winter sports participation in China. However, international scholars have questioned the origins and feasibility of this goal, likely due to limited supporting data, language barriers, and differing social and cultural contexts. Besides curiosity about the number, many researchers have turned their eyes to the strategies, programs, and legacy delivery mechanisms behind them.

Our dissertation satisfied these curiosities by creating a theoretical approach and examining the political promise and the legacy delivery process. Firstly, we developed an integrated framework by combining CR with the "Three-Source Model" (Liu & Jiang, 2016), which enabled us to acquire a deeper understanding of the legacy delivery process, and the underly mechanism behind China's "300 million" goal achievement. With the conceptual model, triangulation, and the Qualitative Quantitative Mixed Method, the main body of investigation was conducted across two studies, following the explanatory sequential design. Then, we examined whether Beijing 2022 has achieved the goal of "Motivating 300 million individuals

to engage in winter sports" and how Beijing 2022 delivers this legacy associating with the value assessment, behavior change, and demographic features of the Chinese participating in winter sports activities. Study 1 centered on tangible and observable variables of winter sports engagement at the 'material layer' and 'artefactual layer' levels. Building upon the 3 critical mechanisms emerging from Study 1, our Study 2 systematically analyzed the facts and evidence at the ideal and social layers corresponding to stakeholders` roles in the legacy creation and delivery process.

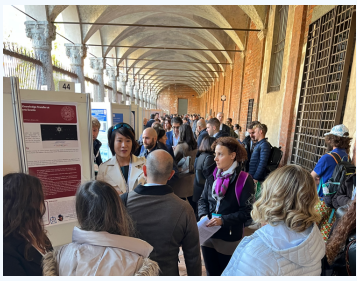
In the discussion, we focused on what could different stakeholders of the preceding and future Olympic Games learn from Beijing 2022 in terms of social sustainability, and revealed that the bilateral paths (Profit and Non-profit) would facilitate both the pre-game legacy and the post-game legacy.

In conclusion, this investigation objectively evaluated Beijing 2022`s winter sports engagement legacy. Moreover, it strengthened the argument that the lessons we learn from the success embedded in the Chinese sports system are empirical, repeatable, and transferable. At last, we suggest launching future studies addressing social reality, the efficiency, and effectiveness of the legacy delivery, as well as supporting regional development and knowledge sharing/ transfer with the advanced sport governing concept of “Big Society”.

Keywords: Winter Sports Participation Legacy, Critical Realism, Integrated Conceptual Framework, Bilateral Paths, Big Society

Curriculum Vitea

Jingfan Zhou



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PhD Programme: Science and Culture of Wellbeing and Lifestyles (With CSC scholarship, 37th cycle)

Vision

Promoting Olympic spirit and healthy lifestyle through research and teaching activities, while inspiring young people to explore different cultures and join hands for peace and development.

Short Biography

A third-year PhD student investigating the social sustainability of the Winter Olympic Games from the perspective of sports participation, at the Department for Life Quality Studies (QUVI) of the University of Bologna. Her current works could provide some references to the social sustainability of Beijing 2022 in conjunction with Milan-Cortina 2026.

Inspired by equality, excellence, and friendship that is deeply rooted in sports spirit and Olympic values, she focused on sports social science, and sustainable development. Besides, she chooses an innovative pass for her academic career development, bridging the gap between theory and practice and accumulating 5-years of international working experience in the sports business.

After her doctoral graduation, she looks forward to contributing to creating social sustainability through sports, education, and innovation.

Education Background & Professional Training

Nov. 2021- Mar. 2025 University of Bologna PhD Student at QUVI

- Research Topic: How to Create Sustainable Winter Sports Participation Legacy?
  - A Case Study of Beijing 2022 Winter Sports Participation Legacy with Critical Realism Ontology

Jun. 2019 BOCWOG International Referee for Luge

- Participate in the professional training course of International Luge Federation for technical officials, pass the written test and oral test, obtain the international referee license of luge, and be on the shortlist of the core technical officials of China.

Oct. 2013-Sep. 2016 EHSM Master of Science (MSc) for Elite Sports

- Main Course: International Elite Sport Politics, Research Method, Application Statistic for Elite Sport, Sports & Law, International Sport Federation`s Politics, Events Management, Quality Management, Sport Marketing, Innovation Management, Offspring and the Development of Their Sport Performance, Performance Physiology and Diagnostic, Technique and Tactics etc.

Sep. 2009-Jul. 2013 Beijing Sport University Bachelor of Management

- Main Course: Accounting, Statistics, Sport Management, Strategy Management, Human Resource Management, Facilities Management, Marketing, Recreational Sport Management, Economy, Administration.

Work Experience

Dec. 2020-Sep. 2021 LeadSports China Company Business Developer

- Introduce sports related foreign equipment and products into Chinese market. Search for suppliers, cooperation partners and experts for various projects of General Administration of Sports/ Olympic Sports Centre etc. Help to extend business network consisting of 50 new connected manufacturers (Including 3 exclusive distributors, 1 non-exclusive distributor).
- Perform market research, analyse sports policy etc. to identify new opportunities. Complete Intra-team tasks & provide language service.

Dec. 2019-Apr. 2020 HC Beijing Kunlun Red Star Assistant of Team Operation

- Assist the manager to draft the end-season working report, the work plan as well as other official documents.
- Data Analysis for the sport teams` expense in accommodation, catering, flight, ground transportation etc. Assist the manager and leaders for the enhancement of process monitoring and system construction.

- ❖ Provide high-quality services and undertake various tasks in the equipment and warehouse management, team operation, visa application etc.

Jul. 2018–May 2019 Chinese Ice Hockey Association Vice Team Leader & Interpreter

- ❖ Assist the team manager for the administration, team management, teaching and educating athletes.
- ❖ Communicate externally, coordinate the cooperation, do media relations work etc. Coordinate and assist to organise various games, visiting programs and events for the team in Switzerland.
- ❖ Coordinate medicine related work, accompany athletes to medical centres/hospitals, communicate with various parties related to health care, first aid, medical support & insurance etc.
- ❖ Make oral and written translation for the daily training course, games, competitions etc.

Jan. 2017-Mar. 2018 SCB Management GmbH International Relations Manager

- ❖ Write the Profile of SC Bern in English and Chinese. Draw up the plan "Switzerland-China Innovative Ice Hockey School".
- ❖ Make all round market research. Promote SC Bern to 56 important organizations in China.
- ❖ Build working network and relationship network. Help to bring Chinese potential cooperation partners (Such as Harbin Sports University, Beijing No.20 High School) to Switzerland for visit and exchange.

Publication and Presentation at International Conferences

- ❖ Full-text publication (Chapter 2, Published): Zhou, J. (2023) Systematic Review for Knowledge Transfer at International Sport Mega-Events. *Sustainability 15(6)*, 4902. https://doi.org/10.3390/su15064902
- ❖ Full-text publication (Chapter 4, Published): Pappous, A., & Zhou, J. (2024). Breaking Ice: An In-depth Examination of China's Winter Sports Participation in the Wake of Beijing 2022. *Athens Journal of Sports*, *11*, 1–19. https://doi.org/10.30958/ajspo.X-Y-Z (The article has been accepted by Frontiers in Sports and Active Living Editorial Office on 30 Sep.2024, but has experienced an unreasonable rejection from the publication office on 19.Nov.2024.)

- Abstract publication and presentation at Italian National Sports Science Conference- La Società Italiana di Scienze Motorie e Sportive (SISMES) 2022, 2023, and 2024 on various topics, including “Movement and Sport Activity in a Socioeconomic and Legal Context”, “Sustainability and Sport”, and “Sustainability and Technology”
- Abstract publication and presentation at the 32nd European Sport Management Conference (EASM Paris) on the topic “Sport Management and Social Inclusion”

License and Certifications

- Certificate for the Training of Soft Skills
- Certificate for Italian Language B1 Level
- Certificate for Academic English C1 Level
- Certificate for Intermediate Level of Biathlon and Shooting
- Honourable Certificate of Presentation at Chinese Students and Scholars Union in Italy (CSSUI) Online Spring Festival