Application of virtual reality technologies in the comrades' marathon as a response to COVID-19 pandemic

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Abstract

The purpose of this study is to analyse the perceptions of Comrades Marathon runners concerning the application of virtual reality technologies as a strategic response to the effects of COVID-19 in South Africa. Furthermore, the study also assesses the runners' challenges and readiness to participate in virtualised marathons post-COVID-19 pandemic. Data were collected from Comrades Marathon runners using online interviews. However, the study results showed mixed perceptions concerning virtual reality application to an outdoor sporting event like the Comrades Marathon in South Africa. Regardless of these perceptions, managers of sporting events are encouraged to make significant investments for the strategic development of virtual sports in the wake of the second wave of the COVID-19 pandemic.

Keywords: virtual reality; COVID-19; destination; sports tourism; Comrades Marathon, South Africa

1. Introduction

The novel coronavirus, Severe acute respiratory syndrome coronavirus-2 (SARS-COV-2, also known as COVID-19), is a pandemic first reported in Wuhan, China, in December 2019. By 11 March 2020, the World Health Organisation (WHO) declared COVID-19 as a global pandemic (WHO, 2020). This resulted in many governments implementing emergent policies and strategies to reduce the spread of the virus (Gössling et al., 2020). The methods employed were largely non-pharmaceutical due to the absence of a vaccine. Several firms closed their operations due to these measures as international travel and consumption plummeted (Musavengane *et al.,* 2020; Wen *et al.,* 2020). The growth trajectory of the tourism industry was affected (Cheer, 2020:2). The argument of overtourism (Dodds & Buttler, 2019; Seraphin *et al.,* 2018) was thus settled following zero tourism due to the SARS-COV-2 (Cheer, 2020).

SARS-COV-2 is not the first pandemic to affect tourism (Blake & Sinclair, 2003; Hall, 2010; Sönmez et al., 1999). Tourism in the past has been affected by disease outbreaks, including Ebola, Severe acute respiratory syndrome (SARS), and the Middle East respiratory syndrome (MERS) (Gössling et al. 2020). However, the only difference between COVID-19 and similar epidemics is the extent to which it has negatively affected the global economy (Naumov *et al.*, 2020; Woyo, 2021). Despite this, tourism is expected to be transformative, reorganized and collaborative (Hall *et al.*, 2020; Rogerson & Baum, 2020; Schipou *et al.*, 2021; Sigala, 2020; Woyo, 2021). For these aspects to be successful, tourism businesses must "be able to maintain "be able to maintain the confidence and physical security of both customers and employees" (Rogerson & Baum, 2020:731).

Since the outbreak of COVID-19, the debate to digitize tourism has been growing strongly. Yung *et al.* (2021:160) argue that "in a post-COVID-19 world, there is a growing importance for innovative use of technology to engage online visitors through web-mediated virtual information, providing vicarious experiences of destinations, garnering interest, and evoking positive emotions toward tourism attractions". This view shows that information and communication technology (ICT) play a critical role in solving the pandemic's problems in several economic sectors, including tourism (Javid *et al.*, 2020). One such crucial aspect of ICT in shaping the transformative agenda of tourism development post-COVID-19 is virtual reality (VR) (Schipou *et al.*, 2021). ICT is a critical enabler for tourism development and competitiveness (Gretzel *et al.*, 2020). Its use will be widespread due to biosecurity and medical concerns (Rogerson & Baum, 2020). VR technologies' application to tourism post-pandemic is essential for "creating a new, more resilient tourism model" (Schipou *et al.*, 2021:1). During COVID-19 lockdown, ICT emerged as a critical resource for remote working, online learning, and entertainment (Gretzel *et al.*, 2020). Though ICT is generally helpful, previous studies note that its application in tourism is disruptive (Benckendorff *et al.* 2019; Xiang, 2018), promotes fake news (Mare, 2019), which affect electronic tourism (Werthner *et al.*, 2015), especially for destinations with negative images (Woyo & Slabbert, 2020).

Due to COVID-19, several sporting events, including the Olympics in Japan and the Comrades Marathon in South Africa, were cancelled as they were "superspreader" events. Following the Comrades Marathon's cancellation in South Africa, the runners were asked to participate in a Virtual Run on the 14th of June 2020. Gretzel *et al.* (2020:188) propose the need for research to understand the "short-term reactions and long-term readiness of the application of technologies to tourism sector "to understand the far-reaching impacts of COVID-19 at the fundamental level". There is no doubt that literature on the application of VR technologies on tourism sectors is growing. However, despite its application to "museums, theme parks, cruises and destination marketing, research on VR remains nascent" (Yung *et al.*, 2021:160). Empirical studies have not fully explored how VR affects sports tourists' behavioural intention in a global pandemic. Previous studies have called for substantive theory-based VR research to bridge the gaps in tourism literature (Wei, 2019; Yung & Khoo-Lattimore, 2017). Based on this, the purpose of this study is to examine the perceptions of Comrades Marathon runners concerning the application of VR technologies as a strategic response to the effects of COVID-19 in South Africa. The study also identified the challenges and analysed the runners' readiness to participate in virtual marathons post-COVID-19. To achieve this goal, data were collected from the participants of a cancelled Comrades Marathon event that was supposed to take place in May 2020 in KwaZulu Natal (KZN),

South Africa. Specifically, this study seeks to answer the following research questions: (1) What are runners' perceptions regarding the importance of technology in sport tourism since the emergence of COVID-19? (2) What challenges, if any, would make VR application to the Comrades Marathon difficult? (3) Do the runners think virtual Comrades Marathon is the forward?

2. **Literature review**

2.1 Sports tourism and its importance in South Africa

Sports tourists are visitors attending, viewing, or celebrating sporting events hosted in a sporting destination (Turco *et al.,* 2002). Previous studies show that sporting events can attract both tourists and spectators (Swart & Turco, 2020). These visitors make visible contributions to local economies where the event takes place (Scholtz, 2019). It is widely acknowledged in the literature that sporting event in South Africa makes a significant economic boost to the local economy through revenue contributions, creation of infrastructure, investment, marketing, curbing seasonality, enhancing community image, job creation, poverty alleviation and health and fitness (Giampiccoli *et al.,* 2015; Saayman & Saayman, 2012; Saayman & Rossouw, 2010; Scholtz, 2019). South Africa hosts more than a thousand sports events annually (Saayman & Saayman, 2012). Among them include the Two Oceans Marathon, the Comrades Marathon, the Midmar Swimming Mile, and the Premier Soccer League.

The Comrades Marathon is a world-renowned ultramarathon of 89 kilometres that takes places between the cities of Pietermaritzburg and Durban in KwaZulu-Natal (KZN), South Africa. Its first marathon was held on the 24th of May 1921, with just 34 runners (Scholtz, 2019). Scholtz (2019) notes that it has continued every year, except during the Second World War (1941 -1945). Earlier studies have shown that the event is economically significant, given the contributions to makes to the economy (Saayman & Saayman, 2012; Scholtz, 2019). For instance, the 94th edition of the Comrades Marathon attracted more than 21000 runners globally and generated over R700 million. This revenue contribution could have been more in 2020 had it not been cancelled. The Comrades Marathon's economic value underscores the importance of developing sports tourism to the local economy (Saayman & Saayman, 2012). Based on the opportunities presented to both travellers and destinations, sports tourism is believed to be one of the enablers of international travel growth pre-COVID-19 (Swart & Maralack, 2020).

While there is a growing stream of research on sporting events in South Africa, most of the studies were approached using supply views (Giampiccoli *et al.,* 2015) and residents' views (Scholtz, 2019). Those who used demand analysis focused on analysing participants' spending during the marathon events (Saayman & Saayman, 2012). Studies measuring runners' perceptions regarding adopting VR technologies during pandemics in South African sporting events are limited. Considering that South Africa is fast becoming a sporting tourist destination (Giampiccoli *et al.,* 2015; Swart & Maralack, 2020), there is a need to understand runners' perceptions of VR technologies' role during COVID-19 pandemics. Understanding these perceptions is important for sports managers in analysing the far-reaching impacts of COVID-19 at the fundamental level (Gretzel *et al.,* 2020). It becomes more important as the spread of COVID-19 is becoming more apparent, and the impacts of cancellations remain unknown on local economies.

2.2 Virtual reality and tourism

ICT developments have significantly influenced the tourism industry and enhanced general users' experiences (Buhalis & Law, 2008). VR is generally regarded as one of the rapid technological signs of progress within the broad ICT sector (Schipou *et al.,* 2021) that integrates several technologies that enable people to experience a world beyond reality immersively (Berg & Vance, 2017:1). Yung *et al.* (2020) argue that VR is one of the technological innovations that has grown in importance and interest among tourism practitioners and academics. Consequently, VR technologies are already used in various tourism sectors (Schipou *et al.,* 2021; Yung *et al.,* 2020). Previous studies acknowledged that tourists' experiences are enriched (Kim *et al.*, 2020).

VR use in tourism makes use of innovative technology's three-dimensional (3D) environment which combines visual, kinetic, and audio elements to enable users to view a real object from a tourist's perspective (Williams & Hobson, 1995). Through the computer-generated 3D environment, users can communicate, resulting in real-time simulation of one or more of the user's five senses (Gutierrez *et al.*, 2010). Consequently, it brings the user into an environment that imitates the real world (Carl, 2018). Tussyadiah *et al.* (2018) argue that using VR tourism, and people can travel anywhere using VR applications and wearing VR devices. Huang *et al.* (2016) say that using 3D VR technologies, destination marketing organisations are presented with several opportunities that help them connect with potential visitors by providing a rich experience that enables tourists to search for destinations. Therefore, VR has three characteristics: visualisation, immersion, and interactivity.

Based on the self-determination theory, the fulfilment of psychological needs often results in repeat purchases (Palmer & McCole, 2000; Huang *et al*., 2016). Understanding the influential factors that make sporting events more prominent and how VR technologies can be integrated is important during these times of COVID-19. Research shows that VR technologies' integration can generate more revenue (Yung & Khoo-Lattimore, 2019) and enhance user experiences. Fong and Trench (2019) argue that virtualised sporting events' development and selling generate multiple benefits to society, including employment creation. Hosting sporting events using ICTs positively impacts the travel and tourism economy (Jenny et al., 2018), particularly through travel, dining, and hospitality (DiLek, 2019). Previous research established a rising number of visitors eager to travel to other cities and countries to attend e-sporting activities (DiLek, 2019).

Dominant themes in VR research focused on virtual environments and virtual worlds (Yung & Khoo-Lattimore, 2019). Furthermore, VR technologies' application is rapid in tourism sectors such as "hotels, entertainment, restaurants, museums, virtual tours, architecture, simulation training and heritage" (González-Rodríguez *et al.,* 2020). VR aspects that have also been adopted include the use of drawings, images, videos, and websites (González-Rodríguez *et al.,* 2020; Yung *et al.,* 2020). While the application of VR technologies in the tourism industry appears to be comprehensive (Yung & Khoo-Lattimore, 2019; Yung *et al.*, 2020), Yung *et al.* (2021) argue that despite its rapid applications in these sub-sectors of the tourism industry, research on VR remains nascent. Although VR has had an important impact on tourism-related domains, few studies have the application of VR in sport tourism (Kurtzman & Zauhar, 1999), more so during a global pandemic where the right of movement is highly restricted to protect public health (Schipou *et al.,*

2021; Woyo, 2021). Bruwer *et al.* (2020) note that VR and robots could be a panacea to COVID-19 challenges. Existing studies on VR research have also been dominated by mature destinations such as Australia, Canada, and British Columbia (Yung and Khoo-Lattimore, 2019), suggesting a theoretical and geographical gap in emerging and developing countries. This research addresses the literature gap by measuring the runners' perceptions regarding applying VR technologies to the marathon event.

2. Methodology

3.1 Study context

Most economic sectors in South Africa still rely on government relief to survive the pandemic's effects (Bruwer *et al.,* 2020). Ochara (2020) argues that the impact of COVID-19 in South Africa has been catastrophic due to the absence of a proper risk management strategy. Based on the Tourism Sector Recovery Plan (2020:22), South African tourism is yet to recover from the impacts of COVID-19, having started 2020 with a "weak consumer demand, growing government debt, high unemployment and growing inequalities". By March 2020, hotel occupancies had dropped by half, with many establishments having already closed (Tourism Sector Recovery Plan, 2020), implying significant tourism revenue losses.

The current research was conducted using Comrades Marathon participants. Comrades Marathon is a world-renowned ultramarathon of 89 kilometres (approx. 56 miles) between the cities of Pietermaritzburg and Durban in the province of KwaZulu Natal, South Africa (Giampiccoli *et al.,* 2015; Scholtz, 2019). The "race direction race direction alternates annually; the race from Pietermaritzburg to Durban is termed the 'down run', while from Durban to Pietermaritzburg it is called the 'up' run" (Scholtz, 2019: 181). Due to the COVID-19 global pandemic, the 95th edition of the Comrades Marathon was cancelled in 2020. 2020 was the first year since World War II that the race was cancelled. The race also remains cancelled for 2021 – a year that marks the Comrades Marathon Association's centenary existence. In 2020, a virtual marathon, which was dubbed: Race the Comrades Legends, was organised on the 14$^{th\ of}$ June 2020. The virtual race was extended to all participants globally, including past legends of the World's Greatest Ultra Marathon.

3.2 Data collection and analysis

Given that COVID-19 is novel and ongoing, a qualitative approach was used and considered appropriate for understanding the research problem. COVID-19 presents new challenges that need to be identified to obtain critical insights (Strauss & Corbin, 1998). Data were collected from Comrades Marathon runners using online interviews. A structured interview guide with questions focusing on the importance of ICT in sports tourism, adoption of VR technologies, attitudes of users of VR technologies, future intentions, challenges of using VR technologies in African sporting events, and users' general readiness to adopt such technologies. The online interviews (in English) were conducted between August and September 2020 via Zoom by both authors. The interviews were recorded using the Zoom cloud facility. Participants were initially invited to participate in the research via Twitter, and subsequent participants were sampled using a snowball sampling technique. Previous tourism studies show that samples between 14 and 30 are considered adequate for scientific analysis (Phelan, 2015; Yap & Ineson, 2009). We settled for 20 interviews,

and these interviews were deemed sufficient for this exploratory study. These interviews ranged from 23 minutes to 30 minutes in length.

Profiles of participants, especially their demographic information, and the number of times they participated in the marathon are summarised (Table 1). Participant's ID consists of the term Comrades Marathon identifier (CM) and associated participant number. The six-step approach to thematic analysis by Braun and Clarke (2006) was followed in analysing the data. Thematic analysis is a useful technic for coding transcripts of interviews based on the accepted factors and related sub-themes. It also offers a framework for systematically coding and evaluating data and relating it to more comprehensive theoretical principles.

Table 1: Participants' profile

ID	Gender	Age	Frequency of participation
CM1	Female	46	10 times, completed all races
CM2	Male	45	8 times, completed all races
CM3	Female	28	It was supposed to be my first
CM4	Female	41	6 times, completed 4 races
CM5	Female	35	Once, completed the race
CM6	Male	42	Once, completed the race
CM7	Male	35	Twice, completed the race once
CM8	Male	46	Five times, completed all races
CM9	Female	49	7 times, completed all races
CM10	Male	40	6 times, completed all races
CM11	Female	40	It was supposed to be my first
CM12	Female	48	6 times, completed 3 races
CM13	Female	37	Once, completed the race
CM14	Male	32	Once, completed the race
CM15	Male	39	Twice, completed all the races
CM16	Male	42	8 times, completed 5 races
CM17	Female	49	12 times, completed all races
CM18	Male	35	6 times, completed all races
CM19	Female	30	It was supposed to be my first
CM20	Female	41	6 times, completed 2 races

3. Results

The results of the study are organised according to the objectives, namely (1) examining the perceptions of Comrades Marathon runners concerning the application of VR technologies as a response to COVID-19, (2) identifying the challenges associated with adopting VR technologies in sports, (3) the readiness of runners to participate in virtual marathons post-COVID-19. The findings are also presented in the form of themes that emerged during the interview and their analysis. The study results show that the application of VR technologies is possible, but not as a

replacement for the in-person marathon. Critical issues of the study are discussed in the following sections:

3.1 Perceptions of Comrades Marathon runners about VR application to the race

The interviewees' narratives show that COVID-19 was not only disruptive but negatively affected the tourism industry in KZN following the cancellation of the marathon event. While the objective of cancelling the event was to protect public health, the economy emerged as the most affected based on the participants' narratives. The Participants underlie the importance of the event's resilience, having endured apartheid and World War II. Thus, the findings note that, despite the challenges presented due to COVID-19, the marathon event has survived cancellations that were done during the World War II years. This signifies that the race will survive and recover from the effects of the COVID-19 pandemic. Participants are optimistic that the impacts of COVID-19 are temporary, and the event will bounce back:

> *CM8:This is not the first time the event was cancelled; it has been cancelled during World War 2. This phase will pass, and we will do whatever it takes to ensure that we will come back stronger after this pandemic.*

The marathon event's cancellation affected the runners in several ways, including the inability to train with others, cancelled trips to South Africa, and giving up on training. Informants also highlighted that the national lockdown in South Africa provided them with more time for training, and using ICT, they were able to grow their training team and save costs of going to the gyms:

> *CM7:I cancelled lots of plans. Music concerts and parties. However, my training team has grown because of meeting online. Even those that had stopped attending the gym are now attending the online gym sessions".*

Regarding the importance of ICT adoption in sporting events during pandemics, especially VR technologies, mixed views were obtained. On the one hand, some participants report that VR technologies adoption as a response to an ongoing pandemic is critical. The findings note that the race's virtualisation can render experiences that help create a new and more resilient marathon event model. The Comrades Marathon's current model involves attracting large numbers of people moving from one destination to the cities of KZN province. Thus, VR technologies' adoption will reduce the necessity to travel physically, contributing to low carbon dioxide emissions and environmental degradation. These informants' narratives show a positive perception and attitude towards adopting VR technologies, which is critical for creating a more sustainable way of travelling post-COVID-19 pandemic. This has the potential for these solutions. These perceptions were due to the impacts that COVID-19 is presenting on public health and economies, so many participants felt it is necessary for the Comrades to virtualise the race:

> *Ran my first Comrades marathon virtually. Virtual run and scheduling. No need to go to Durban and Cape Town marathons. It was a good way to keep us motivated and to still get us onto the road safely. Although it was nothing in comparison to the real race, it did seem like the only alternative.*

Furthermore, the results' analysis showed that participants are keen to have the Comrades Marathon race organised in a hybrid model: in-person and virtually. On the question of adopting VR technologies specifically for the Comrades Marathon, participants CM1 and CM6 said that the future could be more inclusive and that the marathon event could become a hybrid event post-COVID-19:

> *CM 1: "Nothing can replace the atmosphere, the camaraderie, the music, the elevation. Once restrictions are lifted, I will run it again. I will still use some technology though".*
> *CM6: "Virtual running is the way to go. No need to travel. More people are now participating. There is a missing link in terms of ensuring people share experiences and creating that real environment. A hybrid approach may be necessary. I am faster when I run with other people than when I run alone…. But both options should be available but not exclusive".*

On the contrary, VR adoption during the pandemic was deemed unnecessary for the event by some of the informants to the study. Some informants indicated their willingness to wait until the pandemic is over. This finding implies that the runners think that the adoption of VR technology in the Comrades Marathon will take away the "realness" of the race. The runners' experiences will not be fully replicable, explaining the negative perceptions about VR technology adoption in the race. With the right to freedom of movement limited due to COVID-19, the findings are surprising as one would generally expect that with limited options to move around and travel, the runners' intention to support the VR technology adoption would be positive. This also implies that although VR technologies are useful, it will take time to replace conventional marathons and tourism. The following quotes sum up the willingness to wait to return to an outdoor marathon experience:

> *CM2: "No virtual runs do not compare to physical runs. The virtual race was boring. I am an outgoing person".*
> *CM12: "I was introduced to comrades and other tourism activities physically. I don't think VR can do that. It can't give me the atmosphere for comrades or any race that I ever did".*
> *CM17: "No. running is about how I feel inside. The adrenaline and the burning chest, the elevation, the winds, the crowds cannot be mimicked".*

Even being unaware, these informants' narratives show a positive attitude towards their virtual participation in the June 2020 Virtual run that was organised following the cancellation of the 95th edition of the marathon. Participants revealed several types of VR technologies they are using during the lockdown as part of their training. The most common ones include Strava, and Nike Run, Nike Run Club App.

4.2 Challenges of VR adoption

Several challenges were highlighted by the informants regarding the effective use of VR technologies during the marathon race organised by the Comrades. Analysis of the challenges of VR adoption also produced mixed results. Some participants indicated that adopting VR technologies in South African sporting events, including the Comrades Marathon, could be stalled limited Wi-Fi access. Access to Wi-Fi and connectivity emerged as a recurrent response from many participants during the study. This challenge is further exacerbated by the cost of data in

South Africa and the ongoing load-shedding, and these aspects imply the sports destination competitiveness of South Africa. Without electricity and the exorbitant cost of data, virtual races could be impossible. Though willingness to adopt is there, the cost of using VR technology emerged as a key challenge among participants. These aspects are summarised with the following quotes:

> *CM5: "Data cost is still expensive, and the signal is still extremely poor in most areas of the country. I can conclude by saying more can be done, but it is a work in progress. The country is partially ready".*
> *CM11: "No. South Africa is not ready. It's not just about Wi-Fi. What about electricity, the hardware needed for the technology".*

Due to anxiety and uncertainty emanating from the COVID-19 pandemic, some participants noted that other forms of doing sports should be adopted. Informants highlighted that aspects of connectivity in South Africa are better when compared to other countries in the region, suggesting that VR adoption could be seamless for the Comrades Marathon event. Furthermore, some participants argued that connection is also fast to support runners to participate in the marathon race even from the remotest areas in the world in the comfort of their own home, leaving the huge potential to use it as a Comrades Marathon substitute:

> *CM2: "Connectivity is better in South Africa compared to other countries that I have visited".*
> *CM4: "I do believe that we are all trying our best to overcome the challenges and that we should push forward and remain positive in trying to move forward in all industries".*
> *CM17: "The connection is fast and fine. I have run even in my rural home and still got my stats".*

4.3. Post-pandemic use of VR technologies in sports.

COVID-19 is a strong force that currently inhibits all the factors that make international travel easy. This study also sought to determine the readiness of the runners to continue the race virtually. Mixed responses regarding the future use of VR technologies in the Comrades Marathon context were analysed. While some countries are now rolling out the vaccine, COVID-19 appears to be a virus that will be with us for a longer period. VR technologies happen to provide a platform where sports could be conducted safely and seamlessly based on these circumstances. Based on the participants' narratives, on the positive side, the future use of VR technologies in sports is possible and critical in catering for the changing realities of post-COVID-19. VR use provides the runners with a virtual experience of the marathon without physically going there, thus protecting the runners' and residents' public health. While bringing up the aspects of pro-active risk management and planning, participants CM7 and CM19 pointed out that:

> *CM7: "We need to be more exposed, not wait to be forced by things like COVID-19".*
> *CM19: "COVID-19 taught us one thing – we need to be more pro-active in managing pandemics, especially on how we were caught unaware".*

Furthermore, some informants to the study argued for the need to expose the Comrades Marathon runners to VR to adjust to the new reality based on the COVID-19 circumstances. The results

generally showed that participants agree that VR technologies in sports tourism are a strategic option worth pursuing to recover from the negative effects of COVID-19. While emphasising the need for adaptive thinking, participant CM6 pointed out:

> *CM6: "Yes, people need to change. We watch live soccer but don't want to watch our live concepts. More customization with hardware will be required".*
> *CM20: "Runners from all over the world get to experience our country, that put the country on a high pedestal and adds positively to economic growth".*

Though some participants favour adopting VR technologies for the marathon race, some viewed the strategy as a short-term approach that might only last until herd immunity has been achieved globally. Therefore, VR adoption is viewed by participants as necessary due to the limitations to travel posed by the COVID-19 pandemic. On the contrary, some participants believe that VR technologies will be affected by cost in the future. The unwillingness of participants to pay for the use of VR technologies also emerged as one aspect that makes the use of VR technologies post-COVID-19 bleak. Furthermore, VR technologies are regarded as substitutable but are not going to replace real experiences, and the runners who participated in this study argue that they prefer the race to be an outdoor experience. These views are summarised as follows:

> *CM3: "Not soon. The ideal of tourism is to be able to go out of the normal day to day environment and experience something different. The context and surrounding matters!"*
> *CM15: "No, only as a resort while the world is dealing with the pandemic. Should it continue virtually even post the pandemic, the whole purpose being Human race will be defeated. It won't be challenging, as some runners will cheat the system.*

5. Discussion

This study aimed to examine Comrades Marathon's perceptions regarding the use of VR technologies when physical running is restricted, as in the specific case of the COVID-19 global pandemic. By taking as a relevant case the Comrades Marathon event held in South Africa annually, the following key findings were evident. Firstly, studies investigating VR adoption in sporting events in a developing country context are lacking. Secondly, findings have revealed mixed perceptions regarding the use of VR technologies during and after the pandemic. These results support previous studies' conclusions where it has been argued that the adoption of VR technologies is critical for lowering carbon dioxide emission (Guttentag, 2010; Yung & Khoo-Lattimore, 2019; Schipou *et al.*, 2021) and also help deal with overtourism aspects.

Furthermore, the findings also revealed that the runners are willing to wait until it is safe to do the race in outdoor settings. This finding shows that the adoption of VR technologies will never fully replicate the tourist experience in physical environments, and this is consistent with past studies on VR adoption (Guttentag, 2010). This finding is also contrary to studies that focused on VR technologies as a substitute for traditional travel during COVID-19 (Schipou *et al.*, 2021). The results are not suggesting an increased uptake of VR technologies, and more research on this is

required. This research provides new perspectives by identifying several factors that influence the intention to use and not to use VR as a substitute for physical marathons during COVID-19.

Thirdly, several challenges, including the element of cost, load shedding, connectivity, and people's unwillingness to pay for virtual sports. The challenge of the cost of using VR technology has been reported in previous studies (Guttentag, 2010; Vishwakarma et al., 2020) as a factor that affects its adoption. However, for the first time in literature where it is being reported in an environment where the pandemic has affected most people's income and paying for VR could not be an immediate need, especially in an era of uncertainty. With high costs, VR technology adoption will not help the Comrades Marathon organisers improve their experiences. Therefore, the cost concerns of VR technologies put the marathon event at a competitive disadvantage. This view is consistent with Rogerson and Baum (2020:731), who argued that "the big challenges for developing countries in both technological and medical responses to COVID-19 in re-starting their tourism sectors are likely to combine social, infrastructure and, above all, cost concerns, all of which could put poorer countries at a major competitive disadvantage".

For the first time, load shedding is being reported as a factor that could affect the adoption of VR technologies in literature. However, the study results show, though, with scepticism elements, that adoption of VR technologies in sport is possible, as recommended by previous studies (Ivanov & Webster, 2018; Webster & Ivanov, 2020). Post-pandemic adoption of VR technologies could be helpful in terms of employment creation (Fong & Trench, 2019) and economic development (Jenny *et al.*, 2018) of the provincial economy of KZN through spending on accommodation, dining and transport (DiLek, 2019). Based on the results, it can be argued that the COVID-19 pandemic crystallised the necessity of agility when managing events such as the Comrades Marathon, especially with the adoption of ICT in times of crisis. Adopting robotic technologies in various aspects of tourism operations has been previously argued to become commonplace (Ivanov & Webster, 2017). The pandemic presents similar opportunities for sporting events and sports tourism destinations.

5. Conclusions and implications for future research

This study's contribution lies in its context, especially the themes that were identified in this study. First, the current study brings an important theoretical contribution. One of the few studies measuring VR technology users' perceptions in a sporting context where most would want to do it in physical settings. As far as we know, we are the first studying the VR usage potential in the context of the Comrades Marathon in times of a global health pandemic. Aspects discussed in this study should be taken as a crucial contribution to VR and sports in the light of the existing COVID-19 pandemic. The current study responds to the need for continuous research on sporting events using demand-side data (Giampiccoli *et al.*, 2015). Therefore, this paper provides relevant insights into new research on ICT adoption in sport (DiLek, 2019; Kim et al., 2020), especially some of the challenges experienced in developing countries, such as load shedding. Though there is now a vaccine, the fact that not many people will be immunized soon means the adoption of VR technologies is critical, especially with reduced mobility. This current study provides awareness concerning the need for agility in managing sports and events, especially in an environment where

the pandemic is perceived as risky. This study recommends that the Comrades Marathon be flexible and adapt to the event, given that life will not be as normal as we knew it.

The study also provides some managerial implications. Our findings, especially the aspects of challenges identified in the study, help managers understand user acceptance of VR in sports. Challenges of connectivity require stakeholder participation and for government and the private sector to increase ICT infrastructure investment. This is critical for the new normal, where technologies will help resuscitate the tourism industry and re-commence events without putting public health at risk. VR has long been adopted in other sports, including football, where live matches are simulated with a live audience. The recommencement of football in the UK Premier League has also resulted in broadcasters pumping spectators' sound effects in an empty stadium to create a simulated environment (Lee, 2020). This is something that managers for sporting events in South Africa can also adopt.

Practitioners should be interested in understanding behavioural intention determinants to increase acceptance and usage of VR technologies in sports tourism. Given the perceived public health risks due to COVI-19, managers of the sporting event must influence the runners' future behaviour through the perceived ease of use, usefulness, and substitutability of VR technologies in sports tourism. Past studies have argued that VR spaces can achieve similar benefits provided by in-person attendance for sports enthusiasts (Mastromartion & Zhang, 2020; Naraine, 2019). Strategies aimed at tourism recovery and building resilient events is critical for the Comrades Marathon, given its value to the provincial economy of KZN (Saayman & Saayman, 2012; Scholtz, 2019).

Impacts of COVID-19 on sports will be an evolving research area. Therefore, comprehensive research on the effects of implementing VR technologies as a strategic response to challenges presented by COVID-19 to sports should be conducted. This current work is limited in that it collected data from runners, and these views do not result in the generalisation of what the other Comrades Marathon stakeholders think about VR adoption during and post-pandemic. There is a need for more large-scale quantitative studies and modelling to further evidence the importance of VR adoption on sport and local tourism economies in South Africa. These studies are critical in bringing out deeper insights that would generally enrich literature.

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