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VR in tourism: A new call for virtual tourism experience amid and after the COVID-19 pandemic

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Abstract: Virtual reality has become a more common phenomenon in both destination marketing and on-site experience. The recent challenges such as overtourism and the COVID-19 pandemic have created a pressing need to examine virtual tourism as an alternative to traditional travel. This conceptual article aims at clarifying virtual experience in tourism, discussing the main antecedents and outcomes of virtual experience, and proposing a conceptual model of virtual tourism experience. The review of the literature revealed that virtual experience in tourism is influenced by factors related to information, quality, technology acceptance, and affective involvement, and has significant effects on tourists' attitudes and behavioral intentions. This paper contributes to knowledge and practice by classifying the main groups of factors influencing virtual tourism experience, introducing the conceptual model, discussing opportunities for future research, and providing recommendations for tourism practitioners.

Keywords: virtual reality; VR; virtual experience; tourism; attitudes, COVID-19

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1. Introduction

Virtual reality (VR) has become increasingly more popular in the gaming, movie, and theme park industries. Despite the long-term association of tourism with physical location and authenticity, VR was being applied to tourism contexts even pre-pandemic along with other contemporary strategies such as augmented reality (AR), 3D virtual worlds, immersive media, and gamification [1]. VR has been utilized most frequently for marketing to illustrate a place and project a destination image to potential visitors [2-4]. Technologies like 3D virtual worlds and VR are revolutionizing the way people experience travel and tourism-related products [5]. There is now an increasingly common practice in visiting simulations of real places, considered virtual tourism (VT) or virtual experience (VE). Sites utilize technologies as strategic business decisions because virtual tourism has been an effective tool in evoking emotion and visit intention towards the real place [6-8]. Though the question of authenticity, or whether the simulation is "real enough" remains an issue [9], VR in tourism spaces is only growing more prominent.

The pandemic brought on a new urgency in creating virtual tourism spaces [10]. The museum sector in particular has experimented with virtual experiences in the past to positive effect [11-17]. Intention to use VR in the tourism sector increased during the COVID-19 pandemic, as it was perceived to be a less risky, more prudent, and affordable

substitute for traditional travel [18,19]. Advertising shifted to virtual platforms, providing opportunities for engagement and new experiences in the midst of the pandemic [20]. Sites from museums to zoos to theme parks engaged with varied forms of communications with guests including behind-the-scenes videos, drone flyovers, 360° videos, virtual tours of spaces, and mixed reality experiences (AR, VR, and others). During the pandemic and even after it subsides, virtual tourism allows for safe, accessible options that keep the place on the mind and may likewise assist in tourism recovery post-pandemic [21,22].

There is a demand for a new research agenda for destinations in response to the significant impact on the industry caused by the COVID-19 pandemic. The United Nations World Tourism Organization (UNWTO) describes tourism as the most affected sector globally and forecasts an annual decline in international tourism receipts of up to \$450 billion [23]. The demand for visiting international destinations, staying at hotels, taking international flights, cruise trips, and other tourism activities may, therefore, not fully recover for several years if at all. The primary barriers likely to hinder tourism recovery include, among others, the closing of international borders, international travel bans, bankruptcies of tourism providers, and tourists' risk perceptions [24-26]. In this period of "forced hibernation," there is a need to develop new services that allow for safe travel experiences, which AR and VR strategies are effective at [27].

In addition to the pandemic, tourism has been subject to other pressures of late, most notably that of "overtourism" [28]. Overtourism, more than any other single issue in recent years, has exhibited the most salient negative impacts on tourism including social, cultural, and environmental costs for the residents with anti-tourism protests witnessed in many popular destinations [28]. Destination resilience factors, traditionally described in the literature as the capacity of tourism systems to resist negative impacts [29], have become powerless in the face of overtourism, environmental destruction, and global pandemics, with them collectively serving as a catalyst for change in the future marketing and management of destinations. Several actions have been proposed to combat overtourism, for instance limiting access, demarketing, price increases, and other on-site interventions [30]; however, a reconceptualization of tourism itself may also be beneficial. This research note advances the view that tourism will never return fully to its previous state and that significant changes in tourism research and tourism management related to the "virtualizing" of the tourism experience should be conducted to respond to the significant challenges that lie ahead.

At a time when experiential research in tourism is more pressing than ever, research in this domain continues to face a number of limitations. Yung and Khoo-Lattimore [31] described three groups of methodological issues in using VR and AR in tourism research: lack of unified terminology, non-acceptance of VR technologies, and lack of theory. In addition, the commonly applied self-reported retrospective evaluations of tourists' experience are biased by social desirability, extreme responding, recency effect, memory limitations, respondents' inability to verbalize their feelings, and other response biases [32]. Currently applied methodology also does not allow capture of the dynamics of pre-visit, on-site, and post-visit phases of the tourist experience. Furthermore, the traditionally described intangible and experiential nature of tourism products is inaccessible in real tourism and hospitality settings due to the material nature of hotel rooms, air flight tickets, monetary transactions, and other physical objects.

This article aims to review the empirical and conceptual literature on VR in tourism, discuss the main antecedents and outcomes of virtual experience, and propose a conceptual model of virtual experience in tourism. Understanding perceptions of VR in the tourism context will allow scholars and practitioners to grasp the macro view of these technologies and assess the directions that sites should develop into considering the pandemic and other challenges facing the global industry.

2. Virtual Tourism Experience

The topic of virtual experience is not new in the tourism context. Although virtual reality and virtual experience are often used interchangeably in tourism and hospitality research, there is a difference between these terms. VR is traditionally defined as a computer-generated environment, where the user has an opportunity to immerse, look around, and control the experience [31]. Technologies represented in virtual reality range from 360° videos, VR, AR, and virtual meetings to the digital world as a persistent virtual environment, which can be broadly classified based on the levels of immersion, presence, and complexity [6]. The levels of immersion can be defined as non-immersive (e.g., computer, display, mice), semi-immersive (e.g. high-resolution displays, projectors, hard simulators), and fully immersive (e.g. VR glasses, head mount display), based on the type of simulation and degree of user's abstraction from the real world [1]. Immersive qualities may differ based on the transparency of the media; more transparent media allows an individual to focus on the content unlike in hypermediated spaces, where the interface is continuously apparent [33]. The level of presence (the perception of being in and feeling connected to the virtual environment) is related to the processing of virtual stimuli by the human sensory system and depends on external stimuli, subjective components of experience, and the user's individual characteristics [34,35]. The complexity of the experience and the capabilities of the technology also make a difference in immersive qualities and the likelihood of adoption by destinations.

At the same time, virtual experience in tourism and hospitality can be broadly described as the totality of tourists' affective, cognitive, and sensorial responses before, during, and after interaction with the virtual environment [36]. Applications of experience in tourism research include visiting virtual destinations, hotels, attractions, and artifacts that make it possible to examine and interact with them. Virtual tours of historic sites and attractions were especially common during the pandemic with ancient Egyptian sites, Petra, the British Museum, the Louvre Museum, Frida Kahlo's house, the White House, and others [21]. Ancient sites that no longer exist (e.g., ancient Roman spaces and traditions) and extant or extinct museum exhibits (e.g., the world's first photographic exhibit) can be recreated with these technologies [16,17]. Many applications allow for marketing a location or providing experience to those who cannot attend. For example, several of the pavilions at Expo 2020 Dubai, the most recent world exposition, are available in 360° videos, walkthroughs, video tours, and other online presentations due to the persistence of the COVID-19 pandemic. Tethered and untethered VR experiences using popular apparatuses are applied in destinations, with some using expensive equipment and others requiring only an application download for a mobile device [8]. AR experiences and holograms, both of which may superimpose digital images on physical space, have been expanding in several industries including tourism [20]. 3D virtual worlds like Second Life have also been considered in research, with functions such as marketing, virtual tours, and hosting virtual embassies [37,38].

There are notable limitations of virtual experience. In some cases, virtual techniques are used to augment visitor experience at the site, for example adding a multi-sensory VR presentation in a wine tourism location [39]. However, certain aspects of sensory experience (particularly gustatory and olfactory dimensions) are much more difficult to reproduce than visual, auditory, and occasionally tactile VR offerings, making the experience less complete. There is concern that VR experiences may be less personal than traditional tourism [39]. One study [40] found that virtual tourism can bring positive outcomes such as learning and intent to visit, but it can also intensify negative emotions elicited in things like dark tourism sites, which then leads to a decrease in visit intention. It is easier to mediate emotions in a physical setting by tactfully structuring experiences. In addition, virtual tourism is often conceptualized as a substitute for experience rather than the experience itself or is viewed as less authentic [13]. Deng et al. [41] found that VR websites might negatively influence visit intentions. The notion that virtual travel not only has advantages to traditional travel but that it poses a threat to tourism because it will

completely displace physical travel [42] echoes the concerns of postmodern critics that simulation is more appealing than reality [43, 44].

Nonetheless, virtual experiences have been found to be advantageous. Virtual experiences, especially those with immersive and social interaction features, can increase guest satisfaction and loyalty [45]. Flavián et al. [46] suggested that virtual experience brings additional value to the customer purchase journey. A recent study by Bogicevic et al. [47] found that pre-visit virtual experience leads to higher levels of tourism brand experience. Di Franco et al. [48] determined that virtual replicas in museum settings evoke more reactions than real artifacts. This aligns with previous work that observes “in situ” display (with dioramas, environmental design, immersion, etc.) is often more impactful than “in context” display, or the traditional technique of artifacts arranged in a curated taxonomy [49,50]. In another study [51], telepresence (allowing one to feel present in a place that is not the physical location one is in) can predict one’s user experience with virtual environments still giving the perception of “being there.” Importantly, no significant differences between physical presence and virtual experience were found for tourists’ emotional engagement, spatial presence, and behavioral intentions [12, 52]. Travelers can be fully immersed by the virtual experience, detached from the real-world environment, partake in the realism of virtual scenarios, and report revisit intentions similar to experiencing the actual physical destination.

3. Antecedents, Outcomes, and Theoretical Foundations

3.1. Antecedents of Virtual Experience

Several potential antecedents of virtual experience described in the literature are presented in Table 1. Antecedents in some of the literature coincide with the theoretical underpinnings of the studies. For example, literature based on the Technology Acceptance Model use that framework’s antecedents of perceived ease of use and perceived usefulness [53-55] or a study focused on experiential dimensions uses those for its attributes [14]. Similarly, those who study presence [56,8,57] or telepresence [3,10] as a core concept observe it as an antecedent of effective virtual experience. Different qualities that lead to immersion including flow and interactivity [10], sensory fidelity [57], and emotional involvement [58] have also been found to be significant. Another common theme in the literature is that of quality [59,60,40], as low-quality experiences may provide less realism. The visual affordances of VR technologies are pointed to in some literature [6,61,58,59,62] while others include the content itself [59,4] or user qualities such as attitudes towards VR [63] or interest in VR [18].

Table 1. Antecedents of virtual experience

Authors	Antecedents
Hyun and O’Keefe (2012)	Information, telepresence
Huang et al. (2013)	Interactivity, perceived ease of use, perceived usefulness
Huang et al. (2015)	Perceived ease of use, perceived usefulness, perceptions of autonomy, competence, relatedness
Griffin et al. (2017)	Type of virtual stimuli
Disztinger et al. (2017)	Perceived ease of use, perceived usefulness
Rainoldi et al. (2018)	Type of information
Tussyadiah et al. (2018)	Sense of presence
Beck and Egger (2018)	Type of virtual stimuli
Marasco et al. (2018)	Emotional involvement, visual appeal
Marchiori et al. (2018)	Field of view, presence of animated elements

Kim and Hall (2019)	Perceived easiness, perceived usefulness
Li and Chen (2019)	Perceived ease of use, perceived usefulness
Hudson et al. (2019)	Immersion, social interaction
Wei et al. (2019)	Functional quality, experiential quality
Yung et al. (2020a)	Immersion, engagement, presence, sensory fidelity
Lee et al. (2020a)	Education, entertainment, escapism, esthetic
Lee et al. (2020b)	Content quality, system quality, vividness
Lo and Cheng (2020)	Intensity of presence
Rejón-Guardia et al. (2020)	Personal innovation, attitude towards VR, performance expectations
Schiopu et al. (2021)	Perceived ease of use, interest in VR, perceived sustainability
Lee and Kim (2021)	Information access, flow, interactivity, telepresence
Rauscher et al. (2021)	Performance expectancy, effort expectancy, social influence, facilitating conditions
Sarkady et al. (2021)	Perceived ease of use, perceived usefulness, perceived risk, perceived severity
Zheng et al. (2021)	Elaboration, quality

3.2. Outcomes of Virtual Experience

Several possible outcomes of virtual experience described in the literature are presented in Table 2. The main outcomes of the virtual tourism experience are related to users' emotional responses, attitudes, and behavioral intentions. A lab experiment conducted by Beck and Egger [6] revealed differences in electrodermal activity and heart rate variability responses that were traditionally associated with emotional arousal between the groups exposed to virtual scenarios by using traditional screens and head-mounted displays. Another heart rate experiment [62] found that characteristics of VR can lead to strong memories. Others found emotional involvement as an outcome [54,58] or pointed to specific emotions such as enjoyment [2,63,8]. Brand or destination image and awareness is another outcome of virtual experience, with several studies addressing it [61,3,4,57]. The learning component of virtual experience is accounted for in literature including understanding material [64], the information search process [4], and the ability to make informed decisions and initiate travel arrangements [65].

Many studies are positioned within the popular Theory of Planned Behavior (Ajzen, 1991), wherein attitudes, subjective norms, and perceived behavioral controls impact behavioral intention and then actual behavior. In several studies, virtual experience can lead to outcomes that connect to this model such as attitude changes [64,56,63,8], overall behavioral intentions [54,2,14], use intentions [63], purchase intentions [64,56], visit intentions [7,10,56,8,57,40], revisit intentions [60], intention to recommend [60], and continued use [66]. Other beneficial outcomes for the destination include visitor satisfaction [45,60], loyalty [45], and value [10].

Table 2. Outcomes of virtual experience

Authors	Outcomes
Hyun and O'Keefe (2012)	Destination image
Huang et al. (2013)	Enjoyment, positive emotions, emotional involvement, flow experience, behavioral intentions
Huang et al. (2015)	Enjoyment, travel intentions

Griffin et al. (2017)	Destination image
Beck and Egger (2018)	Emotions
Marasco et al. (2018)	Emotional involvement, behavioral intentions
Rainoldi et al. (2018)	Destination image, information search process
Marchiori et al. (2018)	Strong memories
Tussyadiah et al. (2018)	Enjoyment, attitude changes, and visit intentions
Kim and Hall (2019)	Subjective well-being, continued use
Li and Chen (2019)	Travel intentions
Hudson et al., (2019)	Satisfaction, loyalty
Wei et al. (2019)	Satisfaction, revisit intentions, recommending intentions
Lee et al. (2020a)	Behavioral intentions
Kim et al. (2020)	Attachment to VR, visit intentions
Leung et al. (2020)	Ad cognition, ad attitudes, ad memory, brand attitudes, purchase intention
Rejón-Guardia et al. (2020)	Enjoyment, use intention, changes in attitude towards the destination
Lo and Cheng (2020)	Attitude toward a hotel, purchase intention
Yung et al. (2020a)	Destination awareness, destination understanding, emotions, visit intentions, perceived risks
Lee and Kim (2021)	Utilitarian value, hedonic value, visit intention
Zheng et al. (2021)	Visit intentions
Hyun and O'Keefe (2012)	Destination image

3.3. Theoretical Foundations

Virtual travel can be understood as a way to enhance tourism experiences or an alternative type of tourism [67,65,68]. Despite initial distrust, virtual experiences have been found to lead to the same levels of emotions, attitudes, and behavioral intentions that physical travel has. These experiences may not be a replacement for physical travel, but they can be viewed instead as “another form” of travel rather than merely a substitute [69].

The Technology Acceptance Model (TAM), modeled on the Theory of Planned Behavior [70], is the most common theoretical foundation employed in research to explain the behavioral outcomes of virtual experience [71,31]. TAM describes perceived usefulness and perceived ease of use as the main antecedents of users’ attitudes that lead to intention to use and then actual usage. Another frequently cited framework is the United Theory of Acceptance and Use of Technology (UTAUT) wherein performance expectancy, effort expectancy, social influence, and facilitating conditions impact behavioral intention and use behavior, with gender, age, experience, and voluntariness of use as moderating influences [72]. Self-determination theory, which understands sources of motivation through several constructs (autonomy, competence, and relatedness), has also been utilized in literature to illustrate that greater autonomy and relatedness while experiencing virtual tourism has a positive influence on travel intention and enjoyment [2]. The presence theory, positing that involvement and immersion enhance the user experience, might also be applied in tourism experience research [57]. The concept of narrative transportation, occasionally used in tourism, could be employed in VR destination narratives [73].

Other disciplines (e.g., digital media, game studies, education, new media studies, etc.), may bring more nuanced conceptualization of immersion, presence, flow,

interactivity, and other components of virtual experience. For instance, Dede [74] found that interactive media could utilize immersion through the senses, through actions not possible in the real world, and through symbolism, triggering psychological associations; virtual tourism environments might use these concepts as well as the potential outcomes he suggested: allowing multiple perspectives, situated learning, and knowledge transfer. Likewise, Brown and Cairns' [75] levels of immersion (engagement, engrossment, total immersion) could be helpful constructs in tourism. Application of these frameworks to the tourism context is a natural next step.

4. Conclusions

4.1. Conceptual model

The main antecedents of virtual experience in tourism include quality factors, technology acceptance factors, information-related factors, and affective factors (Figure 1). The quality factors are associated with VR content quality, functional quality, and system quality. Among the previously described technology acceptance factors are perceived ease of use and perceived usefulness. The information factors include the type of virtual stimuli and the type of presented information. Affective antecedents are related to the level of immersion, presence, intensity of virtual experience, emotional arousal, and the valence of emotions.

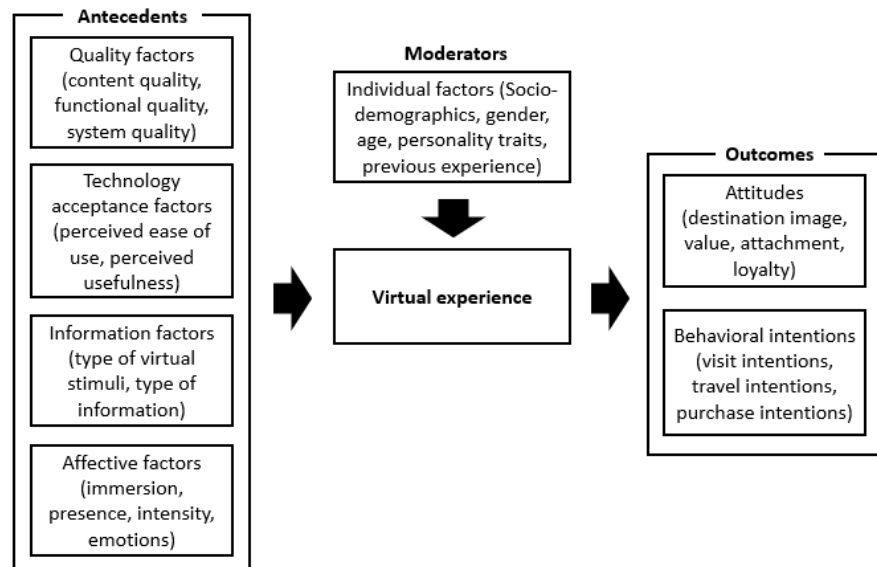


Figure 1. Conceptual model.

Attitudes and behavioral intentions are introduced as the main outcomes in the proposed model. Virtual experience in tourism settings might affect the image of the destination, perceived value, destination attachment, and different components of attitudinal loyalty. The behavioral intentions influenced by virtual experience include intentions to visit a destination, as well as purchase and travel intentions. The effects of quality factors, technology acceptance factors, information-related factors, and affective factors on virtual experience, attitudes, and behavioral intentions are moderated by users' individual characteristics, including age, gender, socio-demographic, personality traits, prior experience, etc.

4.2. Future research directions

The virtual tourism research agenda should include using types of computer-generated travel experience that provide tourists an opportunity to view, immerse, and control

the environment. Considering the level of immersion into a virtual environment and the degree of realism, it is suggested that tourists can receive affective, cognitive, and sensorial experiences from visiting virtual attractions, choosing travel transportation and accommodation, admiring landscapes, and interacting with other virtual tourism providers and tourists. Concepts of co-creation and participation can be assessed to determine whether design merits more agency and interactive features, as one study noted that multiple technology usage can lead to value co-creation in each phase of the visit [76]. Researchers might conduct cross-sectional and longitudinal research by using VR, collect data from smartphones and wearable sensors, as well as manipulate different experimental scenarios, stimuli, and interventions. The current adoption level of mobile and web-based applications makes it possible for participants to visit virtual destination scenarios by using smartphones and personal computers, VR headsets, and other extended-reality technologies. Virtual travel experience scenarios can also include pre-trip, on-site, and post-trip components. There are myriad opportunities for meaningfully reassessing the presence of contemporary technologies in the tourism sector.

The main difference between virtual experience and the traditional hypothetical experimental scenarios is the participants' motivation to receive virtual travel experiences that they cannot receive in real life and the levels of immersion in virtual destination scenarios. Additionally, using mobile technologies makes it possible to design different travel scenarios and collect objective data from wearable sensors and smartphone applications (geospatial position, heart rate, blood pressure, galvanic skin response, acceleration, etc.). One of the successful examples from the medical field is the Eureka health research platform, which helps to collect data from mobile applications for many health-related studies with hundreds of thousands of volunteers worldwide [77]. The pandemic has made technology interaction more common, with consumer purchases of VR and AR headsets up more than 50% [78]; thus, this is an ideal time to consider innovative data collection and technology adoption in tourism.

4.3. Implications for research and practice

Using virtual tourism experience can contribute to tourism research in several ways. First, it will ensure ideal intangible experiences, which are hard to provide in real settings. It will also facilitate the objective measurement of the temporal dimensions of the tourism experience at different time points before, during, and after the virtual trip. Next, it will make possible the study of subjects in natural virtual environments, taking into account the levels of immersion and realism of virtual scenarios. Finally, it will help prevent self-report biases by observing the real behavior of tourists and collecting sensor and mobile-based psychophysiological responses. Virtual reality scenarios make it possible for investigators to design and test outcomes of different destination situations by placing peak experiences at different time points [79,80], segmenting visitors by sociodemographic and personality characteristics [81], and introducing the effects of different affective stimuli before, during, and after the visit [82]. The further development of virtual destinations might make it possible to test different pricing models, including pay-what-you-want strategies, which currently remain underexplored in tourism research [83]. In the case of virtual destinations, the online environment will not be a limitation of the research since people will behave in real, immersive destinations in a virtual experience, perceiving realism, and subsequently becoming detached from the real-world environment.

Introducing virtual destinations will also have promising implications for destination marketing and management, tourism providers, and tourists. To begin, virtual destination scenarios can be used by governments and DMOs to pre-test new programs, policies, and marketing campaigns for existing and emerging destinations. Second, virtual destinations will help to control visitation to the overdeveloped destinations by providing opportunities to receive alternative virtual experiences. Next, virtual tourism will provide new business opportunities for tourism providers in challenging times as well as create

new niches markets for distinct customer segments. Virtual destinations can provide opportunities for people who cannot visit the real destinations or vulnerable categories of people, including low-income categories, people with disabilities [21], or the elderly [84]. Lastly, virtual destinations will satisfy tourists' need for travel experiences during crises, outbreaks, and potentially increase the resilience of travel destinations.

Virtual destinations will likewise bring important implications for the management of emerging, existing, and overdeveloped destinations, tourism businesses, and tourists. The COVID-19 pandemic creates opportunities for developing new tourism systems. The current period of time is ideal to invite people to visit virtual destinations, which combine advantages of realism and immersion with opportunities to design new travel scenarios and apply different subjective and objective measures of the visitor experience [85]. One more promising direction of future interdisciplinary research in using virtual tourism experience is the exploration of important health [86], transformation [87,88], and wellbeing outcomes [89,90] of tourism activities. Modern mobile technologies make it possible to capture important indicators of positive feelings and health (e.g. cardiac vagal tone, electrodermal activity, and facial expressions), which can be used as proxies of tourists' wellbeing as highly desirable outcomes post-COVID-19. Crises can provide a "transformative opportunity" for rethinking industry and academic work, driving change and sparking paradigm shifts [91]. In this case, the pandemic has instructed that one way to move forward is to move to the virtual realm.

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