




Article

Virtual and Space Tourism as New Trends in Travelling at the Time of the COVID-19 Pandemic

Michał Roman ¹ , Robert Kosiński ² , Kumar Bhatta ^{3,*} , Arkadiusz Niedziółka ⁴ and Andrzej Krasnodębski ⁴

¹ Department of Tourism, Social Communication and Consulting, Institute of Economics and Finance, Warsaw University of Life Sciences, Nowoursynowska 166, 02-787 Warsaw, Poland; michal_roman@sggw.edu.pl

² Public Relations Student Research Group, The Economic Department, Warsaw University of Life Sciences, 02-787 Warsaw, Poland; kosinski.robert@wp.eu

³ Kyushu University Institute for Asian and Oceanian Studies, Motooka 744, Fukuoka 819-0395, Japan

⁴ Department of Business Management and Economics, Faculty of Agriculture and Economics, University of Agriculture in Krakow, 31-120 Krakow, Poland; arkadiusz.niedziolka@urk.edu.pl (A.N.); andrzej.krasnodebski@urk.edu.pl (A.K.)

* Correspondence: kumar2bhatta@gmail.com

Abstract: The first European COVID-19 infection was recorded in February 2020, and Poland followed in mid-March. Restrictions were imposed on traveling between states and using public space. These movement restrictions forced a search for new, often innovative, forms of tourism. Google Earth virtual reality (VR), Google Street View, and the Chernobyl VR Project are just some of the selected opportunities to create virtual tours. Different activities using VR mean that people can experience the illusion of travelling in time and space, outside of their everyday surroundings, in a digitally constructed three-dimensional (3D) environment, for cognition or entertainment. Therefore, this study aimed to present virtual and space tourism as new traveling trends during various crises, such as health, economic, etc. A diagnostic survey with a developed questionnaire was conducted in June and July 2021 in Poland. A total of 564 fully answered responses were collected from randomly selected respondents. We found that around 82% of Polish people were aware of VR technology, and 70% believed that new technologies determine VR tourism development. VR presents the possibility of travelling to places that no longer exist in their original form, but have been reconstructed only in VR. Around 75% of the respondents agreed that VR tourism plays an essential role in tourism promotion in Poland and throughout the world. Moreover, VR and augmented tourism lets us visit fictitious and dangerous, politically restricted, and geographically as well as economically difficult destinations. For example, our results revealed that many people want to experience North Korea, the USA, Antarctica, Syria, etc. At the same time, people recommended the NASA space station as a visiting destination using VR and augmented reality. VR offers an alternative form of tourism during crises and pandemics such as COVID-19. We found over 26% of the respondents were satisfied with contemporary tourists' cognitional needs during VR sightseeing. More than 87% of the respondents believed that VR tourism cannot substitute real-world tourism in the long run. However, VR tourism will be more beneficial for developing countries facing difficulties in economic aspects, and easier than attaining visas to enter developed countries. Furthermore, virtual sightseeing may also constitute an alternative for people who are disabled or sick, and who cannot undertake the effort of active tourism and explore tourist resources of the world on their own.

Keywords: virtual reality; virtual tourism; augmented reality; space tourism; health; COVID-19 pandemic; tourism trends



Citation: Roman, M.; Kosiński, R.; Bhatta, K.; Niedziółka, A.; Krasnodębski, A. Virtual and Space Tourism as New Trends in Travelling at the Time of the COVID-19 Pandemic. *Sustainability* **2022**, *14*, 628. <https://doi.org/10.3390/su14020628>

Academic Editor: Juan Ignacio Pulido-Fernández

Received: 18 November 2021

Accepted: 29 December 2021

Published: 6 January 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

March and April 2020 were extremely troublesome for the tourist industry because of COVID-19 [1]. Specifically, as of 18 May 2020, 100% of destinations worldwide continued to have some sort of travel restrictions, 75% of them had completely closed their border,

and foreign visitors had to be put in quarantine [2]. For some time, it was only possible to travel for business, or for purposes essential to life [3].

A well-known Polish writer, Stanisław Lem, stated: “is it possible—we will ask—to create artificial reality, downright similar to natural, but impossible to distinguish from it? The first issue is the creation of worlds, the second one—illusions. But perfect illusions. I don’t know, however, if they can be called just illusions. Please, be the judge”.

“Man introduces order into the immeasurable space of the Universe, because he creates values”. Lem’s dream has now become a reality through virtual and space tourism.

The movement restrictions of 2020 forced a search for new, often innovative, forms of tourism. New technologies, such as virtual reality (VR) and augmented reality, have been talked about in the construction, manufacturing, transport, and communication sectors, as well as tourism. They have determined new directions in developing a variety of tourist offers, forming under the influence of new organisational and technological opportunities for the development of societies’ needs. Such an approach emphasises the contemporary role of innovation as a main way to a new generation of tourism style, the dominant elements of which are new, formerly unknown possibilities of participation in tourism [4].

The vision of artificial reality was created as early as the 1960s, when Stanisław Lem used the concept of ‘phantomatics’ in his voluminous essay *Summa Technologiae* in 1964 [5]. Today, the term is defined in *Słownik języka Polskiego PWN* as “the technique of creating the illusion of artificial reality in the human brain” [6]. At present, the idea of VR consists of the creation of a three-dimensional interactive environment, with the use of computer simulation, which will seem indistinguishably realistic to people immersing in it. The interactive vision of objects, buildings, space, and events creates a way of combining the elements of the real and fictitious world [7].

At the time of the coronavirus pandemic, many societies and destinations were forced to close due to the potential risk of infection; as a result, a large group of people moved their activities, including tourism, to the virtual world. All classifications and modes of tourism have one thing in common, namely, the physical movement in space and time [8]. If we are not on the road, will we experience new impressions, feelings, and emotions that a real journey carries? To what extent can VR substitute for those sensations?

VR in the tourism industry is called virtual tourism. United Nations World Tourism Organisation (UNWTO) defined virtual tourism as “the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes different from being remunerated from within the place visited” [9]. So defined, tourism involves voluntary and temporary displacement, but its motive is different from the purpose of obtaining a job in a new place [6]. In this study, we define virtual tourism as all activities of a person who experiences the illusion of travelling in time and space, and stays in places outside their usual environment in a digitally-constructed three-dimensional (3D) environment for the purpose of leisure or entertainment.

In the case of virtual tourism, movement in time and space takes place only in the digitally created reality, which indistinguishably resembles a real journey limited to a short-time excursion. A journey is usually associated with relevant preparation, for example packing clothes suitable for the climate conditions of the destination and other necessary accouterments. When we say “a journey”, we mean at least a few day’s stay away from home, which does not take place in the case of virtual journeys which can take from a few minutes to a maximum of a few hours. Virtual tourists do not need overnight accommodation and restaurant food in the places they visit with the use of the virtual world. This tourism lets them move to almost any place with no need to leave home, and visit areas and objects that cannot be visited in reality. VR lets visitors travel in outer space, or see historic places that do not exist in their original shape, but have been reconstructed with the use of computer applications [6].

2. Tourism at the Time of the COVID-19 Pandemic vs. New Challenges

Innovation is a lever of technical progress that provides an impulse to the development of economy [10]. Stimulating development consists of skillful use of knowledge, combining the processing of knowledge with creativity and resourcefulness to create and implement innovation [11]. The use of modern tools in the form of VR is a characteristic trend in tourism, and has also been noticed in other sectors of economy [12]. It is applied in manufacturing, transport, construction or communications. In tourism, it determines the directions of development of the variety of offers forming under the influence of new technological and organisational opportunities, in terms of the development of societies' needs. Such an approach emphasises the contemporary role of innovation as the main way to a new generation of tourism style, the dominant elements of which are new, formerly unknown possibilities of participation in tourism [4].

The phenomenon of travelling, which is the subject of research conducted by scientific experts involved in the anthropology of tourism and cultural tourism, assumes breaking the existing barriers of both time and space, as well as venturing beyond the already known reality in order to find what is new and mysterious [13]. Tourism is a complex response to the human need to discover the unknown and, at the same time, a condition of psychical and mental health [14]. Thus, abandoning the monotonous rhythm of everyday life, which tourism rituals provide [15], is something more than entertainment; it becomes a necessary condition of being a healthy individual within the meaning of the concept adopted by the World Health Organisation (WHO). Therefore, the SARS-CoV-2 coronavirus pandemic, which started in late 2019, dramatically emphasised the challenges and problems that had been signalled in tourism for a long time [16].

Tourists all over the world are exposed to various types of pathogens transmitted with food or by insects. The world is becoming more and more like a global village. Tourists will increasingly often take up a challenge to travel to the least accessible places. They often do not think what risks or unpleasant surprises may wait for them there. The risk of getting sick during such expeditions depends on a few factors, such as the level of endemism of the region of the world visited, the travellers' own state of health (the proper functioning of their immunological system and chronic diseases), length of stay, and protective measures in the form of vaccination or types of rest (e.g., doing extreme sports). The most common health problems resulting from travelling include gastroenteritis, inflammation of the airways, fever of an unknown origin and skin diseases [17].

Health risks resulting from the development of international tourism have been discussed since the early 1990s. That is when a commonly used term, "travel medicine", defined a multi-disciplinary specialisation combining the knowledge of health problems resulting from travelling, epidemiological data concerning the occurrence of risk factors of infectious and non-infectious diseases, as well as recommendations and regulations concerning prophylactic activities in particular countries and regions of the world [18].

The necessity to distinguish travel medicine as a medical specialisation may result from various factors including, first of all, a real need to provide health services, mainly prophylactic ones, connected with travelling and changing social mentality with regard to the need to visit physicians before a journey. This need should be accompanied by the conviction that one should not undertake reckless activities that pose a risk to human health. It is also important to refute the conviction that exists in social consciousness that every journey is beneficial or safe for human health [19].

In 2018, WHO released the list of priority contagious diseases that pose threats to human health. First of all, the list included viral haemorrhagic fevers (Ebola, Marburg disease, Lassa fever, and Crimean–Congo haemorrhagic fever), coronavirus infections (MERS and SARS), and a Disease X (a disease resulting from a pathogen not yet known but of animal origin and viral aetiology). At the end of 2019, a Disease X revealed itself as COVID-19, caused by the SARS-CoV-2 virus, the epidemic of which broke out in Wuhan in Hubei Province, Central China [20].

The first problem that was observed during the coronavirus pandemic was the resilience of health protection systems in the face of a sudden growth of the number of patients requiring intensive medical care. In the situation where even rich countries such as Italy, France, the United States or Japan, were not able to contain the spread of the virus, we cannot expect that it could be possible in the weakly developed healthcare systems of poorer countries that are often tourist destinations, such as Thailand, Mexico, Tunisia or Morocco. Therefore, one cannot expect that healthcare systems affected by the pandemic will be able to provide tourists with proper health protection against the existing threats to their health in the nearest future [16].

Transportation is a large contributor to the tourism industry. The branch of transport that has undoubtedly suffered the most from the pandemic is an air transport. Two years ago, forecasts for the development of the aviation market in Poland indicated a dynamic increase in the number of passengers at domestic airports, especially in regional airports [21]. Meanwhile, the pandemic that broke out in March 2020 resulted in a reduction in passenger traffic in the period from March 2020 to May 2020 by 90%, which had a dramatic implication for the income of all participants in the sector, and their employees in the aviation value chain [22]. In April 2020, restrictions on international travel had been introduced in most countries with which Poland had direct land or sea passenger connections [23].

3. Virtual and Augmented Reality

VR means a computer-constructed three-dimensional environment, which lets a user move and interact, which results in stimulating one of the five human senses [24]. The English term 'VR' and its abbreviation 'VR' are often used in literature. Virtual world is a computer-generated three-dimensional environment that can be static or dynamic in nature [25]. The broadest definition of VR can be found in S. Bryson's work. He perceives it as: "a new interface paradigm that uses computers and computer interfaces to create a three-dimensional effect of the world in which a user directly interacts with virtual objects" [26]. In this definition, VR is treated as a synonym of virtual environment (VE), composed of the static and dynamic world. In the static approach, the virtual world uses the environment that had already been created; in the dynamic world a user may interact with other people, creatures or objects. What makes a difference is only the method of contact with the user [27].

Three different systems of VR can be distinguished [28]:

- a non-immersive one consisting of observation of a virtual environment on high definition monitors;
- a semi-immersive one that can be attached to the system of projection on a big screen or multi-television projection;
- an immersive one affecting many senses via a virtual world by means of, inter alia, using the system of presentation on display units put directly of the head [29].

Augmented reality (AR) is an intermediate form between the real and virtual worlds. It consists of introducing computer-generated content to the real surroundings, e.g., one supplemented by graphic content [30]. R. Azuma identifies augmented reality as a real-time interactive system linking the real world with VR, and letting a user move freely in three dimensions [31]. Augmented reality does not create newness, or a fully three-dimensional world from scratch, but supplements a real picture (that is not subject to change) with new pictures or information. These can be, e.g., street names added, building markings, or extensions based on photo-realistic objects that interblend in the real world and form a whole [32]. A. McNamara expresses an opinion that augmented reality lets the physical world be enriched by virtual information in order to increase its understanding by consumers, and rise the level of their satisfaction and usefulness of direct surroundings [33]. Augmented reality does not have to be limited to a picture. The world that is created in it may remain enriched by sound and even smell. Thanks to technological progress,

commonly available smartphones and tablets have already become devices that make it possible to enhance superimposed effects, linking the real world with the virtual one [34].

4. Characteristics of Selected Applications Using Virtual and Augmented Reality in Tourism

VR application is available in different specs. Big applications, such as Google, provide the opportunity to experience VR worldwide, whereas some others offer the experience at the regional level, or at a specific destination. Thus, we selected the example of Google and two destinations from Europe as VR and AR destinations.

4.1. Google Earth VR

4.1.1. Google Earth VR

Until recently, high-definition aerial photographs or satellite pictures were available only to a few users. Today, everyone who has access to the Internet may see them with no limitation. Google Earth VR is an example of one of the most popular applications of this type, and constitutes “a vivid 3D computer map” of the whole Earth (Figures 1–3) [35].



Figure 1. The Colosseum, Rome, Italy; Source: [36].



Figure 2. Hoover Dam on the Colorado River, US; Source: [36].



Figure 3. The summit of the Matterhorn in the Pennine Alps; Source: [36].

It lets a person immersed in VR visit innumerable places on all continents. Visiting the selected corners of our planet, one can see from various perspectives. The software and goggles serving VR make it possible to see a bird's-eye view of the world, as well as observe it from the ground thanks to millions of spherical photographs produced in 360° format [6]. Due to the Google Earth app, we can admire the Colosseum from every side (Figure 1) and, after a moment, find ourselves over Hoover Dam on the Colorado River (Figure 2), or the summit of the Matterhorn (4478 m) in the Pennine Alps (Figure 3).

4.1.2. Google Street View

The virtual world of Google Street View was built from millions of panoramic photographs linked with each other electronically. Such a construction has no frames or limitations. Its boundaries are established by the Internet search engines' interfaces, as well as monitor and tablet cases Figures 4 and 5, respectively.



Figure 4. The view of the Eiffel Tower, Paris, France; Source: [36].

Moving around this world, we can freely look upwards and downwards, get closer to the objects observed or step backward [34,35]. Each walk in the world of Google Street View can also be done with the use of VR goggles. Google Street View makes it possible to admire the Eiffel Tower, inter alia, from Place De Varsovie in Paris (Figure 4), to be close to the Trevi Fountain in Rome and, regardless of the name “Street View”, to observe the interior of the Basilica de la Sagrada Familia in Barcelona (Figure 6).



Figure 5. The Trevi Fountain, Rome, Italy; Source: [36].

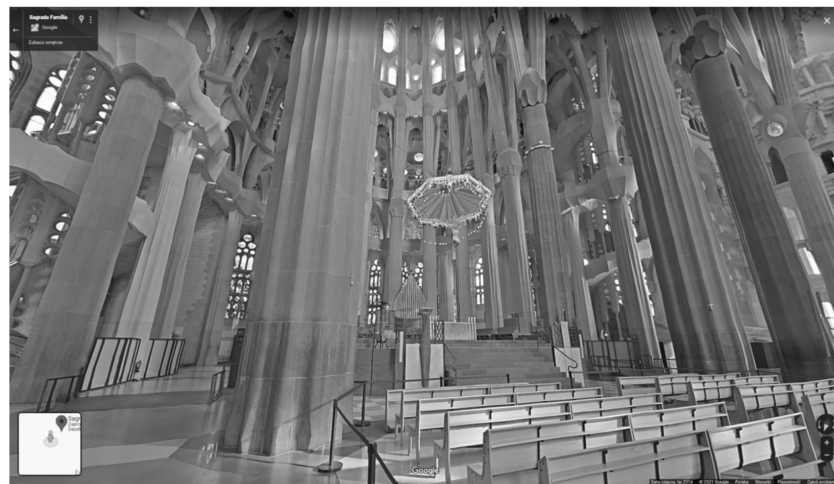


Figure 6. The interior of the Basilica de la Sagrada Familia, Barcelona, Spain; Source: [36].

4.2. VR Sight-Seeing at a Regional or Destination Level

VR and augmented reality is of growing interest, even at regional or destination levels.

4.2.1. Virtual Sightseeing of the Wawel Royal Castle in Poland

The development of IT techniques contributes to the creation of new forms of participation in culture and the wide popularisation of cultural heritage (Figure 7).

The transfer of museum pieces into the digital world constitutes an essential element of programs of protection, and the modern promotion of cultural heritage. These activities also result in the creation of new tourist values, encouraging visits not only to virtual collections, but also to given places or regions [37,38].

The best example of virtual participation in culture may be the project of a virtual sightseeing trip to the Wawel Royal Castle (WRC) in Poland [39]. The WRC was a cradle of Polish monarchs, the place of their births, coronations, reign, and funerals for centuries. Furthermore, it is necropolis of Polish heroes and national bards. The WRC became one of the most important museums in Poland in 1930. By its link with the history of Poland, it is now becoming a patriotic centre to the general public [40]. The WRC has collections of paintings, graphics, sculptures, tapestry, gold smithery, militaria, porcelain and furniture. One can admire King Sigismund II Augustus' famous arrases, and excellent Italian Renaissance paintings of the Lanckoroński collection [41].



Figure 7. Wawel Royal Castle in Poland. Source: [37].

4.2.2. Chernobyl VR Project

The Chernobyl VR Project is an interesting application using VR that constitutes a combination of the world of computer games, the world of educational applications, and a film narrative [42]. The app makes it possible to move around the abandoned ruined flats of Prypeć (Figure 8), closely observe the No 4 reactor in the Chernobyl Nuclear Power Plant (Figure 9), or climb the over-the-horizon radar called the Eye of Moscow, which is not far from the Chernobyl reactor (Figure 10). This is an interactive story about the tragic fate of the people and the site directly hit by the Chernobyl disaster [6].



Figure 8. A ruined flat, Prypeć, Ukraine; Source: [43].



Figure 9. No 4 reactor in Chernobyl Nuclear Power Plant, Prypeć, Ukraine; Source: [43].



Figure 10. Over-the-horizon radar called the Eye of Moscow, not far from the Chernobyl nuclear reactor, Prypeć, Ukraine; Source: [43].

5. Essence of Space Tourism and Selected Applications Using VR in Space Tourism

For years, space has been an object of people's fascination all over the world. However, the history of its physical exploration is relatively short [44]. What made the fulfillment of the dreams about its physical exploration possible was the rapid development of technology in the early years after World War II. The work on the development of the so-called space programme started and was performed by the two then economic superpowers.

Taking into account only the physical distance, space is relatively close to the Earth. The lowest points of satellite orbits are only about 100 kilometres above our heads, which may be recognized as the beginning of space. However, the distance is not all that counts [43]. Reaching that height requires appropriate aircraft, and much energy and specialist equipment, without which a human organism will not be able to function and survive in space [44]. Space flights relate to considerable risk, and everyone who decides to take part must realise what that threat is. Human beings leaving the earth and travelling in space leave their natural environment; the lack of gravitation has a negative impact on the human organism, and thus, health [45].

Private space journeys and space tourism are no longer a fantasy. The first space tourists underwent a series of tests and medical examinations before flight in order to

minimise the risk of harm to their health or life. A properly functioning human organism can adapt to changed conditions to some extent. In the case of a space tourist, spinal deformity or poor eyesight does not disqualify them from space travel, as it does for a professional astronaut. However, blood circulation or heart rhythm disorders, asthma, diabetes, claustrophobia, or neurosis may close the door to this form of traveling [46].

Space tourism should be treated, at present, as an exclusive form of travelling, which impels people to first think of the possibility of organising ground-based “space” journeys [47–49]. We can draw an analogy between space and sports tourism. We can distinguish its active form (e.g., journeys connected with participation in competitions) and passive sports tourism (to support teams or watch games). Thus, why not make the same distinction in relation to space tourism? In this case, active space tourism could mean travelling to and beyond the Earth’s orbit, and its passive form could mean journeys to observe astronomic phenomena and visits to places connected with the exploration of space [50].

Some experts forecast that the space tourism market will grow at the average pace of 16.9% per year, and companies involved will generate income reaching USD 1.3 billion in 2025 [47]. This results mainly from the competition between three billionaires: Elon Musk, Jeff Bezos and Richard Branson, who have develop their projects, Space X, Blue Origin, and Virgin Galactic, respectively. The business models of those enterprises differ considerably. Musk develops luxury tourism, Branson puts mass tourism first, and Bezos prioritises a diversification of income sources [51].

In spite of high costs, space journeys are already a fact, and the list of space travellers is becoming longer and longer. The development of technology will certainly influence the popularisation of this form of tourism in the nearest future, although it will remain inaccessible to a wide circle of customers for a long time. In light of the debates and opinions presented in the literature, it can be already entered into the catalogue of cultural tourism forms [48].

The characteristics of selected applications using VR in space tourism are presented below.

5.1. KSC 360 Expedition

A space tourism adventure can start with the “SC 360 Expedition” application released on 1 October 2020 by the NASA Kennedy Space Center Visitor Complex. It lets its user, inter alia, virtually visit the NASA Space Center, take a seat in the Mercury, Gemini or Apollo capsules, and see Space Shuttle Atlantis (Figures 11 and 12).



Figure 11. KSC 360 Expedition—NASA Kennedy Space Center Visitors Center (KSCVC); Source: [52].



Figure 12. KSC 360 Expedition—the interior of a space capsule. Source: [52].

5.2. The NASA SLS VR Experience

The software of the NASA SLS VR experience, released in March 2018 by NASA, lets a user take a seat inside a launch rocket and be taken, like a professional astronaut, on scientific space missions towards Mars, Saturn or Jupiter (Figures 13 and 14).

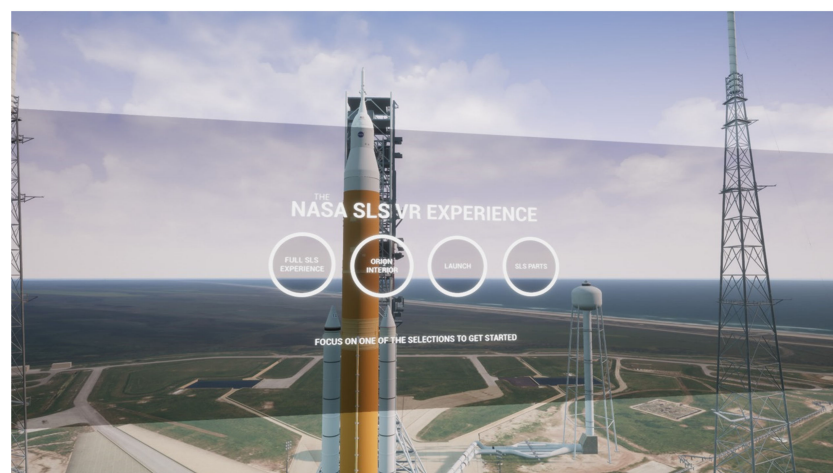


Figure 13. The NASA SLS VR experience—launch preparation. Source: [53].



Figure 14. The NASA SLS VR experience—the interior of a spaceship. Source: [53].

5.3. International Space Station Tour VR

Due to the House of Fables publisher and “International Space Station Tour VR” released in March 2018, we can join astronaut Samantha Cristoforetti aboard the International Space Station. The application lets its user move freely and become acquainted with over 40 key rooms of the station, which serve as the astronauts’ accommodation or laboratories (Figures 15 and 16).



Figure 15. International Space Station Tour VR—the interior of the International Space Station. Source: [54].

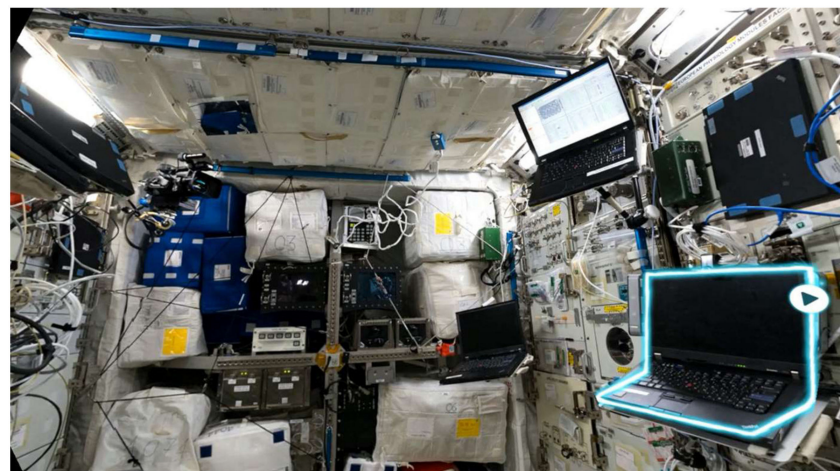


Figure 16. International Space Station Tour VR—International Space Station Laboratory. Source: [54].

5.4. Spacewalk VR Experience

Application “Spacewalk VR Experience”, released by Forward Thinking Interactive in March 2021, lets an owner of VR goggles walk in space without leaving home. Thanks to a few modes, apart from a space walk, one can choose a part of day or night and carry out some repairs of the space shuttle.

5.5. Moon Base

For anyone who would wish to visit the first moon base, the operation of which is scheduled for 2038, the application “MOON BASE” released by Rossiya Segodnya in January 2021 can be used. The software lets its user visit a moon base, walk on the Silver Globe, drive a lunar vehicle, and operate the drilling equipment or solar panels (Figures 17–19).



Figure 17. Spacewalk VR Experience—a space walk at sunset. Source: [55].



Figure 18. MOON BASE—a walk around a moon base. Source: [56].

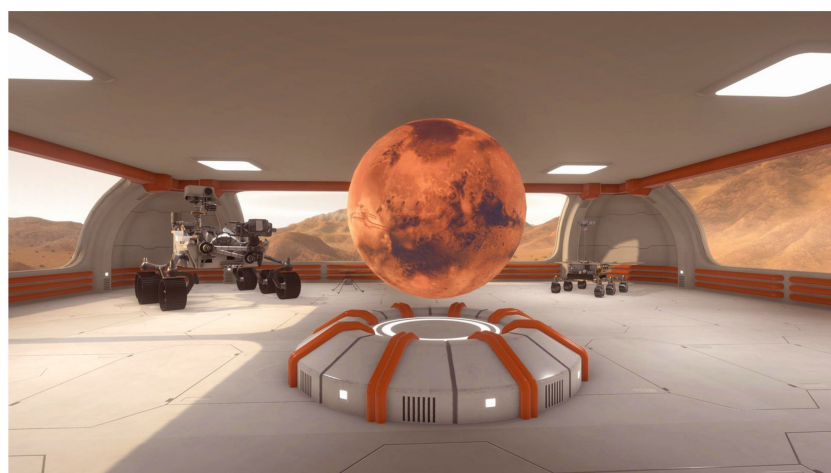


Figure 19. Mission: Mars—the interior of a museum on Mars. Source: [57].

5.6. Mission: Mars

“Mission: Mars” created by Nubalo Studios S.L. in January 2021 is a VR application, with the use of which a user can thoroughly examine three vehicles that China, Europe and the USA are planning to send to Mars in 2022. An adventure with “Mission Mars”

starts in a futuristic museum on Mars. A user can examine three-dimensional models of the vehicles, and move to the orbit of Mars in order to admire its moons and explore some satellites.

The authors of the article understand virtual and space tourism as follows: virtual tourism is a journey through various regions of the world, visiting tourist attractions on all continents of the Earth. Travels take place virtually, as a result of the Internet virtual tourism can be widely implemented, and is a phenomenon of the 21st century. Online virtual tourism is very widespread, and is a mass phenomenon. It often takes the form of cognitive tourism—journeys made to the most exotic and inaccessible corners of the world. Tourist destinations mainly concern real jungles, deserts, canyons, tropical forests and islands, but can also be related to virtual space tourism and fantasy.

Space tourism can be considered in two ways. Firstly, in “real-life”, it is by far the most expensive travel option, catering for the individual travels of people into space. This form of tourism is available only to millionaires who can fly a rocket from 20 to tens of millions of dollars, and has been developing for two decades. In the second sense, space tourism can be a form of virtual tourism that relies on space flights.

6. Materials and Methods

This research aims to present virtual and space tourism as a new trend in traveling in the face of the restrictions resulting from the threats of the COVID-19 pandemic. The research was carried out in June and July 2021, on a group of 564 people in Poland. When the research was conducted, there was no specific travel restriction within Poland, the COVID-19 infections were at 3.13 million on average, and full vaccination was 52.9 % of the total population. In order to meet the objective of a diagnostic survey, a developed questionnaire was used. The questionnaire was developed in Google forms, and distributed online (on social networks). The study included a group of 564 people and was conducted in June and July 2021, using an online questionnaire. The method of diagnostic survey and self-construction questions were used. The open questions concerned issues on which the respondent could write about what they associated with virtual and space tourism. The surveyed person could independently indicate which place of travel they would choose when practicing virtual tourism. Table 1 presents characteristic features of the research sample.

Table 1. Characteristic features of the research sample.

Specifications		N = 564	%
Gender	Female	348	61.7
	Male	216	38.3
Age	18–24 years old	24	4.3
	25–34	257	45.6
	35–44	132	23.4
	45–54	84	14.9
	55–64 years old	67	11.9
Education	Primary	12	2.1
	Basic vocational	60	10.6
	Secondary	390	69.1
	Higher	102	18.1
Place of residence	Village	84	14.9
	Town with up to 5 thousand residents	6	1.1
	Town with from 5 thousand to 50 thousand residents	54	9.6
	Town with from 50 thousand to 100 thousand residents	30	5.3
	Town with from 100 thousand to 200 thousand residents	36	6.4
Average (net) monthly income per family member	Town with over 200 thousand residents	354	62.8
	PLN 1001–1500	66	11.7
	PLN 1501–2500	150	26.6
	PLN 2501–3500	144	25.5
	over PLN 3500	204	36.2
Professional status	Blue-collar worker	54	9.6
	White-collar worker	384	68.1
	Student	54	9.6
	Entrepreneur	18	3.2
	Self-employed	42	7.4
	Pensioner	12	2.1

Source: Authors' survey, 2021. Notes: USD 1 = 3.97 PLN (as of 12 October 2021).

We selected Polish people for this survey purposely, because the discussion around VR and space travel has increased in Poland. An old military fighter jet has been transferred to the space station in Poland, where a total of 6 people can exercise the space station for two weeks to live like an astronaut, for example, eating frozen food, walking in gravity-free zones, and other activities, for 1700 Euros [58].

The following research hypothesis was formulated: “the COVID-19 pandemic affects the development of virtual tourism, and the main purpose of practicing it is a cognitive theme, or more precisely, tourist attractions that under normal travel conditions would be very difficult or impossible to implement for organizational and financial reasons”.

Furthermore, the Polish Space Agency (POLSA) was established in 2014 and supported by combining the world of business and science [59]. POLSA recently signed with US counterpart NASA to cooperate in space exploration, including the Moon and Mars. In addition, POLSA activities, such as the space station in the jet, have increased public awareness for space tourism and VR reality in Polish people. Thus, conducting a survey on the perspective of VR and space tourism in Polish people can contribute to the literature on space tourism.

As seen in Table 1, over 60% of the respondents were women. Most respondents were below 44 years of age, and were secondary school or university graduates. Most often they were residents of big towns. Over half of them had a net income of over PLN 2500. The majority of the respondents were white-collar workers.

7. Results

The COVID-19 pandemic had a considerable influence on the tourist industry. The research shows that some respondents gave up travelling in 2021. The dependence is presented in Figure 19. From our survey, only a tentative 15% of respondents were willing to travel abroad, whereas 44% planned to travel to a domestic destination. A similar survey was conducted in China in 2020, and explored that people like to travel in short distances [60]. This result clarifies that tourists' are motivated to travel in short distances to domestic locations.

The research shows that the COVID-19 pandemic had considerable influence on the organisation of journeys in Polish respondents. Many of them decided to spend their holidays in their country, and around 23% of the respondents were against travelling (Figure 20). This might have been due to several reasons; however, the most important reason is the COVID-19 pandemic. Due to the border closure and travel restrictions in many countries, people do not have a choice, and travel to their home countries [2,61]. As depicted in Figure 21, around one-third of the respondents said they would either continue exploring the tourism destination or would probably plan a trip in the near future.

Travel motivation is a very important factor in organising journeys. Motivation is directly connected with a desire to go to a particular destination or a country. This survey found that almost one-third of the respondents' travel plans were not affected by the pandemic (Figure 21). We also asked them how afraid of COVID-19 they were (Figure 22). In the group of 18-24 years, almost 78% of the respondents said they were not afraid, but in the group over 55 years, only 13% expressed the same opinion. It follows that young people are more willing to take risks, and do not fear getting infected with the COVID-19 virus during a trip in 2021.

There were no significant differences with regard to knowing the concept of 'VR' between men and women. As this survey mainly dealt with VR, we asked how knowledgeable the respondents were. We found that 81% of Polish respondents had knowledge about VR (Table 2), which may be the influence of the film industry and technology together. For instance, *Tron* directed by Steven Lisberger (1982), *The Lawnmower Man* directed by Bret Leonard (1992) or *The Matrix* series, directed by Lana Wachowski and Lilly Wachowski (1999, 2003, 2003) made the technology widely recognised in society. Furthermore, the first mobile VR headgears have appeared in Poland (e.g., VFX1 developed by Forte Technologies) and peaked the interest of VR technology in Polish.

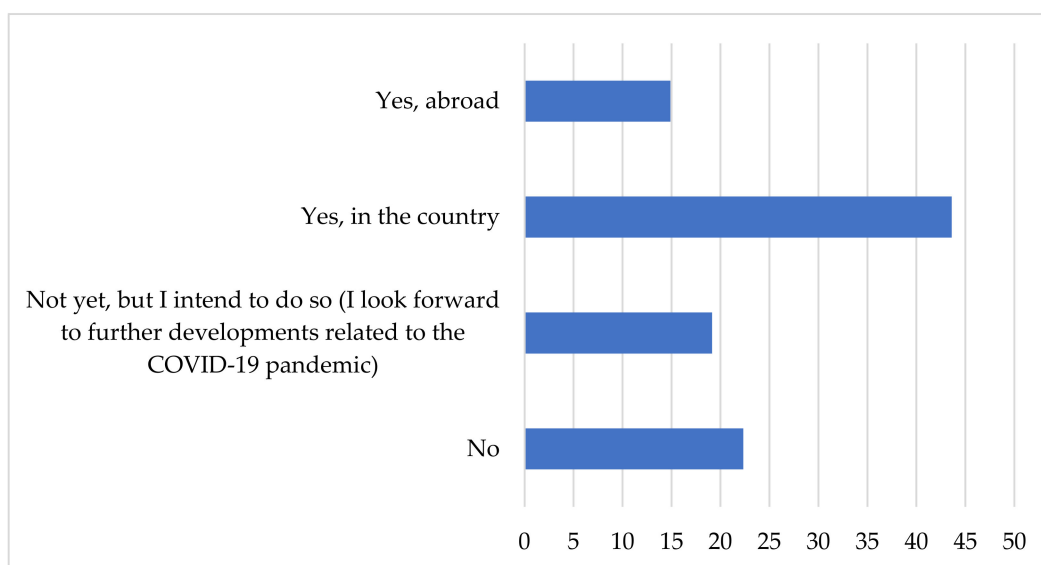


Figure 20. Respondents' opinions about planning tourist journeys in the country or abroad in 2021 [%].

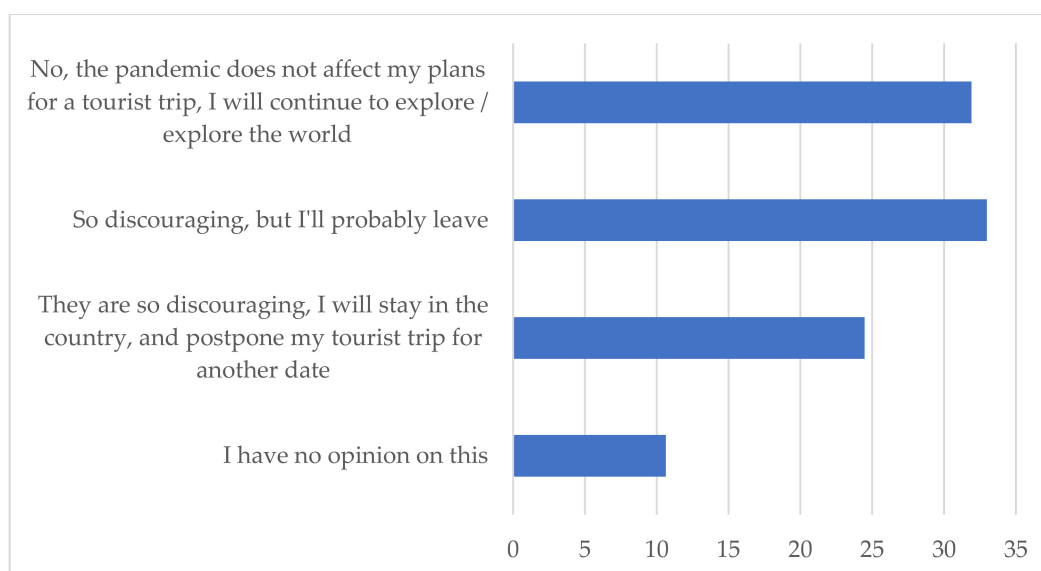


Figure 21. Influence of the COVID-19 pandemic on the organisation of tourist journeys in 2021 [%].

Table 2. Respondents' opinions and knowledge on VR and AR.

Topics	Response
Respondents' answers to the question about their knowledge of the concept VR	Yes, I know = 81%, I do not know = 19%
Respondents' knowledge of AR	Yes = 49%, No = 51%
Respondents' contact with virtual or augmented reality	Yes = 54%, No = 46%
Respondents' use of applications/projects connected with tourism that use VR	Yes, Ex., Google Earth VR, Google street view, Chernobyl VR Project, Virtual Museum of Fine Art = 88%, No = 12%

Source: Authors' survey. % is rounded decimal figure.

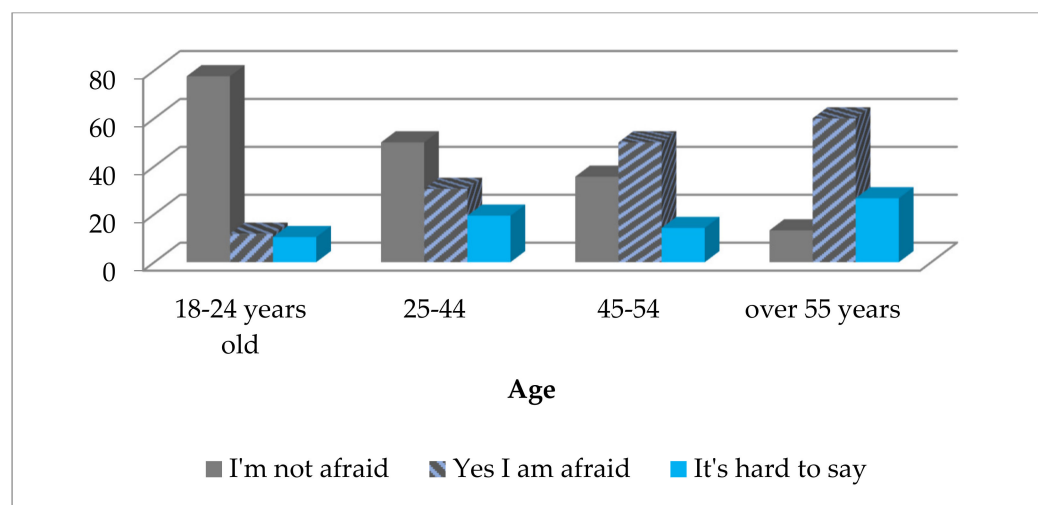


Figure 22. Fear of getting infected with the COVID-19 virus during a trip in 2021 [%].

The so-called augmented reality can be recognised as an intermediate form between the real and virtual world. It consists in the introduction of computer-generated content into the real surroundings, e.g., graphic content. The technology is not so widespread as VR, and that is why its recognition by the respondents is lower; half of them had never come across this term (Table 2). There were no significant differences in knowing of “augmented reality” between men and women.

The most popular applications connected with tourism that use VR include Google Street View, Google Earth VR or Virtual Museums (e.g., The VR Museum of Fine Art) (Table 2).

The respondents’ high level of recognition of VR technologies was reflected in this survey. For contact with VR or augmented reality, more than 54% of them had been in contact in everyday life (Table 2).

Figure 23 presents the respondents’ association with a virtual journey. The first association that the respondents had when they heard about a virtual journey was the Internet, a computer screen, visits to places inaccessible in everyday life, or watching photographs and films.

Figure 24 presents the destinations that people would like to travel using VR. The most popular destinations the respondents would like to visit within virtual tourism are places that are inaccessible or with limited access (e.g., the bottom of the Marian Trench or outer space), dangerous places (e.g., the nuclear power plant in Chernobyl), exotic places, ones under strict protection, those that do not exist now, and historic objects. These findings suggest that people like to experience VR for either dangerous or expensive destinations.

Figure 25 depicts the importance of choosing VR travel. The most important factor in choosing virtual travel is the possibility of visiting inaccessible places. A similar group indicated unique offers of virtual tourism and instant access to the places visited. The least important factors indicated by the respondents were the location of places visited and other people’s opinions.

Table 3 displays the opinions about satisfying contemporary tourists’ cognitional needs during VR sightseeing. Over 56% of the respondents indicated that VR tourism is not able to satisfy a contemporary tourist’s cognitional needs. That may be why VR in tourism is used more simply to communicate with visitors by providing information about a destination [56]. That means VR itself cannot substitute the conventional tourism market. Regarding the substitution of tourism activities by VR, we found that almost 90% of respondents were convinced that tourism with VR cannot substitute for traveling in the real world. This clarifies that virtual tourism does not significantly affect real-world tourism.

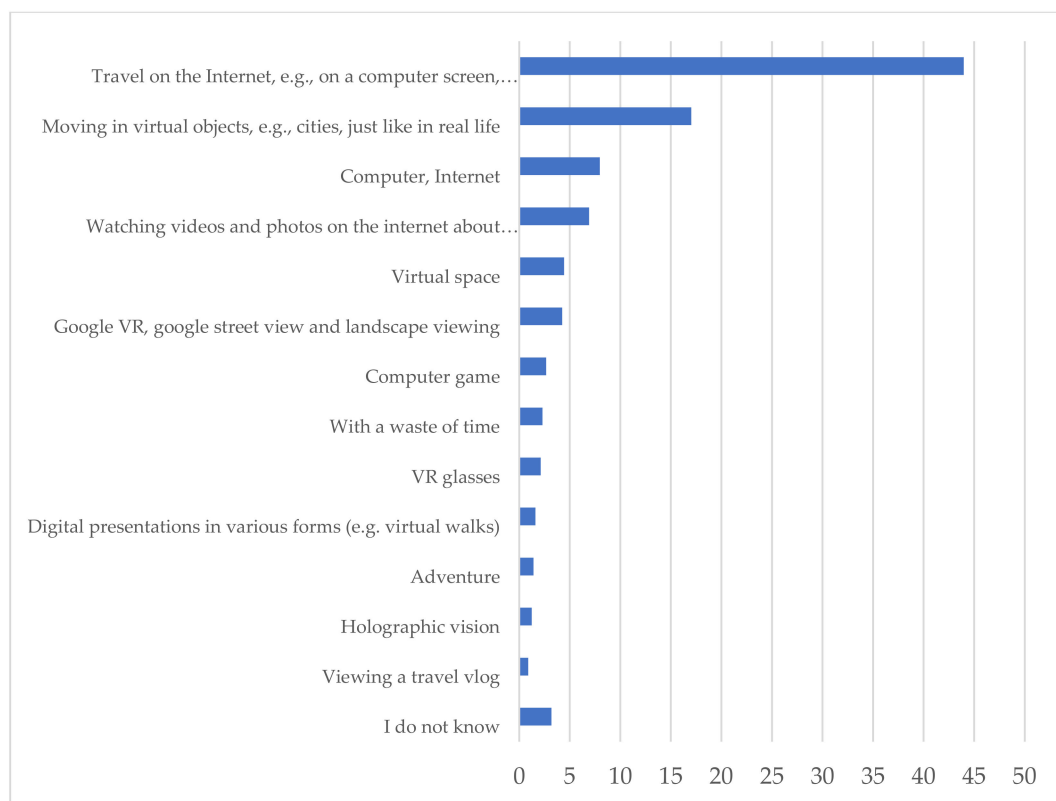


Figure 23. Concepts that the respondents associate with a virtual journey [%].

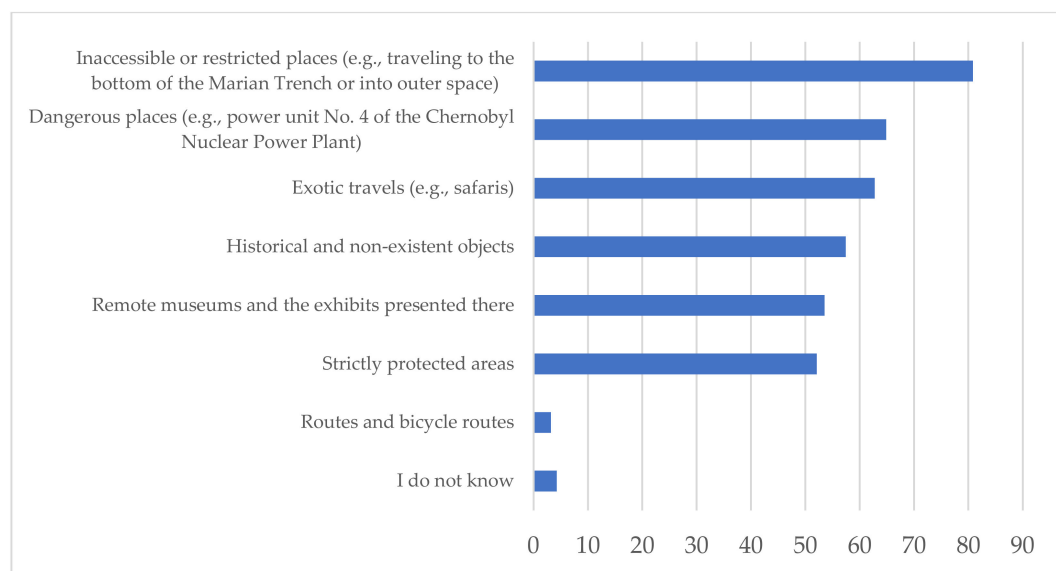


Figure 24. Objects that the respondents would most willingly choose to visit as virtual tourists [%].

The country that attracted the biggest number of the respondents within ‘virtual tourism’ was one that, for political reasons (restrictions on free travel) and, to a smaller extent, geographical location, is the most difficult to visit within real world travel: North Korea (Figure 26). China, as a country with rich culture and dynamic economic development, was second, and the USA was in the third position. Next, the respondents indicated the Mediterranean states, considered the cradle of our civilisation (with Italy holding a higher position) were worth visiting using VR. The continent indicated by the respondents as the one to be visited in the virtual world most willingly was Antarctica.

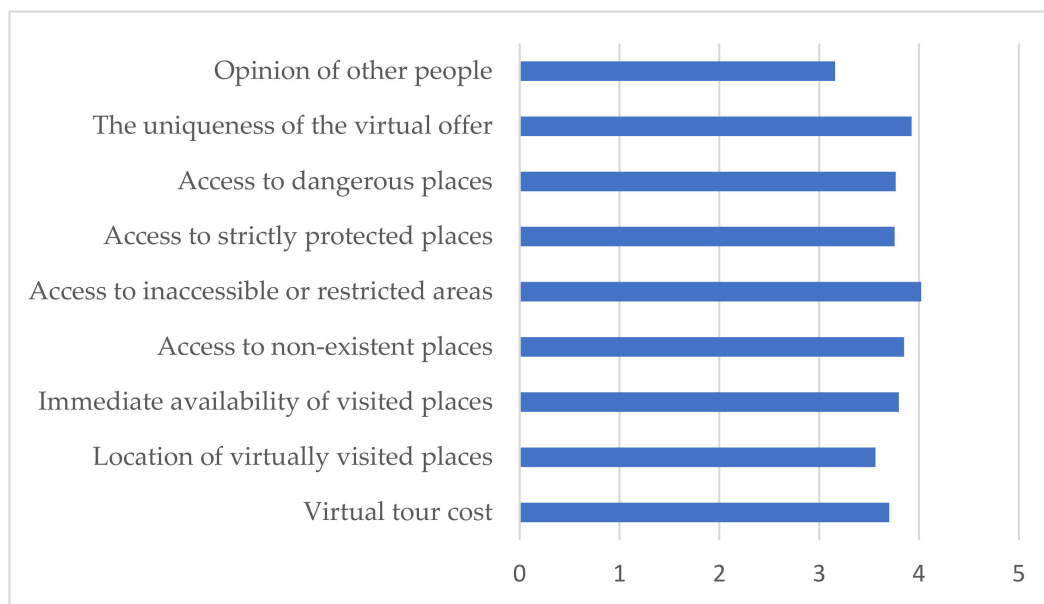


Figure 25. Importance of factors in choosing virtual travel (1—unimportant; 5—of great importance).

Table 3. Respondents' opinions on VR selection and its substitutions.

Topics	Response
Respondents' opinions about satisfying a contemporary tourist's cognitional needs during VR sightseeing	Yes = 27%, No = 56%, I have no opinion = 17%
Respondents' opinions on whether tourism with the use of VR can substitute for real traveling	Yes = 9%, No = 87%, I have no opinion = 4%

Source: Authors' survey. % is rounded decimal figure.

We asked the respondents where they wanted to go using VR openly. Our survey clearly demonstrated that the people have different tests and preferences on their VR destination selection (Figure 27). We found that people like natural, cultural, and challenging destinations, or prefer experiencing dangerous destinations. It is not surprising that many people mentioned the NASA space station because many people cannot afford the cost, but they can experience the station using VR technology. Different natural destinations such as the Grand Canyon in the USA, Mt. Everest in Nepal, the South Pole, Antarctica, Niagra falls, and the Atlantics were the preferred natural virtual destinations. People also wanted to experience ocean depths, cultural destinations, coal mines, and many other destinations. This shows that the market for VR tourism will increase further in the near future (Figure 28).

Figure 28 shows the respondents' opinions on VR as one of the ways of destination promotion. Only one in ten (12%) believed that VR was an efficient way of promoting tourism in Poland and the world. However, a study found that VR is used to promote destinations [56]. Significant number of people disagreeing means that more development is necessary for VR. Onsite tourism will remain popular.

The factors determining VR in tourism are presented in Figure 29. The biggest group of the respondents indicated that new technologies, security and changes in travelling caused by the COVID-19 pandemic were the most important factors in determining the development of VR in tourism. Comfort and accessibility of such places to disabled people were not recognized as such factors.

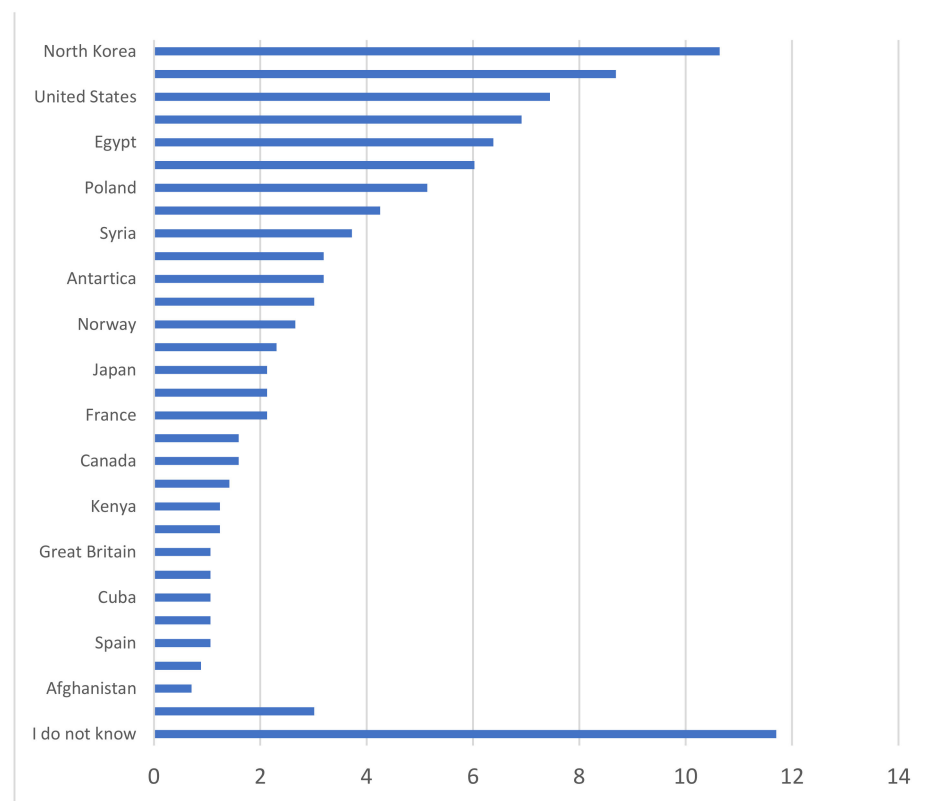


Figure 26. Countries or continents that are worth ‘visiting’ with the use of VR [%].

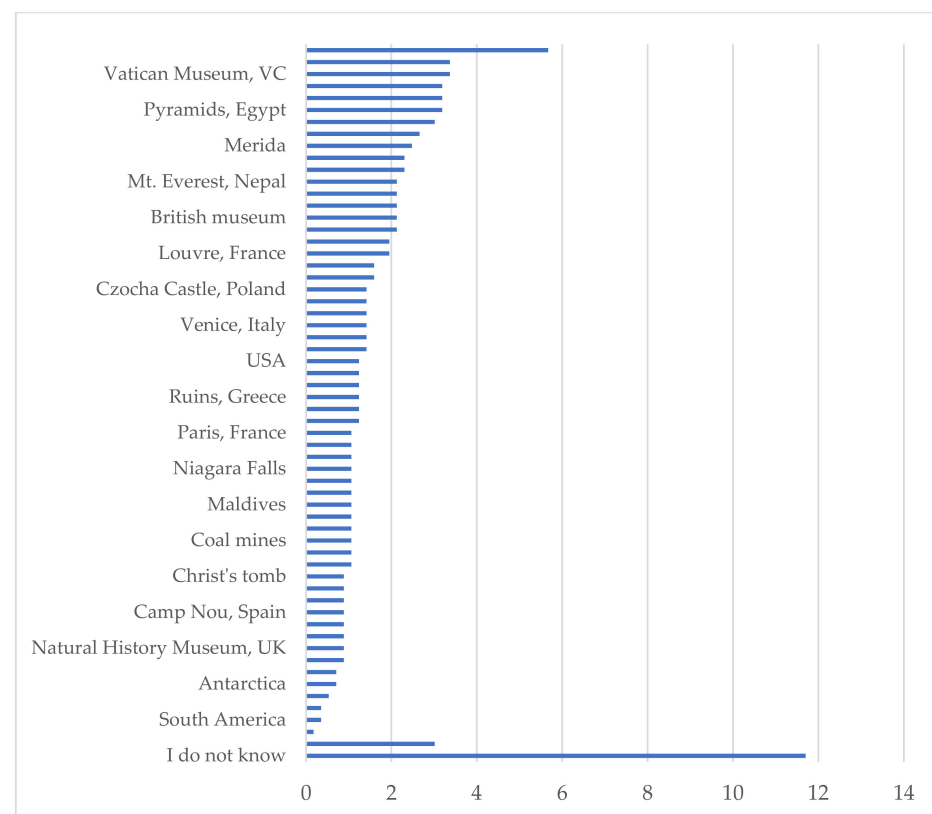


Figure 27. Places that are worth ‘visiting’ with the use of VR [%]. *The respondents could indicate more than one option.

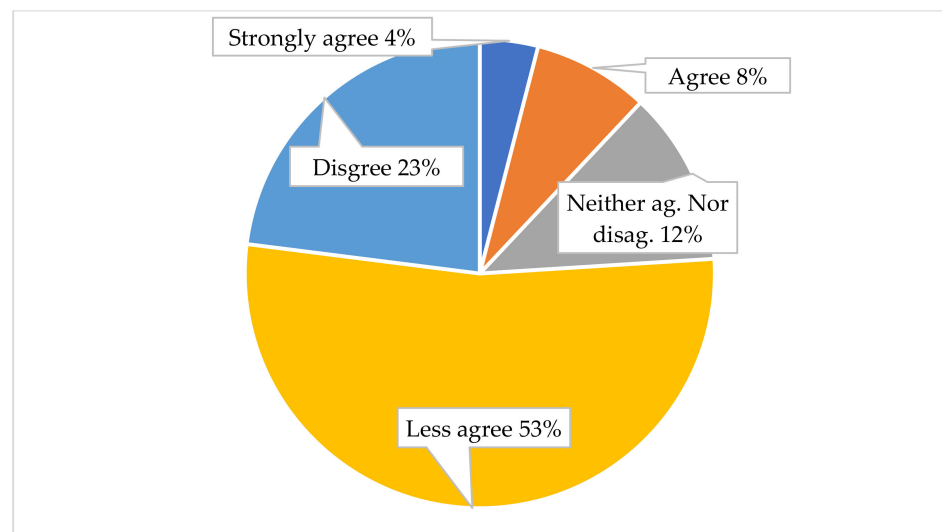


Figure 28. Respondents' opinions on whether VR is an efficient way of promoting tourism in Poland and the world.

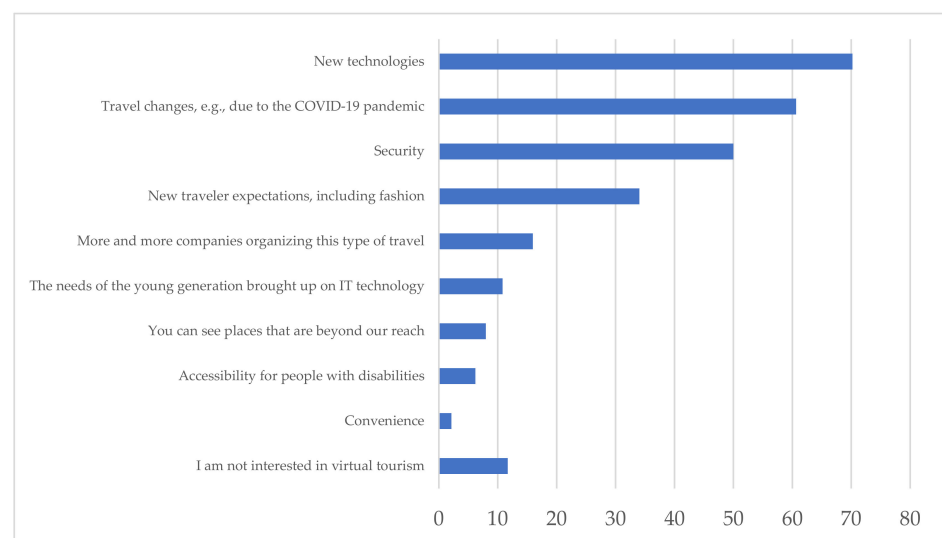


Figure 29. Most important factors determining the development of 'VR' in tourism [%].

VR and its importance in the time of COVID-19 is presented in Figure 30. Almost 70% of the respondents expressed an opinion that the use of VR is important at the time of the COVID-19 pandemic, and only 10% had the opposite view. This is likely because people could not visit the real world, and leaned toward the use VR during lockdowns.

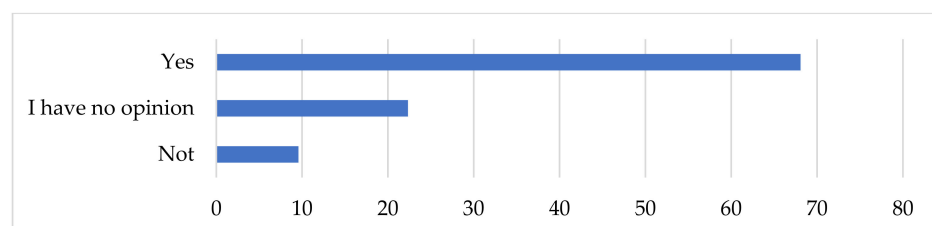


Figure 30. Respondents' opinions on whether the use of VR is important at the time of the COVID-19 pandemic [%].

8. Conclusions and Discussion

Virtual and augmented reality is increasingly often used in various fields of human life and tourism, where it is used to create, inter alia, virtual business cards of hotels and holiday resorts or promote towns and tourist attractions. The right equipment and specialist software make it possible to go on deliberate, planned, and very realistic trips in the virtual world.

Modern technologies have considerable influence on forming a totally new, non-traditional type of tourism, in which VR and the Internet is the main space of activity [62]. It can be assumed that the development of modern technology determines the outcome of this type of tourism, which has resulted in enormous growth in its importance in recent years. The increasing role of modern technology has caused considerable social-economic changes in tourism [63]. The use of modern tools such as VR is not only a characteristic trend in tourism, but can also be observed in other sectors of the economy [64].

The issue of the potential competition between virtual tourism based on displacement into the virtual world of digitalized experiences, and experiences resulting from real journeys, remains unsolved. It is hard to predict the direction of the development of technologies creating multi-sensation experiences that are copying tourists. We cannot assess to what extent they will become common, for the reason of costs alone. The level of acceptance of such a tourist offer by potential customers, in terms of their needs of physical and psychical recreation, is another unknown factor. It can be supposed that VR will become an area of intense experiments with virtual travelling in the near future, and this type of product will compete with classic journeys and stay-related proposals as a result of considerably lower costs, time requirements, the complete and discretionary presentation of viewed objects, and the elaborate descriptions presented in varied forms [65].

What may constitute a factor in the increasing competitiveness of traveling in VR is copying authentic spaces and places that are cultural heritage resources. Like interactive games, thematic programmes that imitate multi-dimensional and multi-sensor journey-related experiences may be implemented. One more, even further developed form of tourism might consist in involving a participant of such a trip in activities taking place not only in the contemporary world, but also transferring that visitor to historical events in the area visited, where their behavior and decisions might have some influence on the course of events [45].

Due to appropriate equipment and software, such a form of tourism makes it possible to relocate to any place in the world, from the Challenger Deep to the summit of Mount Everest, or even further, into outer space, with no need to leave home. There are no obstacles on the way to the Moon or Mars, or millions of kilometers beyond the Solar System and the Milky Way galaxy. Not surprisingly, around 82% of Polish people were aware of VR technology, and 70% of them believed that the new technologies would determine VR tourism development. VR offers the discretion to travel in time, as well as the possibility of traveling to places that do not exist in their original form, but have been reconstructed only in VR. Around 75% of the respondents agreed that VR tourism plays an important role in tourism promotion in Poland, and throughout the world. Moreover, VR and augmented tourism lets us visit fictitious and dangerous, politically restricted, geographically, and economically difficult destinations. For example, our results revealed that most people wanted to experience North Korea, the USA, Antarctica, Syria, etc. At the same time, people recommended the NASA space station as a destination worth visiting using VR and augmented reality. VR tourism will be more beneficial for the people in developing countries who face difficulties in economically, and in attaining visas for developed countries.

The research hypothesis put forward in the article: “the COVID-19 pandemic affects the development of virtual tourism, and the main purpose of practicing it is a cognitive theme, or more precisely, tourist attractions that under normal travel conditions would be very difficult or impossible to implement for organizational and financial reasons” has

been positively verified. The respondents would most willingly choose outer space or the Marian Trench as the destination of their “virtual journey”, to which only a few have access.

Virtual sightseeing may also constitute an alternative for people who are disabled or sick, and those who cannot undertake the effort of tourist activity or explore the tourist resources of the world on their own. Additionally, VR can act as an alternative source of tourism during crises and pandemics such as COVID-19. We found over 26% of the respondents were satisfied with contemporary tourists’ cognitional needs during the VR sightseeing. However, more than 87% of the respondents believed that VR tourism cannot substitute real-world tourism in the long run. This is what scientific publications by people involved in the issues presented confirm [66–74]. However, social media positively and significantly affects the image of a tourism destination, and the attitudes and intentions to visit said destination [75]. In addition, it is worth adding that tourism is one of the economic sectors that have suffered greatly in the COVID-19 pandemic [76]. This fact has also contributed greatly to the popularity of virtual tourism, and will certainly also significantly influence its further popularity in the near future. The use of VR also offers the opportunity to visit locations that are difficult or even impossible to access for most people.

Further research into VR in the field of tourism is advisable. This trend in the tourism economy is prevalent today, and contrasts traditional tourism in the form of domestic and international travel. In our opinion, the research issues of VR in tourism should concern: (1) conditions for applying various promotional instruments in this area; (2) institutional cooperation in the development of virtual tourism; (3) identification of forms of tourism taken virtually by humans; (4) determining the factors influencing the development of virtual tourism among the disabled; (5) research on the development of virtual space tourism. In general, in the development of virtual tourism on various topics, the implications for its development resulting from a tourism policy at multiple levels are also important. Moreover, the managerial and practical implications related to the activities of various enterprises and individuals are essential for the dissemination of virtual tourism.

It is important to discuss the limitations of the study that readers should consider when evaluating its results. The limitation of the research is the analysis itself, which focuses on the type of methods used, the scope of the study, and research trends in general. Statistical analysis could be another way of analyzing the data. Another limitation in conducting the research was the proper selection of respondents during the COVID-19 pandemic. Despite these limitations, we argue that the presented topic deserves further empirical research by scientists studying the development of virtual and space tourism. Furthermore, it would be interesting to survey further countries and compare the results.

Author Contributions: Conceptualization, M.R., R.K., K.B., A.N. and A.K.; methodology, M.R. and R.K.; software, M.R. and R.K.; validation, M.R. and R.K.; formal analysis, M.R. and R.K.; investigation, M.R. and R.K.; resources, M.R. and R.K.; data curation, M.R. and R.K.; writing—original draft preparation, M.R. and R.K.; writing—review and editing, M.R., R.K., A.N., K.B. and A.K.; visualization, M.R.; supervision, M.R.; project administration, M.R.; funding acquisition, M.R., K.B., A.N. and A.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Japan Society for the Promotion of Science under Grant-in-Aid for JSPS fellows no JP20J11833.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Von Rohrscheidt, M.M.; Plichta, P. Gnieźnieńskie Forum Ekspertów Turystyki Kulturowej. Turystyka w czasach zarazy. Jak współczesne epidemie zmieniają turystykę kulturową (Tourism in times of plague. How contemporary epidemics are changing cultural tourism)? *Tur. Kult.* **2020**, *2*, 161–184. Available online: <http://turystykakulturowa.org/ojs/index.php/tk/article/view/1157/983> (accessed on 10 November 2021). (In Polish)
2. UNWTO. Restrictions Tourism Travel Starting to Ease but Caution Remains, UNWTO Reports. Available online: <https://www.unwto.org/news/covid-19-restrictions-on-tourism-travel> (accessed on 10 November 2021).
3. Widomski, M. Turystyka krajowa a pandemia (Domestic tourism and the pandemic). *Poszerzamy Horyz.* **2020**, *21*, 771–779. Available online: https://ruj.uj.edu.pl/xmlui/bitstream/handle/item/246801/widomski_turystyka_krajowa_a_pandemia_2020.pdf?sequence=1&isAllowed=y (accessed on 10 November 2021). (In Polish)
4. Olechnik, J. Innowacje w turystyce—Ich charakter i obszary poszukiwań (Innovations in tourism—Its nature and areas of research). *Rozpr. Nauk. AWF Wroc.* **2015**, *50*, 81–91. (In Polish)
5. Lem, S. *Summa Technologiae*; Wydawnictwo Literackie: Krakow, Poland, 1964. (In Polish)
6. Słownik Języka Polskiego PWN (Polish Dictionary PWN). Fantomatyka (Phantom). Available online: <https://sjp.pwn.pl/szukaj/fantomatyka.html> (accessed on 10 November 2021). (In Polish)
7. Polechoński, J.; Tomik, R. Czy „turystyka” w zanurzeniowej wirtualnej rzeczywistości może zastąpić realne podróżowanie (Can „tourism” in immerse virtual reality replace real travelling)? *Folia Tur.* **2019**, *52*, 11–29. (In Polish) [CrossRef]
8. Banaszekiewicz, M.; Plichta, P. Gnieźnieńskie Forum Ekspertów Turystyki Kulturowej. Pytanie 94: Jak digitalizacja/cyfryzacja dziedzictwa i wirtualizacja praktyk kulturowych wpływa na rozwój turystyki kulturowej (Question 94: How the digitization/digitization of heritage and the virtualization of cultural practices affect the development of cultural tourism)? *Tur. Kult.* **2021**, *1*, 212–239. (In Polish)
9. *Terminologia Turystyczna—Zalecenia WTO (Tourist Terminology—WTO Recommendations)*; Organizacja Narodów Zjednoczonych, Światowa Organizacja Turystyki: Warsaw, Poland, 1995. (In Polish)
10. Roman, M.; Roman, M.; Prus, P. Innovations in Agritourism: Evidence from a Region in Poland. *Sustainability* **2020**, *12*, 4858. [CrossRef]
11. Roman, M.; Niedziółka, A.; Krasnodebski, A. Respondents’ Involvement in Tourist Activities at the Time of the COVID-19 Pandemic. *Sustainability* **2020**, *12*, 9610. [CrossRef]
12. Korinth, B. Przyszłość rzeczywistości wirtualnej w branży turystycznej: Analiza SWOT (The future of virtual reality in the travel industry: SWOT analysis). *Zesz. Nauk. Wyż. Szk. Tur. Ekol. Suchej Besk.* **2018**, *13*, 67–79. Available online: https://www.wste.edu.pl/materialyII/ZESZ_NAUK/zn13.pdf (accessed on 10 November 2021). (In Polish)
13. MacLeod, N. Cultural Tourism: Aspects of Authenticity and Commodification. In *Cultural Tourism in a Changing World Politics, Participation and (Re)presentation*; Smith, M., Robinson, M., Eds.; Channel View Publications: Toronto, ON, Canada, 2005. [CrossRef]
14. Graburn, H.H.N. The Anthropology of Tourism. *Ann. Tour. Res.* **1983**, *10*, 9–33. [CrossRef]
15. Edensor, T. Staging Tourism: Tourists as Performers. *Ann. Tour. Res.* **2000**, *27*, 322–344. [CrossRef]
16. Lew, A.A.; Cheer, J.M.; Haywood, M.; Brouder, P.; Salazar, N.B. Visions of travel and tourism after the global COVID-19 transformation of 2020. *Tour. Geogr.* **2020**, *22*, 455–466. [CrossRef]
17. Korzeniowski, K. Medycyna podróży—O czym każdy lekarz wiedzieć powinien (Travel medicine—What every doctor should know). *Fam. Med. Prim. Care Rev.* **2012**, *14*, 457–461. Available online: <https://docplayer.pl/13479415-Medycyna-podrozy-o-czym-kazdy-lekarz-wiedziec-powinien.html> (accessed on 10 November 2021). (In Polish)
18. Leong, W.-E. COVID-19’s impact on travel medicine surpasses that of all other emerging viral disease. *J. Travel Med.* **2020**, *27*, taaa221. [CrossRef]
19. Haberkow, J. O potrzebie formalnego wyodrębnienia medycyny podróży (About the need for a formal separation of travel medicine). *Hygeia Public Health* **2013**, *48*, 249–254. Available online: <http://www.h-ph.pl/pdf/hyg-2013/hyg-2013-3-249.pdf> (accessed on 10 November 2021). (In Polish)
20. Roman, M.; Grudzień, P. The Essence of Agritourism and Its Profitability during the Coronavirus (COVID-19) Pandemic. *Agriculture* **2021**, *11*, 458. [CrossRef]
21. Pijet-Migoń, E. *Zmiany Rynku Lotniczych Przewozów Pasażerskich w Polsce po Akcesji do Unii Europejskiej*; Rozprawy Naukowe Instytutu Geografii i Rozwoju Regionalnego Uniwersytetu Wrocławskiego 25; Jary, Z., Ed.; Instytut Geografii i Rozwoju Regionalnego, Uniwersytet Wrocławski: Wrocław, Poland, 2012. Available online: https://www.geogr.uni.wroc.pl/data/files/publikacje-rozprawy-naukowe-igrr/rozprawy_25.pdf (accessed on 10 November 2021). (In Polish)
22. Paprocki, W. Sektor lotniczy wobec pandemii COVID-19, ekspertyza 13. In Proceedings of the Open Eyes Economy Summit 2020, Krakow, Poland, 17–18 November 2020. (In Polish).
23. Wiskulski, T. COVID-19 and tourism—The case of Poland. *Pr. Kom. Geogr. PTG* **2020**, *23*, 37. Available online: <https://webcache.googleusercontent.com/search?q=cache:Cj018BrFREUJ:https://www.ejournals.eu/pliki/art/18150/pl+&cd=2&hl=pl&ct=clnk&gl=pl> (accessed on 10 November 2021). [CrossRef]
24. Guttentag, D.A. Virtual Reality: Applications and Implications for Tourism. *Tour. Manag.* **2010**, *31*, 637–651. [CrossRef]
25. Kayne, R. What is the Difference Between a Static and Dynamic Virtual World? Available online: <https://www.easytechjunkie.com/what-is-the-difference-between-a-static-and-dynamic-virtual-world.htm> (accessed on 10 November 2021).

26. Bryson, S. Virtual Reality in Scientific Visualisation. *Commun. ACM* **1996**, *39*, 62–71. Available online: <http://papers.cumincad.org/data/works/att/029b.content.pdf> (accessed on 10 November 2021). [CrossRef]
27. Berbeka, J. Wirtualna i rozszerzona rzeczywistość a zachowania konsumentów (Virtual and augmented reality and consumer behaviour). *Stud. Ekon. Zesz. Nauk. Univ. Ekon. Katow.* **2016**, *303*, 84–101. Available online: <https://www.sbc.org.pl/dlibra/publication/285597/edition/270169/content> (accessed on 10 November 2021). (In Polish)
28. Isdale, J.; Fencot, C.; Heim, M.; Daly, L. Content Design for Virtual Environments. In *Handbook for Virtual Environments: Design, Implementation, and Applications*; Stanney, K.M., Ed.; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 2002.
29. Witmer, B.G.; Singer, M.J. *Measuring Immersion in Virtual Environments*; ARI Technical Report 1014; U.S. Army Research Institute for the Behavioral and Social Sciences: Alexandria, VA, USA, 1998.
30. Hyun, M.Y.; Lee, S.; Hu, S.C. Mobile-Mediated Virtual Experience in Tourism: Concept, Typology and Applications. *J. Vacat. Mark.* **2009**, *15*, 149–164. [CrossRef]
31. Azuma, R. Tracking Requirements for Augmented Reality. *Commun. ACM* **1993**, *36*, 50–51. [CrossRef]
32. Dejnaka, A. Rzeczywistość rozszerzona i jej zastosowanie w edukacji (Augmented reality and its application in education). *E-Mentor* **2012**, *2*, 30–36. Available online: <http://www.e-mentor.edu.pl/artykul/index/numer/44/id/918> (accessed on 10 November 2021). (In Polish)
33. McNamara, A. Eye-tracking and Mobile Augmented Reality. In *Proceedings of the AR and VR Conference: Perspectives on Business Realities*, Dublin, Ireland, 27 April 2016.
34. Carmigniani, J.; Furht, B.; Anisetti, M.; Ceravolo, P.; Damiani, E.; Ivkovic, M. Augmented Reality Technologies, Systems and Applications. *Multimed. Tools Appl.* **2011**, *51*, 341–377. Available online: <https://link.springer.com/article/10.1007/s11042-010-0660-6>. [CrossRef]
35. Jędrzycka, R. Wykorzystanie Google Earth we własnej aplikacji do internetowej wizualizacji danych geograficznych (Using Google Earth in your own application for online visualization of geographic data). *Arch. Fotogram. Kartogr. Teledetekcji* **2006**, *16*, 259–268. (In Polish)
36. Google Earth, VR. Available online: <https://arvr.google.com/earth/> (accessed on 10 November 2021).
37. Sontag, S. *O Fotografii (About Photography)*; Wydawnictwo Karakter: Krakow, Poland, 2009. (In Polish)
38. Pawłowska, A.; Matoga, Ł. Wirtualne Muzea w Internecie—Forma promocji i udostępniania dziedzictwa kulturowego czy nowy walor turystyczny (Virtual museums on the Internet—A form of promotion and sparing of cultural heritage or a new tourist value)? *Tur. Kult.* **2014**, *9*, 46–58. (In Polish)
39. Wawel. Available online: <http://3d.wawel.krakow.pl> (accessed on 10 November 2021). (In Polish)
40. Spector, S.; Higham, J.E.S. Space tourism in anthropocene. *Ann. Tour. Res.* **2019**, *79*, 102772. [CrossRef]
41. Katedra I Komnaty Królewskie na Wawelu. Available online: https://sas.tpnk.org.pl/images/pliki/seniorzy/wjablonska_wawel_27112019.pdf (accessed on 10 November 2021).
42. Grochowska, A. Święte Wzgórze? Obecność Wawelu w literaturze, sztuce i kulturze polskiej w epoce narodowej niewoli. Rozprawa doktorska (Holy Hill? The presence of Wawel in Polish literature, art, and culture in the era of national captivity). Ph.D. Thesis, Faculty of Polish Studies, Jagiellonian University, Krakow, Poland, 2018. (In Polish)
43. O Wawelu (About Wawel). Available online: <https://wawel.krakow.pl/o-wawelu> (accessed on 10 November 2021). (In Polish)
44. Approaches and Lending. Available online: https://sas.tpnk.org.pl/images/pliki/seniorzy/wjablonska_wawel_27112019.pdf (accessed on 10 November 2021).
45. Grigorev, A.I.; Fedorov, B.M. Stress under normal conditions, hypokinesia simulating weightlessness, and during flights in space. *Hum. Physiol.* **1996**, *22*, 139–147.
46. Aubert, A.E.; Beckers, F.; Verheyden, B. Cardiovascular function and basics of physiology in microgravity. *Acta Cardiol.* **2005**, *60*, 129–151. [CrossRef] [PubMed]
47. Global Space Tourism Market Trajectory Report 2020–2027: Suborbital Tourism is Projected to Account for \$1.5 Billion of the Total \$1.7 Billion Market. Available online: <https://www.businesswire.com/news/home/20210129005293/en/Global-Space-Tourism-Market-Trajectory-Report-2020--2027-Suborbital-Tourism-is-Projected-to-Account-for-1.5-Billion-of-the-Total-1.7-Billion-Market--ResearchAndMarkets.com> (accessed on 10 November 2021).
48. Kruczek, Z. Gnieźnieńskie Forum Ekspertów Turystyki Kulturowej. Czy turystyka kosmiczna (Space Tourism) jest formą turystyki kulturowej czy przygodowej (Is space tourism a form of cultural or adventure tourism)? *Tur. Kult.* **2015**, *5*, 108–113. (In Polish)
49. Weibel, D.L. Following the Path That Heroes Carved into History: Space Tourism, Heritage, and Faith in the Future. *Religions* **2020**, *11*, 23. [CrossRef]
50. Yazici, A.M.; Tiwari, S. Space tourism: An initiative pushing limits. *J. Tour. Leis. Hosp.* **2021**, *3*, 38–46. [CrossRef]
51. Rosik, P. Elon Musk, Jeff Bezos i Richard Branson ścigają się o kosmos. Czym się różni model biznesowy Space X), Blue Origin i Virgin Galactic (Elon Musk, Jeff Bezos and Richard Branson race for space. What is the difference between the Space X, Blue Origin and Virgin Galactic business model). Available online: <https://strefainwestorow.pl/artykuly/ludzie/20210701/wyscig-kosmos-turystyka-elon-musk-richard-branson-jeff-bezos> (accessed on 10 November 2021). (In Polish)
52. KSC 360 Expedition. Available online: <https://www.vrexplorer.net/KSC-360-Expedition/104717> (accessed on 10 November 2021).
53. The NASA SLS VR Experience. Available online: <https://www.vrexplorer.net/THE-NASA-SLS-VR-EXPERIENCE/101770> (accessed on 10 November 2021).

54. International Space Station Tour, VR. Available online: <https://www.vrexplorer.net/International-Space-Station-Tour-VR/101829> (accessed on 10 November 2021).
55. Spacewalk VR Experience. Available online: <https://www.vrexplorer.net/Spacewalk-VR-Experience/101851> (accessed on 10 November 2021).
56. Moon Base. Available online: <https://www.vrexplorer.net/MOON-BASE/104937> (accessed on 10 November 2021).
57. Mission: Mars. Available online: <https://www.vrexplorer.net/Mission-Mars/104935> (accessed on 10 November 2021).
58. Space Tourism in Poland. Available online: <https://gl-news.com/news/space-tourism-in-poland/> (accessed on 10 November 2021).
59. Polish Space Agency Signs Deal with NASA for “Exploration of Moon, Mars and Beyond”. Available online: <https://notesfrompoland.com/2021/10/28/polish-space-agency-signs-deal-with-nasa-for-exploration-of-moon-mars-and-beyond/> (accessed on 10 November 2021).
60. Huang, S.; Shao, Y.; Zeng, Y.; Liu, X.; Li, Z. Impacts of COVID-19 on Chinese nationals’ tourism preferences. *Tour. Manag. Perspect.* **2021**, *40*, 100895. [CrossRef]
61. Roman, M.; Bhatta, K.; Roman, M.; Gautam, P. Socio-economic factors influencing travel decision-making of Poles and Nepalis during the COVID-19 pandemic. *Sustainability* **2021**, *13*, 11468. [CrossRef]
62. Reformat, B. E-turystyka i uwarunkowania jej rozwoju w Polsce—Wybrane aspekty analizy (E-tourism and conditions of its development in Poland—selected aspects of the analysis). *Stud. Ekon. Zesz. Nauk. Uniw. Ekon. Katow.* **2015**, *215*, 74–89. Available online: https://www.ue.katowice.pl/fileadmin/_migrated/content_uploads/05_16.pdf (accessed on 10 November 2021). (In Polish)
63. Panasiuk, A. Nowoczesne technologie informacyjne w kształtowaniu innowacji na rynku turystycznym (Modern information technologies in shaping innovation of the tourists market). *Rozpr. Nauk. Akad. Wych. Fiz. Wroc.* **2015**, *49*, 100–102. (In Polish)
64. Atsiz, O. Virtual reality technology and physical distancing: A review on limiting human interaction in tourism. *J. Multidiscip. Acad. Tour.* **2021**, *6*, 27–35. [CrossRef]
65. Von Rohrscheidt, M.A. *Zarządzanie w Turystyce Kulturowej. Konteksty, Koncepty, Strategie (Management in Cultural Tourism. Contexts, Concepts, Strategies)*; Bogucki Wydawnictwo Naukowe: Poznań, Poland, 2020; Volume 1.
66. Williams, P.; Hobson, J.S.P. Virtual reality and tourism: Fact or fantasy? *Tour. Manag.* **1995**, *16*, 423–427. Available online: <https://reader.elsevier.com/reader/sd/pii/S026151779500050X?token=262E43838EDA119DA5A5A3F7D674702F3C9CD0B2E6895B9E68582281A8C595A7BB74A5481FF963CEFC691B6C4839112C&originRegion=eu-west-1&originCreation=20211115091434> (accessed on 10 November 2021). [CrossRef]
67. Cho, Y.-H.; Fesenmaier, D.R. A New Paradigm for Tourism and Electronic Commerce: Experience Marketing Using the Virtual Tour. In *Tourism Distribution Channels: Practices, Issues and Transformations*; Buhalis, D., Laws, E., Eds.; Continuum: London, UK, 2001; pp. 351–370.
68. Choi, Y.; Hickerson, B.; Lee, J. Investigation of the technology effects of online travel media on virtual travel experience and behavioral intention. *J. Travel Tour. Mark.* **2018**, *35*, 320–335. [CrossRef]
69. Jan, D.; Roque, A.; Leuski, A.; Morie, J.; Traum, D. A virtual tour guide for virtual worlds. In *Intelligent Virtual Agents, Proceedings of the 9th International Conference on Intelligent Virtual Agents, Amsterdam, The Netherlands, 14–16 September 2009*; Lecture Notes in Computer Science; Ruttkay, Z., Kipp, M., Nijholt, A., Vilhjálmsson, H.H., Eds.; Springer: Cham, Switzerland, 2009; Volume 5773, pp. 372–378. [CrossRef]
70. Mütterlein, J.; Hess, T. Immersion, presence, interactivity: Towards a joint understanding of factors influencing virtual reality acceptance and use. In *Proceedings of the AMCIS 2017—America’s Conference on Information Systems: A Tradition of Innovation*, Boston, MA, USA, 10–12 August 2017. Available online: <https://aisel.aisnet.org/amcis2017/AdoptionIT/Presentations/17> (accessed on 10 November 2021).
71. Vergara, D.; Rubio, M.P.; Lorenzo, M. On the design of virtual reality learning environments in engineering. *Multimodal Technol. Interact.* **2017**, *1*, 11. [CrossRef]
72. Shokouhyar, S.; Shokoohyar, S.; Sobhani, A.; Gorizi, A.J. Shared mobility in post-COVID era: New challenges and opportunities. *Sustain. Cities Soc.* **2021**, *67*, 102714. [CrossRef]
73. Shokoohyar, S.; Berenji, H.R.; Dang, J. Exploring the heated debate over reopening for economy or continuing lockdown for public health safety concerns about COVID-19 in Twitter. *Int. J. Bus. Syst. Res.* **2021**, *15*, 650–672. [CrossRef]
74. Sultan, M.-T.; Sharmin, F.; Badulescu, A.; Stiubea, E.; Xue, K. Travelers’ Responsible Environmental Behavior towards Sustainable Coastal Tourism: An Empirical Investigation on Social Media User-Generated Content. *Sustainability* **2021**, *13*, 56. [CrossRef]
75. Licata, M.; Larentis, O.; Tesi, C.; Fusco, R.; Ciliberti, R. Tourism in the Time of Coronavirus. Fruition of the “Minor Heritage” through the Development of Bio Archaeological Sites—A Proposal. *Heritage* **2021**, *4*, 42. [CrossRef]
76. Caciora, T.; Herman, G.-W.; Ilies, A.; Baias, S.; Ilies, D.-C.; Josan, I.; Hodor, N. The Use of Virtual Reality to Promote Sustainable Tourism: A Case Study of Wooden Churches Historical Monuments from Romania. *Remote Sens.* **2021**, *13*, 1758. [CrossRef]