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Analysis of technology foresight for metaverse in tourism sector by integrating quantitative approaches

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ABSTRACT

The name "metaverse" is a combination of the words "meta" and "universe." The metaverse refers to both present and future digital platforms that are interconnected and focuses on virtual and augmented reality. The purpose of this research to identify the drivers of the future of metaverse in tourism and study the future trend of metaverse in tourism. The target respondents are select and cover mainly by developers and organizational users of metaverse in tourism. In the conduct of this research, both quantitative and qualitative research methods have been taken, and both methods will be apply in the process of the data analysis and data interpretation. In this research, the STEEPV analysis is apply. The STEEPV technique will be utilized in order to determine or identify all the drivers of metaverse in tourism. Data from the questionnaire are analyze using "Social Science Statistics Package" (SPSS). It shows the result of drivers of metaverse in tourism portable devices in the second phase of the research with impact-uncertainty analysis. The top two drivers are “government policy in digitizing the nation” and “technology reliability”. Four different scenarios have been formed based on the top two drivers chosen from the impact-uncertainty analysis. These four alternate scenarios reflect the four potential outcomes between 2022 and 2032. Hence, this research can help future researchers and developers increase their awareness of adopting the metaverse in tourism sector in future. A further explanation of the findings has been given in the discussion.

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1. INTRODUCTION

Beginning with the modern era, this chapter will provide an informative introduction to the evolution of the metaverse. The discussion is on the contemporary issue of metaverse tourism, problem statement, research questions, research objectives, research scope and significance of study is done subsequently

The name "metaverse" is a combination of the words "meta" and "universe." The metaverse refers to both present and future digital platforms that are interconnected and focused on virtual and augmented reality. A metaverse is a network of 3D virtual environments that are primarily concerned with social interaction. Metaverse entails the development of virtual environments cantered on social interactions. This may take various forms, ranging from virtual reality experiences in which consumers are engaged in a digitally altered environment to augmented reality overlays on real world [1]. The metaverse comprises a wide variety of experiences. Instead, it refers to a series of immersive digital experiences that will be available to users in the future and allowing them to participate in a variety of activities in entirely digital environments.

One breakthrough stands out above all others in the metaverse from the standpoint of human experience which is extended reality (XR) technology. These include virtual reality (VR), augmented reality (AR), and brain-computer interfaces (BCI), all of which are positioned as the next generation of computing platforms [2]. That may entail taking part in a big virtual reality multiplayer game via a VR headset, or experiencing integrated digital and physical places, such as location-specific immersive digital material from business visitors via digital glasses or smartphones [3]. Something that most likely has a connection to Second Life. It is an online virtual world where people may build digital avatars of themselves and live digital lives just like they would in the real world. It is similar to the way people would live in the real world.

The current situation of metaverse is now considered to be one of the most promising upcoming tourist concepts. With the further development of metaverse travel and tourism options and the increasing acceptance of these opportunities, it is expected that the metaverse will play an increasingly important role in the tourist sector, strengthening communication and the overall customer or visitor experience.

The metaverse of tourism will also bring the benefits to economy such like in tourism sector. The worldwide metaverse in travel and tourism market size was very strong in 2021 and revenue CAGR is predicted to rise fast during the forecast period [4]. Over the forecast period, an increased focus on developing innovative and immersive AR and VR technology, rapid integration of virtual reality platforms in the travel and tourism sector, and the rising potential of metaverse to boost hospitality to the next level are expected to drive market revenue growth. It can assist in the transformation of expensive sites into accessible locations, unknown locations into popular destinations, mature locations into youthful locations, and young locations into mature locations. The Metaverse of tourism can solve deep-rooted concerns by bridging the gap in travel inequality and creating chances for actual diversity in tourism, in addition to working as a tool for rebranding and enhanced marketing.

Increase in awareness of the potential of metaverse to transform the travel and tourism industry in a post-pandemic world, as well as collaborative efforts between technology companies, innovators, policymakers, and metaverse-related companies to build robust alternative universe worlds and platforms, are some other key factors expected to fuel revenue growth in the market in the future [4].

Every technology will bring its advantages and disadvantages. Nevertheless, metaverse of tourism have also its advantages and disadvantages. The first advantage is improving the booking process. Enhance booking procedures by giving useful information that can't be presented accurately any other way. As a result, the chance of a consumer completing their booking trip rather than cancelling it increases. For instance, hotel may utilize virtual reality tours or digital avatars to allow guests to move around over a realistic recreation of their facility, gaining a feel of how big rooms are and what amenities are available [1]. The second advantage is can travel to places that are unreachable. Not every part of the world can be visited, or at least not by everyone. This is due to a variety of factors. The regions might be isolated, closed to travellers, or unsafe to visit. Not everyone has the ability to climb Mount Everest or dive deep into the ocean. We can go everywhere with virtual tourism. This is enough to pique our interest for many of us [5].

The first disadvantage is implications for privacy and security. Many of the digital solutions available today have been linked to privacy and security concerns. The primary source of criticism for digital solutions is the reality that they obtain data from users. Such information can also be used for invasive online advertising and identity theft [6]. The second disadvantages are users will become addicted to the virtual world. A person who has been trained in a virtual reality environment may perform well in that environment, but he will not perform well in the actual world. As a consequence, in real world environments, it will not produce the same effects as in the virtual world environment [7].

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Clearly, there exists advantages and disadvantages of metaverse in tourism. This creates uncertainties to a certain level regarding the application of metaverse in tourism sector in the future. Therefore, this research intends to study the future trend of metaverse in tourism by analyzing its drivers.

This forecasting study was carried out with a view on the time horizons of the 10 years that arise in the future specifically from 2022 until 2032. The current study focuses on each resource or each of information relevant to the metaverse tourism trend. All related data and information, collected from various sources such as newspapers, conference proceedings, government-related articles, the internet, NGOs and all types of metaverse research material. The scope of this study was limited to industries related to the tourism using metaverse. The respondents to this research study would be stakeholders, consisting of developers and users of metaverse in tourism. The target respondents were selected and covered mainly by developers and organizational users of metaverse in tourism.

The aim of the study was to analyses the driver for adopting metaverse in the tourism sector, as well as to investigate the metaverse's future trends in Malaysia. This metaverse research in Malaysia assists developers in gaining insight into and perspectives on the problematic and good issue of metaverse, while also improving user understanding of metaverse in tourism sector. This research also assists Malaysians in their understanding of the metaverse in tourism. Furthermore, future researchers will benefit from this work since it gives information on the influence of uncertainty in the metaverse, which may change companies' performance practices. Governance in security and privacy review and regulation may also be highlighted in order to improve metaverse effectiveness requirements for future customer satisfaction and brand recognition by the firm or government sector.

2. METHOD

In this research, the STEEPV analysis was applied as part of the qualitative methodology. The use of STEEPV analysis provides the objective of assisting in the identification of the external factor that will influence future trends. It also is an acronym for Social, Technological, Environmental, Economic, Political and Values will be used in this research [8].

2.1 Research Design

This study requires a larger than usual number of respondents, and it investigates information on the possible futures that may be used to address the demands, in addition to an opportunity for the future. Hence, a combined technique including qualitative and quantitative data was adopted to interpret the data. This research used a mixed-based method and the foresight process to conduct an analysis of the trends, uncertainties, and problems that will be presented by metaverse in tourism in the future. This technique of foresight focuses on evidence-based thinking about the future by employing a mixed-based strategy to investigate the potential of metaverse in tourism in the future.

2.2 Foresight Process

Foresight is the process of looking into the future and estimating what could happen or what would be necessary in the future. The foresight process consists of a few processes, the first of which is horizon scanning, followed by data analysis using the STEEPV approach, and finally the identification of the drivers that change the metaverse.

2.2.1 Horizon Scanning

Horizon scanning is a method for identifying early indications of potentially significant changes by a methodical assessment of prospective threats and opportunities with a focus on new technology and its implications on the subject matter. The contribution advantage that commercial firms provide to strategic planning, risk management, policy making, and the prioritization of research of this horizon scan is gaining more and more recognition. Based on desk research, this horizon scan approach detects constants, shifts, unanticipated issues, and trends. The Internet, periodicals, government, non-government, and research communities are all sources for desk research.

2.2.2 Drivers

The term "drivers" refers to the forces that will affect, shape, or otherwise ve an impact on the development that will occur in the future. The STEEPV technique will be utilized in order to determine or identify the drivers. Various tools may be used to establish the ranking or identity of drivers. For example, the s-curve, impact uncertainty and the future wheel. In this research study, an impact-uncertainty analysis was performed on the drivers or future elements that influence and change the trend of metaverse in tourism.

2.3 Population and Sampling

2.3.1 Population

A research population is a big group of people or items that are the subject of a scientific question. Research is carried out for the benefit of the population. This research is focusing on metaverse. So, the respondents to this research study would be stakeholders, consisting of developers and users of metaverse in tourism. The target respondents were selected and covered mainly by developers and organizational users of metaverse in tourism.

2.3.2 Sampling Method

Purposive sampling is the sampling method that was used in this research. Purposive sampling is a judgement or expert sampling that was chosen based on the study's goal and population characteristics [9]. Using the Krejcie and Morgan Table as a guide, this study will gather data from a sample size of 384 respondents based on a population of 1000000. The respondents are from Kuala Lumpur and Johor Bahru.

2.4 Research Instrument

As the researcher, it must choose a reliable instrument for this present study. As a result, the research tool for this study was determined to be a questionnaire. The justification for using questionnaires in this study was that the data acquired from them was efficient and easy to comprehend. The questionnaire was applied in this research as it can assist in identifying the difficulties or drivers of change that faced by metaverse in tourism sector.

2.4.1 Questionnaire

The objective of questionnaires is to collect information on respondents' perceptions, attitudes, and behaviour, knowledge regarding a given component [10]. The questionnaire was sent out to those who are advocates in metaverse in tourism in Malaysia. This study questionnaire was split up into four distinct sections, labelled A, B, C, and D respectively. Part A consists of the respondents' demographic data. Part B demonstrated how to choose or rank the most significant drivers. Part C was used to assess the level of ambiguity around each driver in metaverse in tourism sector and part D was created to assess the influence of each driver on metaverse in tourism.

2.5 Data Collection

The method of data collecting may be divided into two categories which is primary data and secondary data. Primary data is defined as information gathered by a researcher from primary sources such as interviews, experiments, questionnaire and other sources. Secondary data is information gathered by someone else and made available for reasons other than the present study. In a word, secondary data is information that has been collected and maintained by others [11]. Journals, articles, newspapers, books, websites, and online and offline databases are all common sources for secondary data collecting. The data for this study was gathered from secondary sources. The metaverse sources were gathered and analyzed in order to determine the difficulties and drivers of metaverse. Additionally, secondary data gathering was preferred since secondary data serves as a supplement to main data and contains more accurate information based on past studies.

2.6 Pretesting

Pretesting was done to improve the questionnaire's reliability and ensure that the items provided were not dependent on the psychometric questionnaire. Pretesting may also aid in evaluating the competence of the chosen instruments in gathering relevant data, with a number of activities being carried out to assess the instrument's capability. Pretesting is intended to aid in the reduction of any measurement mistake on a bigger scale [12]. Three experts from UTHM's expert researchers were chosen to assess the questionnaire and point out any items that they thought were inappropriate. Their suggestions were considered when the questionnaire was revised accordingly.

2.7 Analysis of Data

2.7.1 Descriptive Analysis

Descriptive analysis consists of transforming brute data into a form that facilitates the understanding, rearrange, ordering and manipulation of descriptive information by readers and interpreters [13]. Data from the questionnaire were analyzed using "Social Science Statistics Package" (SPSS). The computer-based statistical

package helps to produce statistical results on a numerical basis. Furthermore, the collected data were shown as frequency, percentage, mean and standard deviations. Since SPSS enables large quantities of data to be handled and was easy to interpret.

2.7.2 Impact Uncertainty Analysis

Following an impact-uncertainty analysis, the scenario development is based on the mean collected in the data analysis. Based on the importance, impact and uncertainty of the impact-uncertainty analysis, the list of drivers generated was selected. The top two drivers with the highest impact and uncertainty were selected to develop a scenario analysis.

2.8 Development of Scenario Analysis

The scenario analysis was produced from the impact-uncertainty analysis with the corresponding top two drivers. There have been four different alternatives, which reflect the future consequences of events and the trend of metaverse in tourism, regardless of the favorable or unfavorable result. The implications and recommendations of the study must be developed at the end of the research. These scenarios provide insight into four possibilities between 2022 and 2023.

3. RESULTS AND DISCUSSIONS

Horizon scanning was used to gather a wide range of data about developing contemporary issues and challenges of metaverse in tourism. Websites, journals, books, and other online sources have been used as primary sources. In addition, the STEEPV analysis was utilized to group the problems, drivers, challenges, and threats that are associated with metaverse in tourism.

3.1 Table of driver related to Merged Issues, Trends, and Challenges

After the combination of several key terms related to issues, trends and challenges, a total of 10 different drivers had been generated. The questionnaires that will be utilized to collect data will make advantage of those merged drivers. The table of driver related to merged issues, trends and challenges was shown in Table 1 as follows.

Table 1: Table of driver related to Merged Issues / Trends / Challenges

No.	Issues / Trends / Challenges	Drivers
1	• Gaming industry and into new business verticals. • Big impact on digital infrastructure industry • Operate independently of those in actual companies	Industrial Revolution
2	• Metaverse follow term and regulation among each country. • Reach out to new generation voters where they are • Change the political campaigning game. • New political frameworks	Government policy in digitising the nation
3	• Better entertainment • Allow users to engage in social activities • Enhance life experience • Product and service functionality would be improved • Create an authentic life	Modernization life style
4	• The impact on the current economy • Create a full economic system connects the metaverse • Metaverse impact variety of economic • Investor and businesses will keep on eye on metaverse • Gaming industry and into new business verticals.	Experience economy phenomenon
5	• Will cause physical harm • Cyberbullying • Lack protection for children • Lead them in 'escaping' from the actual world	Technology Reliability
6	• Reduces risk for travelers • Improve actual travel experiences • Improve booking procedure • Travel to places that are unreachable	Improve the experience of travel

7	• Blockchain technology • Brain-computer interfaces technology • Store data anywhere in the metaverse • Artificial Intelligence(AI)	Digitalization era
8	• Need huge quantities of energy • Increase of carbon dioxide • Reduce levels of air pollution. • Increase greenhouse gas emissions	Awareness in the application of metaverse in tourism sector
9	• Hyper-connecting • Artificial Intelligence(AI) • 3D reconstruction • IoT • Web 3.0 • DAOs • GPS and Wi-Fi are used.	Complexity technology of metaverse
10	• Solved problems in the actual world • Store data anywhere in the metaverse • Get right cosmetic • Take care of our health	Technology innovation

All the data has been analyzed using the Statistical Package for the Social Science software (SPSS). The demographic data will be presented into frequency, percentage, and cumulative percentage, while the issue and drivers will be presented into mean and standard deviation. The mean data will be arranged in descending order, and the top 50 percent of issue and driver with the highest mean were constructed for impact uncertainty analysis.

3.2 Pilot Test Result

This research was used 15 respondents to test the pilot test. The pilot test was conducted, and the data result was presented into Cronbach's Alpha value. SPSS software has been used to calculate the Cronbach's Alpha value. For this research, three parts of the questionnaire have been tested the pilot test: Level of Importance, Level of Impact and Level of Uncertainty. The pilot test result is shown in the Table 2. The Cronbach's Alpha value for Level of Importance is 0.803, Level of Impact is 0.871, and Level of uncertainty is 0.916. The Cronbach's alpha value for Level of Importance and Level of Impact is categories as Good because the Cronbach's Alpha Value is above 0.8. While for the level of Uncertainty is categorized as Excellent because the Cronbach's Alpha Value is above 0.9. But three of the factors also can be categorized as accepted and good.

Table 2: Reliability of pilot test

Factors	Cronbach's Alpha Value
Level of Importance	0.803
Level of Impact	0.871
Level of Uncertainty	0.916

3.3 Actual Study

The reliability of the actual study also has been conducted. The result of the reliability for the actual study is shown in the Table 3. According to the table, the Cronbach's Alpha Value for Level of Importance is 0.805 and Level of Impact is 0.845. Besides that, the Cronbach's Alpha value for Level of Uncertainty is 0.843. Based on the result, these three factors were categorized as a better reliability because the Cronbach's Alpha value is above 0.8.

Table 3: Reliability of actual study

Factors	Cronbach's Alpha Value
Level of Importance	0.805
Level of Impact	0.845
Level of Uncertainty	0.843

3.4 Survey Return Rate

The total sample size has been collected is 384 respondents, and the collected data is mainly covered in Malaysia. The respondent of this research was included the developer of metaverse, and the user of metaverse in tourism sector. The questionnaire was designed by using the Google form. The Google Form was chosen as a distribution channel because the data is easily collected directly online. The most important reason is the long distance between the organization and the company. There are 384 sets of questionnaires distributed, and those questionnaires were distributed to the respondent by sending email and social media platforms like Facebook and WhatsApp. The survey return rate for this research is 52.34 per cent, and the percentage rate is shown in Table 4.

Table 4. Survey Return Rate

Population	1000000
Sample	384
Questionnaire Returned	201
Questionnaire Distributed	384
Percentage	52.34%

3.5 Demographic Analysis

The demographic data of the respondents has been analyzed and discussed. The questionnaire was design into seven questions. For example, type of advocate, occupation sector, company business activity, number of employees in the company, experience in usage in metaverse, cost to employ metaverse and usage of metaverse.

a. Respondents Demographics Information

In this research, the developer of metaverse are 5 people (2.5%) and the users of metaverse are 196 people (97.5%). For occupation sector, private sector are 130 people (64.7), government sector are 5 people (2.5%), self employed 2 people (1.0%), unemployed are 64% (31.8%). For company business activity, tourism are 189 people (94.4%), wholesale/retail/distribution are 5 people (2.5%), manufacturing/production industries are 6 people (3.0%), other is 1 people (0.5%). For number of employees in the company, 181 (90.0%) respondents are less than 10 people, 2 respondent (1.0%) are 10 to 19 people, 2 respondents (1.0%) are 20 to 29 people, 6 respondents (3.0%) are 30 to 39 people, 10 respondents (5.0%) are above 40 people. For experience in usage in metaverse, 195 peoples (97.0%) are less than 1 year, 5 people (2.5%) are between 1 to 5 years, 1 people (0.5%) are between 5 to 10 years. For cost to employ metaverse, 194 people (96.5%) are less or equal to RM10,000, 3 people (1.5%) are between RM10,001 TO RM30,000, 1 people (0.5%) are more or equal to RM50,001. For usage of metaverse, 188 people (93.5%) are tourism, 11 people (5.5%) are mobile application, 1 people (0.5%) are event, 1 people (0.5%) are other.

3.6 Descriptive Analysis of the Drivers

The driver has been voted based on three aspects: importance, level of impact, and level of uncertainty. The result of the driver also will be presented as mean. The top 50 percent driver in the aspect of importance selected to form the scenario analysis. The approach impact-uncertainty analysis was used to determine the top driver that can bring the impact and uncertainty in the future.

a) Mean of Drivers in Corresponding with Importance

Table 5 below showed the mean of the first five leading Drivers based on level of importance.

Table 5. Mean of the first five leading drivers on importance

No	Drivers	Mean
1	Government policy in digitizing the nation	4.5075
2	Technology reliability	4.4328
3	Complexity technology of metaverse	4.2139
4	Awareness in the application of metaverse in tourism sector	4.1791
5	Technology innovation	4.1692

b) Mean of the Drivers in Corresponding with Level of Impact

Table 6 below showed that mean of the five leading drivers on level of impact.

Table 6. Mean of the five leading drivers on level of impact

No	Drivers	Mean
1	Government policy in digitizing the nation	4.5771
2	Technology reliability	4.5174
3	Complexity technology of metaverse	4.1194
4	Awareness in the application of metaverse in tourism sector	4.0995
5	Technology innovation	4.1194

c) Mean of Drivers in Corresponding with Level of Uncertainty

Table 7 below shows that the mean of the five leading drivers on level of uncertainty.

Table 7. Mean of the five leading drivers on Level of Uncertainty

No	Drivers	Mean
1	Government policy in digitising the nation	4.5821
2	Technology Reliability	4.4975
3	Complexity technology of metaverse	4.0846
4	Awareness in the application of metaverse in tourism sector	4.0746
5	Technology innovation	4.1393

3.7 Impact Uncertainty Analysis

Table 8 shows the mean value of the top five leading drivers based on the level of uncertainty and level of impact. The purpose of doing this Table 4.16 is because it can help to identify the difference mean value of the driver based on the two aspects and easy to find the driver which has higher uncertainty and impact on the future. Figure 1 below shows the top two drivers who have higher impact and uncertainty will be chosen. So, the Coordinate D1 (4.5821, 4.5771) and Coordinate D2 (4.4975, 4.5174) was selected. Coordinate D1 has the highest level of impact, while Coordinate D2 has the highest level of uncertainty. Coordinate D1 and Coordinate D2 have represented the driver Government policy in digitizing the nation and Technology Reliability.

Table 8. Mean of the five leading drivers on level of impact and uncertainty

No	Drivers	Mean	
		Uncertainty	Impact
D1	Government policy in digitising the nation	4.5821	4.5771
D2	Technology Reliability	4.4975	4.5174
D3	Complexity technology of metaverse	4.0846	4.1194
D4	Awareness in the application of metaverse in tourism sector	4.0746	4.0995
D5	Technology innovation	4.1393	4.1194

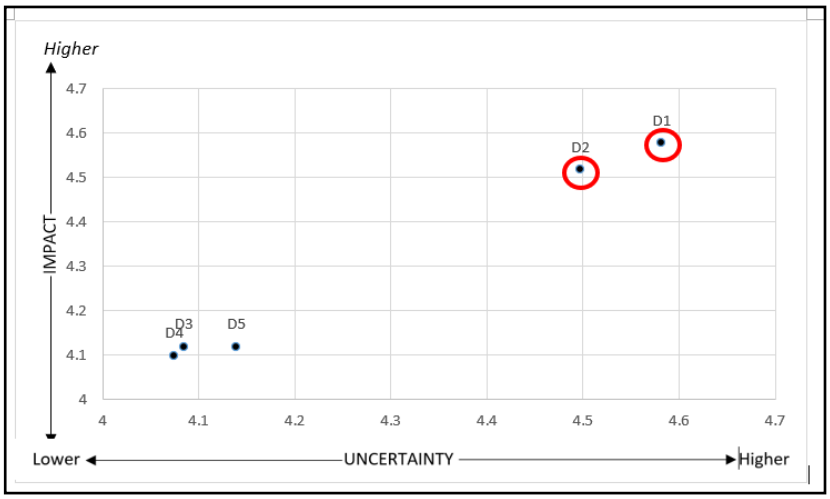

Figure 1. Impact uncertainty analysis

4. CONCLUSION

The study's first objective is to identify the issues and drivers of employing metaverse in tourism sector in Malaysia. The two primary drivers have been chosen based on the impact-uncertainty analysis. Both drivers have the most significant impact and uncertainty based on the user and the developer of metaverse in tourism sector review. "Government Policy in Digitizing the Nation" and "Technology reliability" have the highest mean in level of impact and uncertainty.

The government policy in digitizing the nation will impact the future adoption of metaverse in tourism sector in Malaysia. Governments build channels to encourage interaction with industry stakeholders in order to guarantee a common understanding of technology, including the role that Central Bank Digital Currencies may play in the metaverse. Governments play a critical role in developing a unified strategy that takes into consideration the realities of blockchain technology and its applications, comprehends the applicable roles of different parties on the blockchain, and helps to ensure responsible regulatory requirements are both effective and relevant. Governments must be prepared to address data protection, cyber security, digital identity, and other digital policy concerns. These problems must be resolved in a manner that finds a balance between the Physical and Virtual worlds. Governments may need to understand the significance of Metaverse and initiate its development, with the assistance of 5G businesses that are predominantly private sector. This places a substantial burden on both the government and the corporate sector perhaps a public-private collaboration is a viable solution [14]. Government should have a policy which mixes digital twins, virtual reality (VR), and cooperation to enhance city planning, governance, and support for virtual tourism [15]. So, this will help to improve the experience of the user of metaverse in tourism.

The technology reliability of metaverse technology is the trustiness in tourism sector. The reliability of metaverse in tourism sector is uncertain because the reliability of metaverse in tourism sector can positively and negatively affect society. From the positive perspective, the metaverse emerges through the interactions of a person, a gadget, and the environment or other people around them. Users may easily put themselves in the shoes of a visitor and go sightseeing on the other side of the world while sitting at home. It gives travelers with a clear sense of what they may encounter when they visit a certain place [16]. The virtual reality headset will enable travelers to explore previously intangible objects and reconnect with their senses. In certain ways, metaverse goods and experiences may assist in increasing the diversity of tourism resources and promote sustainable tourism. From negative perspective, it is about privacy issues. VR-headsets will integrate eye-tracking technology, allowing marketers and advertisers to potentially determine where we are looking during an immersive encounter based on headset data [17]. Therefore, the reliability of metaverse is crucial and will influence its future in the tourism sector.

The second objective was to study the future trend of metaverse in tourism sector in Malaysia. This objective also needs to identify the forces that can change the future of metaverse in tourism sector. Four different scenarios have been formed based on the top two drivers chosen from the impact-uncertainty analysis. These four alternate scenarios reflect the four potential outcomes between 2022 and 2032.

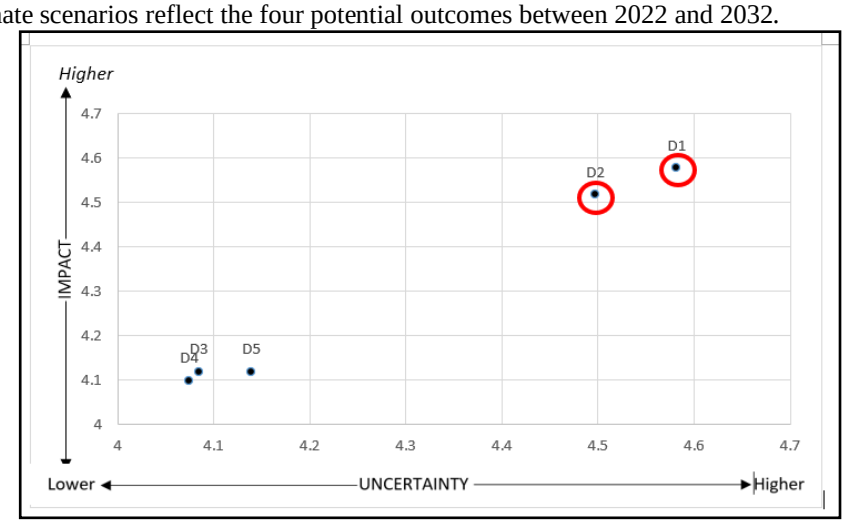

Figure 2. Development of four scenario analysis

a. Scenario 1 "Emergence of New Normalization"

The first scenario will happen when the technology reliability of metaverse in tourism sector and government policy in digitizing the nation is high. The "Emergence of New Normalization" refers to the metaverse will become a regular part of our lives. The metaverse will always be with us as a buddy. Depending on where we are in our lives, technology will connect us to it in the right way and with the right tools [18].

For the new normalization, the metaverse in tourism sector is high in reliability. Metaverse in tourism sector which in travel industry come from the fact that it can improve how people buy things before, after, and during a trip [7]. Most customers usually try out products before buying them. The metaverse has the potential to completely change the tourism industry by letting people have virtual experiences before they book their trips. This will help the "try before you buy" idea spread [19]. Metaverse allows travelers to experience sites as if they were physically present. They can also engage in travel to determine how long it takes to reach the destination or to determine the most entertaining path between two destinations.

Metaverse may play a big role in enhancing the booking experience. Metaverse can offer travelers and guests immersive experiences. It will be possible for travelers to see hotel rooms and other places prior to booking, and even simulate the check-in procedure by offer prospective guests realistic tours of their properties to demonstrate what they would experience if they select their hotel over others [7]. For example, hotel may use virtual reality tours or digital avatars to allow customers to explore a realistic recreation of their property, obtaining a sense of room size and accessible facilities.

From the perspective of strong government policy in digitizing the nation, government had come out the intellectual property law. The IP law protects the creators of tourism industry rights to their inventions, trademarks, and other works. IP law has become a crucial aspect of appropriate governance in the Metaverse environment, which is an unavoidable component. Soon, technology companies will strive to produce incredibly advanced AR and VR equipment, such as high-tech glasses and headsets. This will open up new opportunities for Intellectual Property Rights in the tourism industry, such as new software and hardware patents for travel sectors.

Hence, this scenario was ideal for employing metaverse in tourism sector. The high technology reliability of metaverse in tourism can virtually experience before they book the trips and enhancing booking experience. Hence, the scenario will also show that government had come the policy regarding intellectual property to protect the tourism industries rights. This scenario had lead to the emergence of new normalization. The user will have confident to use metaverse in tourism sector.

b. Scenario 2 “Doom of Technology”

The second scenario represents the "Doom of Technology," which was the worst-case scenario for the future of metaverse in Malaysia's tourism sector. The "Doom of Technology" scenario depicts a future in which the metaverse in the tourism sector would decline or technology will become extinct in the metaverse. When the technology reliability of metaverse is low, this situation shows that the metaverse is not safe, unreliable, and lacks accuracy. The weak government policy in digitizing the nation of metaverse in tourism sector will also make the user not be convinced to use the metaverse in tourism sector. This scenario would also reduce the need for metaverse in the tourism sector.

This scenario demonstrated that the metaverse in the tourism sector is unreliable. The metaverse in the tourist industry cannot replace the actual trip experience. The metaverse only has visible and audible signals. While it is still the greatest approach to keep target users informed about the offer, but from many aspects, such as the distinct feel of the air in the location, the taste of food, the comfort of being bathed in sunlight, and so on. It cannot be expressed through the metaverse [7].

Besides, it required of advanced digital technologies. Many innovative and advanced technologies, including as VR headsets, haptics, blockchain, and other needs, are introduced by Metaverse. However, not every person on the earth has access to such technologies. For instance, one of the basic conditions for participation in the metaverse is a fast Internet connection. The majority of the world's population does not have access to high-speed internet and cannot use the full potential of the metaverse. In addition, the limitations of the metaverse highlight the necessity for enhanced communication methods and devices. Many individuals cannot afford an expensive VR headset to join the metaverse [6]. This will cause the happening on there is only rich people can only join the metaverse in tourism sector, the poor people cannot join the metaverse in tourism sector due to the high price of the VR headset.

Nonetheless, this scenario demonstrated that weak government policy in digitizing the nation indicating that employing the metaverse in the tourism sector will absolutely no purpose. Governments were need to make crucial decisions regarding their integration into the Metaverse and their position in this more immersive online virtual reality. Governments must also address the requisite energy and computer power to allow the Metaverse, as well as the price barrier for users [16].

Therefore, this scenario will indicate the domm of technology in metaverse in metaverse in tourism sector Malaysia, as the majority of Malaysians have no interest in utilising metaverse technology. In addition

to the experience and cost, the unwillingness of users to trust the metaverse and the declining demand for the metaverse in the tourism sector can be attributed to their lack of faith in the metaverse.

c. Scenario 3 “Insecure Technology”

The third scenario will happen when the metaverse is strong in government policy but low in reliability. This scenario, “Insecure Technology,” will occur when low reliability of metaverse has high usage in a different technologic area, and this situation will cause the security issue outspread. Some negative impacts about the security issue might change the user intention toward the Metaverse in tourism sector.

Some undesirable effects of the security issue may affect user perceptions about the metaverse in the tourist sector. The metaverse is the next generation of the internet, and users employ augmented and virtual reality to immerse themselves in the digital universe. With all of this digitization come issues of privacy. A publisher of a Metaverse will manage all elements of their Metaverse and gather significant user data. Due to the decentralized structure of the Metaverse, this acquired data can be monetized and sold by the Metaverse publisher is a difficult-to-control action [20]. For instance, VR-headsets will involve eye-tracking technology, allowing marketers and advertisers to possibly determine where and for how long users are staring throughout an immersive encounter by analyzing headset data. Obviously, this is a marketer's desire, but it is a huge worry for everyone who cares their privacy. As we connect to wearable and haptic gadgets that record our emotions and bodily reactions, companies will also be capable of monitoring users physical responses. Companies might collect and utilize huge amounts of information for marketing and other purposes.

Besides, the identity hacking. In the virtual world, users will use avatars, and it will be easy for others to take their online identities by hacking their avatars. If this occurs, the hacker might impersonate anyone and cause havoc in both their virtual and physical lives [17]. It is very dangerous and must to put more concern of this technology.

When the reliability of the metaverse is low, users will be hesitant to apply it to the tourism sector. In addition, people are unwilling to adopt metaverse since there is no evidence of the technology's trustworthiness in protecting privacy. Because metaverse technology infiltrates users' privacy, the majority of users will feel anxious and fearful. Although metaverse can provide users with comfort, this benefit must be weighed against the security level of the system.

Therefore, this scenario demonstrated that the low reliability of metaverse in the tourism sector will result in unsafe metaverse technology. Although there is a strong government policy, but the user of metaverse will be unwilling to place confidence in metaverse if there is an insecure technology. In will lead the use of metaverse in the tourist sector in Malaysia will decline in the future.

d. Scenario 4 “Low Adoption”

The last scenario will happen when the technology reliability of metaverse in tourism sector is high but weak government policy in digitizing the nation. The “low adoption” scenario will happen when the high technology reliability of metaverse in tourism is weak government policy digitizing the nation with the metaverse and causing society will reluctant to use the metaverse.

So, this scenario will show that high technology reliable of metaverse in tourism is can reach other inaccessible. Not all places of the world are accessible, or at least not to everyone. There are several causes for this. These places may be inaccessible to travelers or hazardous to visit. Not everyone is able to climb Mount Everest or plunge into the ocean's depths. Metaverse in tourism allows users to travel anywhere. This provides sufficient excitement for many of us. For some, it might reduce the disappointment of not travelling, or make them more eager to attend. Consider how this technology may improve the quality of life. User can just wear headset and 3d glasses and moving around in room. User can reach to everywhere using metaverse by staying at home.

This will increase the willingness of user to try metaverse in tourism sector because it will also reduce the accident during the travel. For example, happen the robbery while walking on the street. So, with metaverse users will not worried about traveling outside because the robbery will not happen in metaverse in tourism sector.

This will increase the willingness of user to try metaverse in tourism sector because it will also reduce the accident during the travel. For example, happen the robbery while walking on the street. So, with metaverse users will not worried about traveling outside because the robbery will not happen in metaverse in tourism sector.

Although it is high technology reliability, but the adoption of metaverse in tourism sector is still low because there is a weak government policy. Governments should emphasis policies that contribute to a democratic approach to the development of the metaverse, such as promoting open-source standards and interoperability, to ensure that the metaverse is not dominated by a select group of large technology companies whose incentives do not align with those of other members of society [21].

Hence, this situation showed that the high technology reliability in metaverse in tourism sector could provide a good opportunity to increase the user's willingness and trust to have a try of the metaverse in tourism sector. However, this scenario also has some advertise situation that will cause the user lack of confidence to use the metaverse in tourism sector.

4.1 Limitation of study

For this study, there may be limitations during data collecting or in the study's findings. The responder population is small, which is the first limitation of this research. The sample size is small since the majority of respondents are Malaysian developers and metaverse users. In addition, time constraints prevented the inclusion of data from the public users of metaverse in the tourism sector. Consequently, the results of this study may not be applicable to other countries due to the sample profile, culture, and demographic region, among other factors.

4.2 Recommendation

a. Recommendation for future study

The public user perception and acceptability of metaverse in the tourism sector requires additional investigation. The general user intention was crucial to the technological acceptance process since it was the only method to determine whether the Malaysian society could embrace the metaverse in the tourism sector. This study aimed to uncover the drivers and trends of the metaverse in the tourism sector. As a result of the limited time available for data gathering, this study lacked information from public users. Therefore, future research must explore gathering the opinions of metaverse users in the tourism sector. Currently, metaverses in tourism are increasingly incorporated into people's daily lives, and public user intent can aid in more exact future forecasting.

b. Recommendation for biometric technology in IoT portable devices

The scenario analysis revealed the outcome determined by the top two drivers. These four scenarios will reflect the potential good and negative effects of adopting metaverse technology in the tourism sector. Therefore, these results may assist the relevant industries in formulating plans to mitigate the detrimental impact further. To ensure the future survival of the metaverse, more enhancements are necessary.

4.3 Conclussion

In conclusion, the purpose of this research is to identify the difficulties and drivers of adopting metaverse in Malaysia's tourism sector and to examine the future trend of metaverse in tourism sector in Malaysia. In the current era of digitization, metaverse expansion has expanded, as has the demand for metaverse security. The extensive use of metaverse in the tourism industry has also pushed businesses and service providers to adopt metaverse for their applications and services.

This research methodology the foresight method, SPSS analysis, STEEPV analysis, and impact-uncertainty analysis as its methodology. Based on the impact-uncertainty analysis, the top two drivers have been identified, and the driver has been employed in the scenario analysis to build the future scenario of metaverse application in the tourism sector. The research objective was realised when the top two drivers were identified, which may be utilized to develop four future possibilities for the tourist sector's application of the metaverse. The four scenarios represented the metaverse technology's reliability and the government policy for digitising the nation of tourism sector in the metaverse.

The high technology dependability of metaverse and government policy in digitization the nation of metaverse in the tourism sector can have a beneficial impact on the future of metaverse in the Malaysian tourism sector. The high technology reliability of the metaverse in the tourism sector might improve the booking experience and raise consumers' trust in adopting it. Government policy in digitization the nation of the metaverse in the tourism sector can protect the rights of the industry's creators.

The relationship between the reliability of metaverse technology and the government policy in digitization the nation of metaverse have a strong relationship. Both factors can generate the optimal "Emergence of New Normalization" situation in which people feel confident using metaverse in the tourism sector. But these two variables will also result in negative future scenarios such as "Technology's Doom," "Insecure Technology," and "Low Adoption." Therefore, future researchers and companies can gain from these future scenarios to support the future growth of the metaverse in the tourism sector.

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