International Journal of Social Science and Education Research Studies

ISSN(print): 2770-2782, ISSN(online): 2770-2790

Volume 04 Issue 02 February 2024

DOI: https://doi.org/10.55677/ijssers/V04I2Y2024-07, Impact Factor: 6.759

Page No : 139-148

Innovation Communication and its Challenges in The Metaverse Era

Hilarius Bambang Winarko[1*], Mohammad Nabil Almunawar[2], Linda Herkenhoff[3]

[1] Department of Communication Science, Faculty of Social Sciences & Humanities, Universitas Bunda Mulia, Indonesia

[2] School of Business and Economics, Universiti Brunei Darussalam, Brunei

[3] Department of Business Analytics, Graduate School of Business, St. Mary's College, California, United States of America

ABSTRACT

The emergence of digital technologies in human-computer interactions nowadays has brought new technological landscapes in many fast-paced developed areas including the innovation communication and metaverse. Innovation communication is relatively a new concept in the field of public relations communication, which is one of the most important elements in integrated marketing communications. Current technological trend development in the metaverse platforms may bring many new opportunities in the future as well as challenges for corporations, governments, and societies. This raised further questions on what metaverse qualities would be the most important for marketers to communicate properly to all relevant stakeholders. To answer the above research question, this paper used the qualitative phenomenological research method by using a prior research framework in the field of innovation communication. It combined with some literature review works to explore the progress of the metaverse development approach which was used for further analysis and discussions of this study. Based on further analysis and evaluations, a matrix was then developed to value which metaverse qualities are the most significant for innovation communication among the stakeholders' model. The study found that the communication of the true metaverse quality on safety was the most important aspect, followed by its innovativeness and inclusivity respectively. The research findings of the study give important considerations for high-tech organizations, especially those who will implement metaverse platforms in the future. Further, the findings can be used to plan carefully innovative communication strategies for all relevant stakeholders through Stakeholders' Innovation Communication Matrix analysis.

Published Online: February 26, 2024

KEYWORDS:

human-computer interaction, innovation communication, metaverse, public relations, stakeholders

I. INTRODUCTION

Innovation is one of the important aspects in organizations about responses to the questions about sustainability and growth, especially in business sectors. Innovation can be seen as the creation of new products and services or new ways that are economically worthy to solve problems systematically with modest solutions. As suggested by Keely et al. (2013) there are ten areas of innovation needed within industries: business model, networking, enabling process, core process, product performance, product system, service, channel, brand and customer experience. Innovation is often seen as a strategic competitive advantage tool to enhance market share.

Corresponding Author: Hilarius Bambang Winarko

****Cite this Article: Hilarius Bambang Winarko, Mohammad Nabil Almunawar, Linda Herkenhoff (2024). Innovation Communication and its Challenges in The Metaverse Era. International Journal of Social Science and Education Research Studies, 4(2), 139-148***

The need to promote the corporate innovations to the public can be realized in the form of innovation communication. Innovation communication is relatively new concept in the corporate communication field, and defined as the symbolic interactions between organizations and their stakeholders dealing with innovative products, services, technologies and ideas (Mast, C., Huck, S., & Zerfass, A., 2005). The idea of innovation communication was how corporate communication department or organization leaders deliver positive messages about their corporate innovations to opinion leaders like medias and direct communication to all related stakeholders (Huck, 2006). Innovation Communication (IC) can also be considered as a strategic competitive advantage tool which in this case enhances stakeholder trust. IC can support an organization's mission, vision, and culture, exemplify espoused organizational values and occur with regularity, yet be innovating.

The exponential growth in convergence of computing and communications technologies has forced vast organizational changes providing an increasing demand for innovation communication (Goryachev, 2022). Facebook founder and leader, Mark Zuckerberg, demonstrated his vision for the future of the metaverse by changing the company's name to "Meta" which he communicated via Facebook Connect and Meta's YouTube channels thereby also showing his commitment to building a more immersive communication beyond mobile internet (Kraus et al., 2021; Meta, 2021). Although the subscribers' number of Facebook remains positioned as the largest global social networking sites. It is now entering a new significant phase of technological development to sustain its business, as its number of teen users has declined by more than 25 percent in the past years, while at the same time the number of users in the older demographic (55 years old or older) has greatly increased (Clow, K. E. & Baack, D., 2022). However, the vision of the true metaverse and how to communicate the innovation of this new generation of Internet applications remains an interesting topic of discussion among the digital transformation evangelists and communication experts. Other global technological companies like Google, Microsoft and Apple will also join in defining the world's true metaverse (Nugroho, 2021).

Digital and internet-based innovations will continue at a rapid pace. As reported by the Gartner Group in 2017, artificial intelligence will reach marketing with radical computational power and big data which is expected to empower our society well be used to solve problems like never before (Frost, R., Fox, A. K., & Strauss, J., 2019). The metaverse world, will offer a 3D computer-based simulated environment built and owned by its residents, where people can create and share many things including clothes, houses, cars, etc. People who belong to these communities may be able to inhabit virtual spaces and communicate in a new way with their avatars. Avatars are usually drawn as textual, 2D or 3D graphical presentations, typically as presented in the Second Life communities, where people could do social networking activities, such as: chatting, interacting, playing, meeting people, learning, shopping or even creating business ventures and commerce in a virtual world. The text, graphical icons, visual gestures, video clips, and sound communication modes that that define human-computer interface are expected to become more natural. Moreover, it is seen as unlocking greater possibilities to improve customer satisfaction and retention by offering personalized, one-to-one service while also helping companies better define their customer profiles. With the emergence of Web 4.0 environment, it is expected there will be more active interactions between companies and customers and generate more honest relationships (Clow, K. E. & Baack, D., 2022). Businesses may not only sell products to customers but also allow them to post the reviews to improve engagement via various platforms of social media, smartphones and gadgets. Therefore, customers and audiences can access brands and services ubiquitously at any time.

While innovation communication carries many promising messages about the economic benefits of metaverses, at the same time it is not without challenges. It is not only affecting business growth, but also other social and communication interactions, including how people will play games and enjoy the music, video and film entertainment. Metaverses are beyond the communication media as a means of transmitting the messages (Cavazza, 2022). The need to escape from the real to the virtual world is one challenge that innovation communication may need to address; for example, the virtual world provides escape from problems of global pandemic and carbon emission in the real world. It addresses how to establish joint social practices and common patterns of meaning by involving audiences to enforce virtual co-creation, user-generated content or participatory advertising to improve engagements (Frost, R., Fox, A. K., & Strauss, 2019; Tobies, K. & Maisch, 2012; Tuten & Solomon, 2018). Freedom in online expression issues such as with spam messages, criticisms or whistleblowing and advertising messages that target children are additional challenges that innovation communicators shall face. Moreover, there are risks in adopting the online or virtual technologies in human daily social life commonly in the context of online privacy and security issues (Jaber, 2022). As warned by cultural theorist Jean Baudrillard modern society is leaving realities and entering a hyperreality world (Nuncio, R.V. & Felicilda, J.M.B., 2021); a place where we can hide from what we don't like. It is because those simulacra instruments of texts, visuals and events will replace the simulated and later be treated as true reality; yet potential limitations or mistakes may occur in mapping this territory (Nuncio, R.V. & Felicilda, J.M.B., 2021; Oktavianingtyas, I., Seran A., & Sigit, R.R., 2021; Rospigliosi, P. 2022). Further, in countries that value religious norms, these metaverse innovations could be seen as potentially dangerous simulacra that isolate people from others, and undermine and disintegrate human social life (Ang, 2022; Faris, 2022). Therefore, this paper is aimed to fill the gap of previous research done from the perspective of innovation communication by providing a useful strategic framework and recommendations that may help metaverse enablers to meet stakeholders' communication demands and avoid new disappointments among the conflicting interests.

What is Metaverse?

According to Clemens (2022), there is no single definition of metaverse, but he provides a metaverse rough characteristics as:

"Digital environment like the World Wide Web, but users can interact digitally with social networking, augmented reality, online gaming, and cryptocurrency".

Another digital transformation expert Frederic Cavazza (2022) noted that the term metaverse itself has already been around for thirty years but technological advancement has

created a true metaverse, an online digital space that combines virtual reality (VR), augmented reality (AR), 3D hologram avatar, video, and other forms of communication, including its advanced which is built based-on artificial intelligence (AI) technologies.

Facebook (Meta) recently produced a similar vision of metaverse (Weber, P. 2021) as:

"The next evolution of social connection, 3D spaces where you can socialize, learn, collaborate and play in ways that go beyond what we can imagine".

Back to the past decade, Turban et al. (2012) suggested a definition of metaverse as:

"3D computer-based simulated environment that is built and owned by its residents".

Metaverse has virtual communities, which is a group of people with common interest, idea, task, or goal, who interact with one another across time, geographic and organizational boundaries, to develop personal relationships in an open system, that take place over a computer network, mainly the Internet. This relationship can be in the form of online associations, or affinity portals with same hobbies, technical topic, vocations, political parties or trade unions. It can be also classified as virtual private communities (such as: particular employers, professions, employees, customers. etc.) and virtual public communities like most of social networking sites.

One characteristic that identifies the metaverse technology is that the members of these virtual communities are free to create their own animated computer characters that exhibit humanlike movements and behaviors, a software agent with personalities, called as avatars. An advanced avatar is fully automated such as a robot that is able to speak with special gestures and facial expressions. These avatars represent human beings in online gaming such as Second Life, Epic Game (Fortnite), Minecraft, and Roblox. They interact each other like in the gameplay, not only for communication, but also for digital financial transactions. This evidence supports Mark Zuckerberg's vision that within the future metaverse commerce will play the biggest part in this new generation of Internet in support of the creation of a new digital economy. The surprising factor is that the relationships that are built in this virtual world may be continued in the real world, just like what we can see in other social networking platforms.

Metaverses also need the virtual space, to provide some alternative of preferred ambiences and atmospheres where the players meet or teleport. It needs advanced technology of AR and VR-supported wearables that enable the processing of big data. The wearable devices development is underway and is expected to be a device will have a user-friendly glass with built-in camera and 3D hologram capability with wristband capabilities. However, there are challenges related to the interoperability of the metaverse platforms. Radoff (2022) an entrepreneur, author and gamer, suggested a metaverse seven tiers framework that describe the value-chain of metaverse market; they are: experience, discovery, creator economy, spatial computing, decentralization and human interface. These tiers will be important factors considered by researchers for the further development on metaverses' interoperability (HoloNext, 2022).

Metaverse Development and Challenges

Virtual world technologies in the past decade only offered limited 3D games and successfully attracted multiplayer online gamers all over the world. In the future it will offer plenty new opportunities or ways to do social communication interactions and even more digital businesses. Here are some examples of metaverse developments including its challenges in the specific areas:

1. Advertising

As the largest social media network site, Facebook (Meta) earns approximately $10 billion through social media advertising on desktop and mobile devices like smartphones, tablets, etc. in 2016 (eMarketer, 2016). With metaverse capability, Facebook may create more personalized advertising communication messages for each customer gamers may have better experiences by using 3D simulations.

2. E-Commerce

The traditional e-Commerce business model transactions are developed based-on four parties' businesses, consumers, governments, and employees (Turban, E., King, D., Lee, J., Liang, T-P., & Turban, 2012). With 3D computer-based simulated environments in metaverses, the e-Commerce transactions may provide improved buying & shopping experiences by using AR/VR wearables. Players can complete commerce activities directly with other players or complete normal e-Commerce activities through the metaverse platform. With cryptocurrency technology advancement in metaverses, the normal e-commerce transactions can be done virtually (Treiblmaier, H. & Sillaber, C., 2021). It means that people can buy and sell their virtual assets, like houses, cars, clothes, etc. in the digital market place provided by metaverse companies. However, potential fraud and disputes in-regards to these digital commerce transactions are still open discussed among researchers and stakeholders.

3. Finance

Trading in the metaverse world is also opening new opportunities for digital/cryptocurrency. An NFT (non-fungi token), a sort of data unit that is both nontransferable and unique, will be used as a digital ledger to store the transactions in the metaverse. Another similar term of NFTs (non-linear optical fibers) is utilized to link digital goods (images, videos, and audio) it provides evidence of ownership based on a digital ledger maintained by the NFT (Bao, H. & Roubaud, 2021). However, there is problem with the use of NFTs due-to the high carbon footprint and energy costs associated with validating transactions. Moreover, value of generating proof of ownership inside a market is usually unregulated and beyond the legal system's jurisdiction.

However, the 3D-simulated virtual financial customer service agent in avatar form may offer a better user experience and improve customer loyalty.

4. Education

The Metaverse would support e-learning implementation based on the capability to deliver more innovative learning experiences for students (Akour, I. A., Al-Maroof, R. S., Alfaisal, R., & Salloum, 2022). It is believed to eliminate time, distance, and social status barriers, so students can better manage their lifelong learning process. The virtual education concept allows universities to offer classes worldwide. but requires highly skilled digital technology competency in building the infrastructure and designing content. Students who don't live in good internet infrastructure areas may have difficulties to an accessing course material (Mathrani, A., Sarvesh, T., & Umer, 2022), Metaverse technology may be interesting and more suitable used for special purpose education, such as vocational, engineering and vestibule trainings that use 3D graphical or animated simulations.

5. Health

Some research found that VR may be useful in the treatment of mental health illness such as stress and anxiety, as well as in medical training (Petrigna, L., & Musumeci, G., 2022). The metaverse in medicine can be defined as the medical Internet of Things (MIoT) facilitated by AR and VR wearables and it will continually expand extensively within the healthcare system. According to Yang et al. (2022), there are plenty of plausible scenarios for major clinical and non-clinical applications of the metaverse in medicine, which include: research, development of computer software, consulting, science popularization, education and training, clinical research, healthcare, physical examination, self-care and geriatric nursing, diagnosis and treatment of diseases, drug and device therapy, surgical treatment, hospital management, pharmacy, quality control in medicine, disease prevention, insurance, medical meetings, etc. However, the security issues such as availability, privacy/confidentiality, integrity, controllability, operational security, system security and management security remain important considerations.

6. Tourism

During the global pandemic time, there is a trend in virtual tour and food-vlogging over the video channels like YouTube, Instagram and TikTok. The viewers may travel virtually to popular tourism sites and culinary destinations that they haven't yet visited in the hope that post-pandemic, they will have more in depth knowledge in preparation for the actual real world travel experience place they want to visit it in the real world. Travel accessibility increases via the virtual world who don't have good fortune to travel due-to financial and other health concerns. With metaverse technology, virtual tours may produce better user experiences (Lee, 2022). Tour agencies may use it as their promotional tool to attract and reach more visitors. Adventure travel may increase as users can familiarize themselves with more exotic travel to places like Moon or Mars.

7. Entertainment & Events

Watching 3D movies and films, experiencing musical concerts, dancing, attending virtual museums, or even sing together in virtual worlds with favourite artists and friends, would be interesting metaverse experiences as presented by Mark Zuckerberg. Entertainment activities also can be performed by e-sports or online gaming activities (Moore, 2022) where users can attempt surfing, fencing, playing chess or cards, etc. Events such as virtual weddings, birthdays, and graduation celebrations gained in popularity during pandemic time, The question is when the pandemic is ended, will the popularity of virtual events greatly diminish or will we live with some type of hybrid model.

8. Public Services

The metaverse technology can be used also for public services to help public institutions or government administrative agencies improve their public service quality and satisfaction by providing virtual services to stakeholders. It may also improve the governance, accountability, transparency, efficiency, cost reduce, encourage transformation/modernization, and ability to reach a larger number of people. However, there may be some implementation issues in regards to digital divide problems in rural areas due to poor internet access and limited technology capabilities, Information dissemination inequalities, exist in many countries and many countries have not yet adopted legislation for data and information practices that spell out the rights of citizens and the responsibilities of the data holders (Schroeder, 2022). The readiness of public service organization to operate and maintain various platforms of metaverse technologies in a large-scale will become essential.

II. METHOD

This paper is based on based on the phenomenology approach which initially tries to understand the realm of metaverse and how far this innovation of technology may bring significant impacts to human social life in the future. Benefits given into specific areas and challenges that need specific solutions, particularly in the innovation communication field are discussed. The paucity of in-depth academic research in this evolving topic required inclusion of other secondary reference sources such as websites, as well as YouTube channels and news media reports from the metaverse founders and experts about metaverses. The stakeholders/ innovation communication was used to identify which stakeholder areas need attention in the area of innovation communication.

III. RESULTS

Facebook (Meta) is not the only technology leader that built the future of a true metaverse platform; some of the other contributors include Microsoft, Google, Apple, Nvidia, and other gaming companies like Epic Game (Fortnite), Minecraft

(owned by Microsoft), and Roblox. These metaverse developments will require digital innovation communication which in turn will enable the fostering of technological, economic and social novelties, as well as ensuring the development of innovation ecosystem throughout the entire innovation process. The innovation communication concept is relatively new research area promoted by German researchers as part of corporate communication derived from mass communication theory. They defined innovation communication as:

"Symbolic interactions between organizations and their internal and external stakeholders, dealing with new products, services, and technologies" (Mast, C., Huck, S., & Zerfass, A., 2005)

Furthermore, Zerfass (2005) suggested the importance of innovation communication in three levels of communication. First, in the macro-level, it shows the competitiveness of nations and regions, especially in the public discourse about novelties. Second, in the meso-level, innovation communication should create clear information and trust in innovations and how the organization positions itself as the major innovation driver. And third, in the micro-level, each leader in the organization shall challenge themselves to support innovation with their leadership communications. He developed a stakeholders' model of innovation communication based-on the meso-level of innovation communication since it focuses on corporate communication. Tobies & Maisch (2012) in their study about early generation of the metaverse platform of Second Life used as an innovation communication tool for Sony-Ericsson, EnBW, and Deutsche Post companies, resulting in the addition of four categories in Zerfass' original stakeholders' model as shown in the Figure 1. This expanded model includes resulting in 12 categories of stakeholders that need to be considered in innovation communication.

Metaverse has been a more widely discussed topic in public discourse since the launch of the new brand of Facebook – Meta - by Mark Zuckerberg (Meta, 2021). It offers tremendous benefits while also questioning the social impacts and the associated risks in the areas of general control, data collection and security. Ethical standards need to be established to secure digital societies from the fake information crimes of human response manipulations by using artificial intelligence to simulate realities through "deep fake". Ethical standards need to be distributed across the stakeholders' model to reduce conflicting interests and avoid social disintegrations while supporting innovation communication processes and a healthier digital economy. One of the proposed ethical metaverses lay on the principles of authenticity, open and honest communication (Clemens, 2022) and shall have the following qualities: inclusive, safe, and innovative.

Inclusivity in the metaverse is needed since there will be many developers as well as artists joining forces to build a true metaverse. An exclusive metaverse built on certain proprietary technology would limit benefits to society. It needs to provide a human-centered, user-friendly system, easily understood, to ensure its sustainability. With the advancement of artificial technology and behavioral targeting, a true metaverse shall put the assurance of safety and protection of users against deceptive practices during the new digital transformation. This will ensure a more open and honest communications among stakeholders. And lastly, the metaverse itself shall foster innovation so it will provide opportunities and have unlimited capacity to grow. Ongoing learning and improvement in the future is critical to mitigating any potential negative effects caused by hyperreality. Based on the stakeholders' model of innovation communication from Tobies & Maisch (2012), there are twelve stakeholders' categories who may have different interests in receiving innovation communication messages. They are employees, R&D partners, customers, competitors, investors, interested public, politics/government, associations, NGOs, mass media, research institutions, and universities. These stakeholders may have common relationships with one or more true metaverse quality elements as suggested by Clemens (2022); they are: inclusivity, safety, and innovativeness. This paper has embedded those true metaverse quality indicators in the stakeholders' model. Further analysis and identification can be completed to further refine which stakeholders should plausibly focus on which qualifiers as indicated in dots. The following matrix analysis in Table 1 helps to identify the focal areas for each stakeholder.

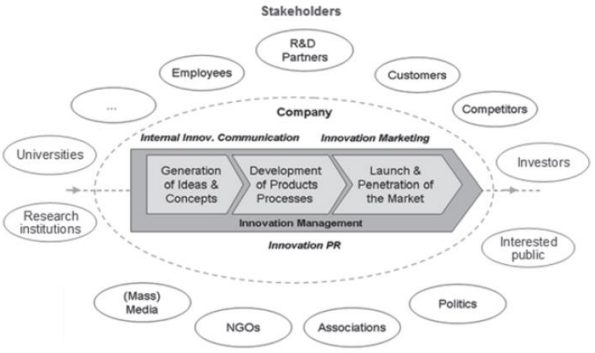

Fig 1. Stakeholders Model of Innovation Communication
(Source: Tobies & Maisch, 2012).

Employees are the most affected stakeholders in terms of their job security, due to the consequences from disruptive innovation activities in their companies. Ethical innovation communication can provide balanced information in addressing these concerns Research & development (R&D) partners as well all related technology suppliers/vendors will need to deal with the impact from discontinuation of current contracts and/or changing technological requirements ensuring the interoperability with other metaverse platforms while preserving their clients' return on investment. There are

growing concerns to consider the metaverse platforms' interoperability or the ability to unify economies, avatars and systems across the companies that use various kind of metaverse technologies (Radoff, 2022). Innovation communication messages may stimulate these research & development companies to invest in developing their competencies in-order to keep relevant with true metaverse capabilities.

Customers will likely demand open and honest communication messages that will ensure that their needs and wants are not being manipulated, and their data privacy is being protected under proper jurisdictions, yet the metaverse platforms shall also be user-friendly enough and worthy. Blockchain could deliver promising secure technology while promoting more decentralization and diverse metaverse connectivity to other applications. Customers do not necessarily become convinced solely by new innovative products which are likely to be more expensive. Competition among the metaverse companies tends to create competitive environments that may become barriers to innovation communication. For example, a company would not want their innovation being prematurely released publicly. Every player in the competing metaverse industry will keep an eye on the others to monitor the progress of innovation processes within their competitors and use it as the basis for their own strategic evaluation. Innovation communication of the metaverse would supports the Open Innovation paradigm ongoing announcements of new technology standards, and developments in interoperability.

Some key topics that investors want to hear about through the innovation communication messages is whether and how the companies will be sustainable in maintaining their metaverse business models, their market share, and return of investments. Innovation communication is a relatively new field which is part of corporate public relations functions (Huck, 2006). It has the potential to be an important tool to convince investors to buy reputable metaverse business shares. An expanding public interest in metaverse technology may provide a positive and significant contribution in generating funding for companies in this sector to improve metaverse capabilities. Innovation communication may play a key role in convincing investors to put more capital in longer-term scenarios such as the metaverse.

Universities and research institutes have similar interests although they have a different position in the stakeholder's model. Universities are assumed to be in more of a more independent position than research universities as they do not influence public policy determination, like research institutes do. However, both universities and research institutes, have similar interests in terms of data privacy issues; one for the teaching-learning credential data and the other for research data. Secondly, both universities and research institutes have diverse teaching and research platforms that should support the interoperability to the metaverse technology. The difference is that common teaching universities, although they are able to improve capabilities to deploy e-learning systems, they are still effective with still offering the offline approach for students. The quality of education delivered by face-to-face pedagogy generally has not yet been replicated by the virtual world. It's not just about the compatibility, but there are also typical constraints that exist, for instance the learners' attitude toward more independent study model required in the virtual context and the existence of internet infrastructure inequalities. On the other hand, research universities or research institutes may have more interest in keeping up to date with innovation communication messages improve research capabilities in a true metaverse environment.

Other promising campaigns for greater good in metaverse innovation communication are those that support governance, transparency and accountability. In the past few years, the world has been awakened and surprised with information leakage problems related to government data privacy and brought accountability of global leaders into question. The deep fake and hoax information distributions over the social networking sites have proven to be major contributors of the disintegration in society land of triggering conflicts that threaten the world peace. Security and privacy data issues will become the most crucial aspect for political leaders in protecting the citizens in virtual avatar-to-avatar communication interactions that may involve players beyond their national ideologies and political boundaries. NGOs (non-governmental organizations) and regulation bodies who promote issues related to the environmental protection, human rights, consumer rights, and labor rights may watch over the progress on new metaverse technological deployment that able to safeguard and concern about these issues. If they see that there are potential problems may occur, especially about security and privacy rights, they may prevent the rollout of an innovation by publicly protesting and legislating to block it. It is a new challenge and may become one of the difficult tasks faced by innovation communicators in the true metaverse era.

The traditional mass media industry (television, radio, magazine, newspaper, etc.) as well as online media would also have a challenging position in the true metaverse era, since they have to ensure their position as the most credible source of information in countering the fake news broadcasted in the virtual world networks. At the other hand, as media industry players, they may utilize the virtual world technology to expand their businesses and seek more revenues by putting the advertisements on their news platform in-accordance to their target viewers. As the public agencies that represent the voice of government and private sectors, the mass media industry may support the government with crisis management and social responsibility releases as well as with innovation journalism that supports the interests of high-tech corporations. The role of mass media also may also be expanded to promote the interests of associations, such as keeping good reputation of the association members

within certain industry or club, in-order to remain competitive yet profitable and solid. Therefore, the inclusivity or diverse technologies in which the association members may have already invested should be supported with high interoperability capabilities. It is expected to remove technological barriers for their organizational sustainability. Not only interoperability aspect, associations also would like to hear from metaverse innovation communication that the true metaverse technology in the future could ensure the protection against potential fraud and misleading information which possibly weaken the members' cohesiveness.

IV. DISCUSSION

Based-on the above explanations, a matrix analysis can be developed further and the dots marked on that matrix analysis (Table 1), while the importance rating of each true metaverse quality based-on stakeholders' model can be determined. The results showed that the highest rank is safety (58.3%) that calculated from 7 dots out of 12 stakeholders, followed by innovativeness (50%) that calculated from 6 dots out of 12 stakeholders and inclusivity (41.7%) that calculated from 5 dots out of 12 stakeholders. The greater rank of safety shall be put into main consideration for innovation communicators, because major stakeholders (customers, politics/governments, associations, NGO, mass media, research institutions, and universities) have common interests toward this metaverse quality indicator compared to the others (innovativeness and inclusivity). In relation to the metaverse safety issues, the blockchain technology has been growing its popularity in recent metaverse technology since it was used to create compatible and unique non-fungible coins needed in the metaverse world for commercial transactions (Clemens, 2022; Fauzi, M.A., Paiman, N., & Othman, Z., 2020). The use of blockchain technology through its decentralized virtual environment will become critical in the field of the blockchain technology serves as a repository for the players to store their data, while it functions as a connecting bridge between virtual and real worlds. It also provides players with digital authentication, access control, and consensus mechanisms, so the players a high level of security with online data privacy. Using the cryptographic system is believed to be more secure than in-game currency in multiplayer games. Since the technological concept underlying the block chain or cryptocurrency technology is not intuitive, innovator communicators will need to clearly explain benefits, and potential drawbacks to all the related stakeholders.

Table 1. Stakeholders' Innovation Communication Matrix Analysis (Source: authors)

No	**Stakeholders** (Tobies & Maisch, 2012)	**Inclusivity** (Clemens, 2022)	**Safety**	**Innovativeness**
1	Employees			●
2	R&D Partners	●		●
3	Customers	●	●	
4	Competitors			●
5	Investors			●
6	Interested Public			●
7	Politics/Government		●	
8	Associations	●	●	
9	NGOs		●	
10	Mass Media		●	
11	Research Institutions	●	●	●
12	Universities	●	●	
	Importance Rating	**41.7%**	**58.3 %**	**50%**

Blockchain technology and cryptocurrency may become the forerunners of this metaverse growth primarily fielded by the conversion and exchange of fiat cash in the real world to the digital currency in the virtual world (Boshkov, 2018). It will be the area of primary concern for commercial utilization built over the metaverse platforms (Norton Rose Fulbright, 2021). In the next decade, there will be vast growing metaverse developments in the field of advertising, e-commerce, finance, education, health, tourism, entertainment & events, public services and many more to come. These developments are not without challenges and innovation communication as a relatively new field could become a useful tool to strengthen the adaptation process of metaverse technology by reducing conflicting interests among stakeholders. They need to balance the safety/risk aspects of metaverse technology usage, while not preserving innovativeness and inclusivity. IC has become increasingly valuable in high-tech firms as they strive to mitigate conflicts of interest in diverse innovation adaptation societies where they operate. Innovation communication in technology and journalism that combine economical, technical and social aspects may be a good answer to solve the problems within innovation adaptation processes, rather than solely featuring messages on the actual innovation per se.

The shift of paradigm toward the digital technology environment drives many high-tech corporations and organizations to find innovative ways within its integrated marketing communication (IMC) efforts, especially in strengthening its public relations function that led to the brand reputation (Betchoo, 2016). They need to mix the public relations element with the other IMC elements such as digital marketing and social media marketing which have been

evolving together with the progress development of metaverse's innovation capabilities. Big corporations like Apple, Google, Meta, and Microsoft are not just developing a company, but they build a strong brand which will be followed and become the enablers to many corporations (Da Costa, 2019; Parrott, 2021). According to McKinsey (2021), the metaverse innovativeness impact in many industries would generate big amount of personal data collected from individuals that may worrying the potential users who will use it. Therefore, it raises the need to convey balanced and appropriate messages through innovation communication to relevant stakeholders. More intense pro-cons discussions about the advantages and disadvantages in-response to the development of metaverse-applications may be happened in our communities in the coming decade. At one hand, the digital disruptive technology may cause the death of some 'old fashioned' jobs that employees worry about, but at the other hand it creates new opportunities. Investors may need to make sure that their return on investments may not take too long, and innovation communicators shall work hand-in-hand with research & development departments to ensure that less tech savvy investors would be able to make better decisions for many developing options for potential metaverse-based prospects while minimizing the risks.

According to the analysis on the Table 1, inclusivity shall be the last prioritized metaverse quality among the stakeholders' model from Tobies & Maisch (2012), since it mainly focuses on how convenience the new developed metaverse technology platform can be used by the end-users (in this case, the customers). What innovation communicators shall address in their communication messages would be the issues related to the diverse technology platforms. The end-users, especially those who belong to innovators and early adopters on Everett M. Rogers' technology adoption segments may happy to hear sincere communication messages that metaverse-enabled apps or wearables they invest are able to work well in multi technology platforms (Gupta, 2022; Thomason, 2021). Other high-tech users such as research and development institutions might also be interested to listen and discuss broadly about this promising interoperability issues. However, this efforts will put more pressures to metaverse developers to realize it, although there is a glimmer hope toward its greater integrations through the introduction of blockchain technology (Park, 2022; Radoff, 2021, 2022).

V. CONCLUSION

The role of the public relations function in innovation communication is to ensure that every message gets delivered to all internal and external stakeholders. To present sustainable and ethical true metaverse qualities, there are at least three information quality indicators that shall be addressed; respectively the *safety*, *innovativeness* and the *inclusivity* of the ongoing true metaverse. According to the Stakeholders' Innovation Communication Matrix Model, among these three qualities, safety is the most critical point that needs to be addressed to stakeholders including customers, government agencies, associations, NGOs, mass media, research institutions and universities. While innovativeness of the metaverse may need to be well-voiced to employees, R&D partners, competitors, investors, interested public and research institutions. Lastly, the metaverse inclusivity would be promoted to R&D partners, customers, associations, research institutions and universities. Among the twelve stakeholder categories, only research institutions are concerned with all three true metaverse qualities. Further research is needed in the field of innovation communication, especially in case studies related to ongoing true metaverse development. The Stakeholders' Innovation Communication Model Matrix may facilitate this type of analysis. As discussed in the previous section, there are some managerial implications that should be taken into consideration, especially for chief of technology officers and chief of marketing officers who may need to deploy metaverse-based technology in their organizations.

VI. DISCLOSURE

We certify that there is no conflict of interest with any financial, personal, or other relationships with other people or organization related to the material discussed in the manuscript.

REFERENCES

1. Akour, I. A., Al-Maroof, R. S., Alfaisal, R., & Salloum, S. A. (2022). A conceptual framework for determining metaverse adoption in higher institutions of gulf area: An empirical study using hybrid SEM-ANN approach. *Computers and Education: Artificial Intelligence*, *3*(2022), 1–14. https://doi.org/https://doi.org/10.1016/j.caeai.2022.100052
2. Ang, K. F. (2022). *5 Things They Didn't Tell You About the Metaverse*. https://www.fatherkenny.com/post/metaverse/#3-whats-bad-about-the-metaverse
3. Bao, H. & Roubaud, D. (2021). Recent Development in Fintech: Non-Fungible Token. *FinTech*, *2021*(1), 44–46. https://doi.org/10.3390/fintech1010003
4. Betchoo, N. K. (2016). Advertising and Public Relations in Changing Technological Times. *Journal of Mass Communication and Journalism*, *S2*, 1–2. https://doi.org/10.4172/2165-7912.S2-e001
5. Boshkov, T. (2018). Blockchain and Digital Currency in the World of Finance. In M. G. A. Salman, A. & Razzag (Ed.), *Blockchain and Cryptocurrencies* (p. 19). https://doi.org/10.5772/intechopen.79456

6. Cavazza, F. (2022). *The Metaverses Challenges*. https://metav.rs/blog/metaverses-challenges-frederic-cavazza/
7. Clemens, A. (2022). *Metaverse for Beginners: A Guide to Help You Learn About Metaverse, Virtual Reality, and Investing in NFTs*. https://www.amazon.com/Metaverse-Beginners-Virtual-Reality-Investing/dp/B09RMBJB33
8. Clow, K. E. & Baack, D. (2022). *Integrated Advertising, Promotion, and Marketing Communications* (9th Ed.). Pearson.
9. Da Costa, C. (2019). *Why You Should Build A Brand, Not Just A Business*. https://www.forbes.com/sites/celinnedacosta/2019/05/31/why-you-should-build-a-brand-not-just-a-business/?sh=519a405277e5
10. eMarketer. (2016). *This Year, More Than Half of Americans Will Use Facebook*. http://www.emarketer.com/Article/1013560
11. Faris, M. (2022). *An experiment in the Metaverse*. https://productivemuslim.com/an-experiment-in-the-metaverse/
12. Fauzi, M.A., Paiman, N., & Othman, Z. (2020). Bitcoin and Cryptocurrency: Challenges, Opportunities and Future Works. *Journal of Asian Finance, Economics and Business*, *7*(8), 695–704. https://doi.org/10.13106/jafeb.2020.vol7.no8.695
13. Frost, R., Fox, A. K., & Strauss, J. (2019). *E-Marketing* (8th Ed.). Routledge-Taylor & Francis Group.
14. Goryachev, A. (2022). *When Communication Is At Its Best, So Is Innovation*. Forbes.Com. https://www.forbes.com/sites/forbescommunicationscouncil/2022/01/31/when-communication-is-at-its-best-so-is-innovation/?sh=7eef73716c7d
15. Gupta, A. (2022). *What is a Metaverse?* Gartner. https://www.gartner.com/en/articles/what-is-a-metaverse
16. HoloNext. (2022). *Metaverse 101: Understanding the Seven Layers of the Metaverse*. https://holonext.com/metaverse-101-understanding-the-seven-layers/
17. Huck, S. (2006). New Perspectives on Innovation Communication: Findings from Germany's Survey INNOVATE 2006. *Innovation Journalism*, *3*(4), 1–20.
18. Jaber, T. A. (2022). Security Risks of the Metaverse World. *International Journal of Interactive Mobile Technologies*, *16*(13), 4–14. https://doi.org/10.3991/ijim.v16i13.33187
19. Keely, L., Walters, H., Pikkel, R., & Quinn, B. (2013). *Ten Types of Innovation: The Discipline of Building Breakthroughs* (1st Ed.). Willey.
20. Kraus, S., Kanbach, D. K., Krysta, P. M., Steinhoff, M. M., & Tomini, M. (2021). Facebook and the creation of the metaverse: radical business model innovation or incremental transformation? *International Journal of Entrepreneurial Behavior and Research*, *28*(9), 52–77. https://doi.org/10.1108/IJEBR-12-2021-0984
21. Lee, U.-K. (2022). Tourism Using Virtual Reality: Media Richness and Information System Successes. *Sustainability*, *14*(3975), 1–17. https://doi.org/10.3390/su14073975
22. Mast, C., Huck, S., & Zerfass, A. (2005). Innovation Communication: Outline of the Concept and Empirical Findings from Germany. *Innovation Journalism*, *2*(7), 1–14.
23. Mathrani, A., Sarvesh, T., & Umer, R. (2022). Digital divide framework: online learning in developing countries during the COVID-19 lockdown. *Globalisation, Societies and Education*, *20*(5), 625–640. https://doi.org/10.1080/14767724.2021.1981253
24. Meta. (2021). *The Metaverse and How We'll Build It Together -- Connect 2021*. Meta's YouTube Channel. https://www.youtube.com/watch?v=Uvufun6xer8
25. Moore, P. (2022). *Is the metaverse a boon for the entertainment industry?* https://atos.net/en/blog/is-the-metaverse-a-boon-for-the-entertainment-industry
26. Norton Rose Fulbright. (2021). *The Metaverse: The evolution of a universal digital platform*. https://www.nortonrosefulbright.com/en-nl/knowledge/publications/5cd471a1/the-metaverse-the-evolution-of-a-universal-digital-platform
27. Nugroho, I. (2021). *Microsoft, bukan Meta, akan menguasai Metaverse. Ini logikanya*. Dr. Indrawan Nugroho YouTube Channel. https://www.youtube.com/watch?v=qFI4MWLCVXg
28. Nuncio, R.V. & Felicilda, J. M. B. (2021). Cybernetics and Simulacra: The Hyperreality of Augmented Reality Games. *Kritike*, *15*(2), 39–67.
29. Oktavianingtyas, I., Seran A., & Sigit, R. R. (2021). Jean Baudrillard and His Main Thought. *Propaganda*, *1*(2), 113–121. https://doi.org/0.37010/prop.v1i2.258
30. Park, D. (2022). *Blockchain is needed for metaverse interoperability: Klaytn*. Yahoo! Finance. https://finance.yahoo.com/news/blockchain-needed-metaverse-interoperability-klaytn-025410562.html
31. Parrott, J. (2021). *Technology Is Changing PR and Marketing Forever*. https://www.entrepreneur.com/growing-a-business/technology-is-changing-pr-and-marketing-forever/398402

32. Petrigna, L., & Musumeci, G. (2022). The Metaverse: A New Challenge for the Healthcare System: A Scoping Review. *Journal of Functional Morphology and Kinesiology*, *7*(63), 1–12. https://doi.org/10.3390/jfmk7030063
33. Radoff, J. (2021). *Web3, Interoperability and the Metaverse*. Medium.Com. https://medium.com/building-the-metaverse/web3-interoperability-and-the-metaverse-5b252dc39da
34. Radoff, J. (2022). *Metaverse Interoperability, Part 1: Challenges*. Medium.Com. https://medium.com/building-the-metaverse/metaverse-interoperability-part-1-challenges-716455ca439e
35. Rospigliosi, P. (2022). Metaverse or Simulacra? Roblox, Minecraft, Meta and the turn to virtual reality for education, socialization and work. *Interactive Learning Environments*, *30*(1), 1–3. https://doi.org/10.1080/10494820.2022.2022899
36. Schroeder, B. (2022). *The Metaverse - The Start of a New Era of Public Services*. https://www.legalcreatives.com/blog/metaverse
37. Thomason, J. (2021). MetaHealth - How will the Metaverse Change Health Care? *Journal of Metaverse*, *1*(1), 13–16.
38. Tobies, K. & Maisch, B. (2012). The 3-D Innovation Sphere: Exploring the Use of Second Life for Innovation Communication. In *Virtual Worlds and Metaverse Platforms: New Communication and Identity Paradigms.* (p. 18). IGI Global. https://doi.org/10.4018/978-1-60960-854-5.ch005
39. Treiblmaier, H. & Sillaber, C. (2021). The impact of blockchain on e-commerce: A framework for salient research topics. *Electronic Commerce Research and Applications*, *48*, 1–14. https://doi.org/10.1016/j.elerap.2021.101054
40. Turban, E., King, D., Lee, J., Liang, T-P., & Turban, D. (2012). *Electronic Commerce 2012: A Managerial and Social Networks Perspectives* (7th Ed.). Pearson.
41. Tuten, T. L., & Solomon, M. R. (2018). *Social Media Marketing* (3rd ed.). SAGE Publications Ltd. https://www.amazon.com/Social-Media-Marketing-Tracy-Tuten/dp/1526423871
42. Ward, R. & A. M. (2021). *Innovative and practical applications of the metaverse*. https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/innovative-and-practical-applications-of-the-metaverse
43. Weber, P. (2021). *How Facebook's metaverse could change your life*. https://theweek.com/facebook/1007409/how-facebooks-metaverse-could-change-your-life
44. Yang, D., Zhou, J., Chen, R., Song, Y., Song, Z., Zhang, X., Wang, Q., Wang, K., Zhou, C., Sun, J., Zhang, L., Bai, L., Wang, Y., Lu, Y., Xin, H., Powell, C., Thuemmler, C., Chavanez, N.H., Chen, W., Wu, L., & Bai, C. (2022). Expert consensus on the metaverse in medicine. *Clinical EHealth*, *5*(2022), 1–9. https://doi.org/10.1016/j.ceh.2022.02.001