Virtual Reality-driven serious communication: Through VR-Dialogue towards VR-Participation

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Abstract. e-Participation depends on a community of users–citizens who constructively engage and collaborate with governments and decision-makers on key democratic and social matters. Effective serious communication requires meaningful social interactions supported by relevant community-building efforts. We argue that achieving that is more visible by engaging dialogue with a constructive shared viewpoint rather than thorough discussions or argumentation. The emerging social Immersive Virtual Reality technologies supply a novel mode of digital communication that brings an opportunity to overcome some of the challenges hindering e-Participation. In this paper, we present the key concepts and explore the principles of Dialogue in the context of serious communication. We link those principles with specific Immersive VR affordances and propose a Framework for Virtual-Reality-Mediated Serious Communication – VR-Dialogue. Finally, we discuss the implications of employing that framework to support e-Participation through an additional component: VR-Participation.

Keywords: VR-Participation, e-Participation, virtual reality, immersive virtual reality, next-gen e-government, framework

Key points for practitioners:
- VR-Dialogue can help practitioners involved in e-Participation gain an additional perspective on contemporary online digital communication issues and the opportunities for e-Participation in employing cutting-edge Virtual Reality Technology.
- Our work raises awareness and facilitates a better understanding of the emerging Immersive Virtual Reality technologies and how they differ from contemporary online communication technology commonly referred to in e-Government literature as virtual reality.
- This research can help e-Participation stakeholders, including IT architects and policymakers, plan strategic investments into adopting emerging Immersive Virtual Reality into their e-Participation toolsets.
- Our framework can help the practitioners who are already engaged in the grassroots of VR-Participation engagement to take more advantage of the VR potential and further improve their online interactions

1. Introduction

We focus on e-Participation, defined as a technology-mediated dialogue between citizens and decision-makers (Sabo et al., 2008). The technology-mediated interactions ensure improved, fast-feedback-enabled public participation (Chadwick, 2003) while also introducing new, innovative channels for political participation (Dijk, 2000). We acknowledge that e-Participation can also be understood more broadly as
communication between different groups of citizens and organisations to influence public policy. It may also involve the whole area of citizen agency and the ability to participate by timely accessing relevant information. Nevertheless, our focus is on the use-case of serious communication with a governing body.

Even though the recalled common definitions of e-Participation point to dialogue in contrast to a discussion, the “online discussions” are at the core of e-Participation research (Kalampokis et al., 2008; Sanford & Rose, 2007). That is mainly related to the typical technical implementation of e-Participation platforms as “discussion forums”. Despite significant efforts and investments, the classic e-Participation initiatives still have a relatively limited impact due to moderate to low engagement both on the side of the government and citizens (Macintosh et al., 2009; Porwol et al., 2013).

1.1. Social-media-driven e-Participation

Social-media-driven e-Participation brought a promise of alleviating the major engagement-related e-Participation issues (Charalabidis & Loukis, 2015; Dini & Sæbø, 2016; Fathul & Sæbø, 2015). While social media are harnessed effectively to promote e-Participation, the benefits of direct e-Participation are yet to be seen (Anupriya Khan & Satish Krishnan, 2017). The often recalled issues are the lack of genuine influence on public policy (Ribeiro et al., 2018) and the case of locking participants in unconstructive discussions that are disengaging both citizens and decision-makers (Porwol & Ojo, 2017). Scholars point out “power-distance” between the government and citizens as an essential matter that hinders constructive engagements (Vakeel & Panigrahi, 2018). Authors stress that the predominant passive information-sharing approach (despite the new medium) without authentic dialogue does not overcome the classic e-Participation constraints (Pflughoeft & Schneider, 2020). The literature suggests that a successful e-Participation requires a thriving community of users-citizens who collaborate with governments and decision-makers on critical democratic and social matters through deeper engagements.

1.2. e-Participation and dialogue

E-Participation researchers argue that the sense of participation efficacy and genuine dialogue with citizens is pivotal to improve the level of citizen engagement (Alarabiat et al., 2017). Unlike in argumentation and discussion, where participants are being convinced to follow a specific viewpoint, dialogue enables participants to explore different perspectives and collectively arrive at a distinct conclusion or construct a new solution (Innes & Booher, 1999). The social-media-based e-Participation lacking relevant affordances supporting meaningful dialogue may result in polarised discussions (Conover et al., 2010). Sia et al. (Sia et al., 2002) argue that increased polarisation of discussions results from reduced social presence online. That is particularly pronounced in the political debates that extend throughout the largest social media platforms, especially during critical events such as elections. Many of those discourses are biased and full of hatred, serving as an "emotional venting place" for disappointed individuals and greatly lack valuable and constructive communication (Gerbaudo, 2018). The emotion-driven communication and the purpose-overload of social media as a tool that became the main information highway introduce new challenges to e-Participation such as fake news, automated bot-trolls and manipulative mechanisms that jeopardise a possibility for serious communication (Silverman, 2019). The challenges identified do not render social media irrelevant to e-Participation. On the contrary, authors acknowledge the very positive applications of social media employed for citizen initiatives in various contexts. However, they argue that new solutions need to be developed that will complement the existing social-media communications with solutions allowing more meaningful interactions.
1.3. e-Participation and emerging social VR technologies

As the new modes of interactivity emerged fuelled by technological advancement in Immersive Virtual Reality, new avenues for improvement in the space of serious communications opened. The availability of affordable and increasingly accessible immersive VR technologies support the emerging Social VR platforms. The new possibilities of immersive communication with a strong user presence and community-building capabilities may help overcome many of the challenges hindering state-of-the-art, largely text-driven serious communications channels applied to e-Participation (Porwol & Ojo, 2018b, 2018a). Indeed, today’s social media offer many information channels, including audio and video, however as per bi-directional communication and group engagement, the asynchronous textual exchange still plays the leading role.

Even though new technologies are often a “hype” and should be treated with caution on their actual benefits, the VR witnesses an unprecedented interest and substantial investments from major IT corporate giants. That situation brings a premise of a significant shift in the domain of online communications. The new platforms are being developed by the major players in the social media space. According to the latest reports, at Facebook, which owns the VR hardware market leader – Oculus, nearly 20% of FB employees currently work on VR/AR technologies.\(^1\) Rapid growth in revenue from VR headsets sales has been noted between 2019 and 2021.\(^2\) Facebook’s execs expect the immersive VR to reach full coverage (nearly every household) by the end of the decade. Facebook’s CEO Mark Zuckerberg and Andrew Bosworth, Facebook’s head of AR/VR, corroborate the observed new VR affordances benefits to allow “meaningful interactions”. That is reflected in increasing notion among the key domain players that not the quantity but the quality of interactions is what matters, and VR could be the way to alleviate some of the contemporary, digital communication challenges as VR experiences often feel deeper, truer, than conventional social media platform (Rubin, 2018). Building on potential benefits of emerging Immersive VR technologies to online communications, by implication, e-Participation can avail for new solutions that may solve some of the challenges hindering effective engagements.

1.4. Our goal

In this paper, we provide an overview of an approach implementing principles of Dialogue to serious online communications through specific affordances of the immersive Virtual Reality technologies. We argue that the unique properties of VR environments and high-interactivity may help improve the serious communication capacity of online e-Participation systems in specific use-cases, such as city-hall meetings and public consultation.

We first discuss the theory and the principles of Dialogue from the perspective of serious communications requirements. We elicit and elaborate upon the key affordances of Immersive Virtual reality in terms of support for constructive social interaction. Then we present a Framework for Virtual-Reality-Mediated Serious Communication – VR-Dialogue, combining the principles of Dialogue with the elicited VR affordances. We discuss the implementation of VR-Dialogue as a component contributing towards building VR-Participation capacity. We elaborate on how VR-Participation can complement existing e-Participation efforts. Finally, we discuss the limitations of the work presented and elaborate upon the next steps.

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2. https://uploadvr.com/zuckerberg-quest-2-q1-2021/#:~:text=The%20company%27s%20non%2Dadvertising%20revenue,%24297
   %20million%20in%20Q1%202020.
2. Methodology

This paper conceptualises immersive VR technology as a tool supporting serious communication through a theoretically sound framework drawing from computer science and communication science research. Specifically, we investigate how to formalise the relationship between the principles of serious communication driven by a theoretically grounded Dialogue model with specific Immersive Virtual Reality affordances that support effective implementation of the model. We employ serious communication capabilities of the VR in e-Participation to alleviate some of the challenges identified in the domain literature.

The research questions we attempt to address in this work are as follows:

– How can Dialogue principles be reflected in Virtual-Reality-based serious communication design, leading to the VR-Dialogue framework?
– Can VR-Dialogue help in addressing some of the e-Participation challenges towards achieving effective VR-Participation?

To address those questions, we apply the desk research approach. In particular, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher et al., 2009) in our analysis. PRISMA distinguishes four phases for systematic review: 1) Identification, 2) Screening, 3) Eligibility, 4) Inclusion. We applied PRISMA to distinct methodology analytical stages, starting with investigating the theory behind Dialogue. We progressed toward VR in e-Government and e-Participation and concluded with concepts important for building our framework for VR-mediated consensus building. The key steps in our methodology are presented in Fig. 1.

2.1. Dialogue

In the identification phase, we used the SCOPUS scientific database and searched for the most cited articles in the Dialogue domain using the “dialogue” query. We focused on works in the English language only. Still, we did not restrict the search to a specific time window as past works (like the 1980s) did not lose their meaning and relevance are applicable to studies on Online Dialogue. We identified five major best-cited papers relevant to our study and applied snowballing technique that gave us about a hundred articles. In the Screening phase, we have removed duplicated documents and excluded thematically irrelevant articles that gave us about 60 articles.

In the eligibility and inclusion phases, out of the set of thematically relevant papers, again, we selected the most cited and the ones dealing with topics strictly related to dialogue as a particular communication protocol (leaving us with 18 papers). We analysed those articles in full text; as for the rest, we investigated only abstracts and summaries. Those were included in our analysis that was focused on identifying data/information items conceptualising Dialogue. We identified a relevant theoretical framework describing the critical components of successful dialogue built upon well-established works in the Dialogue domain.
2.2. VR affordances

In the Identification phase for the extended set of articles, we looked at publications not older than 2000 (in English) since we investigate the contemporary understanding of Virtual Reality. We identified about 80 articles. At the Screening stage, we discarded about 60 articles as most of them referred to Virtual Communities and Virtual Spaces when referring to Online Communities and Online Spaces, not Communities and Spaces in immersive Virtual Reality environments as we would have expected. We also used non-scientific articles, web blogs and websites to get more information on the most popular social VR platforms we used for initial experimental engagements. Additionally, we have organised three experimental VR small-scale sessions. We implemented some elements of dialogue to discuss the future of training the trainers in VR. That resulted in collaboration and tentative support of our VR research from the industry.\(^3\) Those brief, grassroots engagements complemented by the literature enabled us to get insights into the sense of community and constructive engagement on contemporary social VR platforms, understand well their affordances and inspiring premises for investigation in this paper.

2.3. Framework

Once we elicit relevant concepts related to Dialogue, especially when we identified relevant Dialogue Framework based on our previous studies, we combined it and linked it to specific VR affordances acquired from scientific and non-scientific sources and those inspired by empirical trials. As a result, we constructed a Framework for VR-mediated Serious Communication – VR-Dialogue. In the final stage, we discussed the applicability of VR-Dialogue implementation in the context of e-Participation to provide a VR-Participation component.

3. Background

3.1. Dialogue principles review

Dialogue has been defined in the literature as an independent, distinct process of communication. Most importantly, the widely recognised works by Bohm et al. (Bohm, 1996; Bohm & Peat, 1987) emphasise dialogue as an exploration of how thought is an inherently limited medium, rather than an objective representation of reality – is generated and sustained on a collective level. That view by Bohm et al. (Bohm & Peat, 1987; Senge, 1991), further refined and explored by Innes and Boher (Innes & Booher, 1999), distinguishes dialogue as a very different type of communication to the discussion. The inherent problem of e-Participation is that it promotes the interaction of citizens and decision-makers through discussion, either led by government or self-organised by citizens, such as political deliberations on social media (Porwol & Ojo, 2017). However, as Senge (Senge, 1991) points out, the discussion at its core does not lead to an organic consensus. Instead, it is a battle where different sides present their views and are criticised and ultimately want to win and have their viewpoint accepted. The sides are not convinced, and it is a mere compromise that leads to constrictive results in a discussion. The authors stress that Dialogue, on the other hand, is about finding and developing a pool of shared meaning. Therefore in dialogue, the

\(^3\)https://www.elsevier.com/connect/can-virtual-reality-revolutionize-education-and-communication-meet-the-researcher-looking-for-the-answer.
participants explore different views and create a new common view. Bohm and Peat (Bohm & Peat, 1987) present three conditions for effective dialogue: a) participants do not make assumptions or hold to their initial views b) participants treat others with respect and consider them partners, c) the presence of a moderator is pivotal. Authors such as Schön and Rein (Schön & Rein, 1994) argue that dialogue leads to reflective policy inquiry and is grounded in practice. Forester (Forester, 1996) adds to that understanding of dialogue to be a transformative learning experience that results in innovation and self-generation. Finally, Innes and Boher (Innes & Booher, 1999) reflect on previous works and corroborate those statements, arguing that human interactions through dialogue are not just communication but a learning process. Boas et al. (Boas, 2013) argue that true consensus building depends on constructive dialogue that can be encountered in highly engaged groups, such as role-play game participants, is substantially different from the concepts defined in the literature on negotiation (Carpenter & Kennedy, 1988; Moore, 1996; Susskind & Cruikshank, 1987; Susskind & Podziba, 1990). Authors stress that in the negotiation domain, the consensus is a goal on its own and requires special meeting management techniques. In terms of important conceptual frameworks in the literature, O’Neill et al. (O’Neill & Peluso, 2013) took the four principles of Dialogue by Bohm – Participant, Coherence, Awareness and Enfoldment (Bohm & Peat, 1987) and reframed it with four principles by Isaacs (Isaacs, 2002). The resulting framework is presented in Fig. 2. The resulting principles are as follows:

1) Listening – participants are listening together and working towards mutuality (learning)
2) Respecting – participants engage in an inclusive space and embrace differing perspectives (multi-perspective view)
3) Suspending – participants examine their own and others’ opinions to deepen common understanding (common viewpoint building)
4) Voicing – authentic, genuine voicing of opinions without common unconstructive responses (common emerging viewpoint evaluation)

We argue that those principles of dialogue presented by O’Neill & Peluso (O’Neill & Peluso, 2013) discussed in the context of consensus-building and elaborated extensively in Innes and Boher (Innes & Booher, 1999), can also be mapped to the space of immersive Virtual Reality-based communication and interactions.

3.2. Online Dialogue Games

In this section, to complement the theory behind Dialogue, we briefly present the related concept and the field of Dialogue Games that attempt to structure the discussions in a framework that enforces dialogue and collaborative learning (Frawley & Carlson, 1982). The latest representation of Dialogue
Games, implemented as Web 2.0 tools, has been widely adopted as an online representation of face-to-face dialogue. In the case of Online Dialogue Games, authors stress that successful dialogue is contingent on the balance between enforced structure and flexibility and openness (Prakken, 2005; Ravenscroft, 2011). While the structure of posts and replies in Online Dialogue Games (DMG) resembles the updated post structure on popular social media platforms such as Facebook, the social media implementation is simplified. It does not distinguish attacking or supporting voices, does not distinguish roles in discourse and implements a free flow of argument exchange. That limited grassroots approach in contemporary social media to innovate with communications is in line with the recommendation by Ravenscroft et al. (Ravenscroft, 2011) who argues that there is a strong need for more learning approaches to online communication to ensure more collaborative behaviour.

We argue that building on the principles of contemporary Online Dialogue Games in terms of collaborative learning and consensus making further contextualises the Dialogue principles as a set of guiding principles for implementing more efficient serious communication online.

4. Virtual Reality Dialogue affordances

This section identifies and elaborates upon the specific Virtual Reality affordances that can support the dialogue principles. Our understanding of affordances is in line with related e-Participation works by Fathul et al. (Fathul & Sæbø, 2015), who explains the emergence of that use of the term from ecological psychology (Gibson, 1977) and further transition to IS domain (Zammuto et al., 2007). This view considers affordances as the relationship between the actors and artefacts rather than properties or functionalities of specific technology. Therefore, in our study, the affordances are understood as specific, unique capabilities of Immersive Virtual Reality to achieve a particular participant (citizen) state allowing better engagement.

First, however, we would like to clarify the definition of Virtual Reality as literature refers to Virtual Environments and Virtual Communities in very different contexts.

Contemporary Authors in the domain of e-Participation (Bailey & Ngwenyama, 2011; Maciel et al., 2018; Martin, 2006; Slaviero et al., 2010) relate to word virtual in a very different sense to the concept considered in this paper. These authors understand Virtual as digital platforms in general, in particular social media, while our understanding of VR is in line with the one relating to Virtual Worlds definition given by Bell et al. (Bell, 2008) presented as a synchronous, persistent network of people, represented as avatars, facilitated by networked computers. Specifically, by Virtual Reality or simply VR, we consider only immersive, simulated environments leveraging Head-Mounted Displays (HMD) as the interface, offering a form of strong telepresence and co-presence, where users are isolated from their surroundings, as defined by Steuer et al. (Steuer, 1992). We exclude cases where virtual environments are experienced through a laptop, desktop computer or mobile device’s display, which are not immersive and suffer from the “screen barrier” effect (Bricken, 1991). Those engagements exhibit different participant behaviour due to low immersion. Moreover, we do not include broader understood XR – Extended Reality or AR – Augmented reality in the scope of this work.

We argue, that the emerging Immersive Virtual Reality (VR) technologies, which offer simulated collaborative environments, also often referred to as the “telepresence” (Steuer, 1992), thanks to high-interactivity, strong immersion and increased presence capabilities, that gets close to real experience (Loomis, 2016), create new opportunities for more inclusive serious communications. Since VR technologies dating back to the 1960s (introduction of Head-mounted Display) made a comeback to the consumer market in the form of affordable and immersive VR solutions, a new opportunity arises to experiment
with more advanced means of communication (Boas, 2013). In particular, according to Sanches-vives at al. (Sanchez-vives & Slater, 2005), there are two distinct aspects of human interaction in Virtual Reality to consider when discussing the human perception of the virtual world and collaborators:

- Immersion – an objective property of a VR system that can be measured independently of the human experience
- Presence – (sense of presence) is the human response to the VR system

In our work, we complement these two affordances with the Sense of Community, which is dependent on Immersion and Presence but focuses more on social than technical aspects of the VR-mediated interactions.

4.1. Immersion

As pointed by Sanches-vives et al. (Sanchez-vives & Slater, 2005), immersion is a property of the VR system that is largely independent of actual human experience. It deals largely with the overall performance of the VR solution that leads to different levels of user immersion inside a virtual world. That includes factors such as degree of field of view, number of sensory systems simulated, quality and speed of image (dependent on computational capacity) and spatial sound simulation. Therefore, the quality of the VR experience is contingent on strong immersion derived from high-performance simulation (Zyda, 2005). In particular, Sanchez-Vives et al. argue that immersion in VR can transform the consciousness of a person in the sense that they respond to the virtual place and to events within that place and feel their body to be part of that place. This is corroborated by studies in medical impacts of VR, where it has been shown that immersion can be sufficiently impactful to decrease pain levels or eliminate pain. Patients disassociate themselves from reality and “live” within VR (Matamala-Gomez et al., 2019). We argue that the strong sense of immersion, discussed by computer science researchers and neuroscientists, can significantly improve VR group interaction capacity to listening and participate. This is due to isolation from the “real world” and focus only on matters in VR, unlike in teleconferencing or social media solutions where participants use screens to interact and get easily distracted and carried away due to the “screen barrier” effect (Bricken, 1991). In this context, we would like to recall a quite colloquial yet expressive statement: “watching heaven is quite different to being in heaven”; Bricken stresses the significant difference between viewing (on-screen) and inclusion (in immersive VR) by stating that in virtual reality users interact directly with various information forms in an inclusive environment.

4.2. Presence

The strong sense of the presence of participants in Virtual Reality environments, discussed by computer scientists (Loomis, 2016; Steuer, 1992), has also been strongly corroborated by works from the domain of neuroscience (Sanchez-vives & Slater, 2005). In the latter works, Sanchez-Vives et al. argue that if participants exhibit responses to impulses in VR the same way they do in reality, that is a sign of strong presence. According to Draper et al. (Draper et al., 1998), presence is a mental state in which the user feels physically present within the computer-mediated environment. The strong sense of presence has been supported by modern VR systems both through visual and haptic stimulation. That approach has been corroborated by studies into remote communication through VR by applying both visual and haptic stimulation, which showed that “the sense of being with another person together in a virtual environment” is very strong (Held & Durlach, 1992; Sallnäs, 2005). The strong presence in simulated environments has been shown in various contexts, in particular in experimentation with public speaking in VR. The
research shows that participants emotional responses in simulated environments correlate strongly with the experience in face-to-face meetings (Pertaub et al., 2002). In fact Sanchez-vives et al. (Sanchez-vives & Slater, 2005) suggest that VR-environments, thanks to solid monitoring capacity, should be used to study the phenomena of presence and consciousness in reality.

We argue that the improved sense of presence in VR compared to any other digital medium can help users be more mindful, have a greater awareness of their inclusion in specific group engagement & environment, and be more aware of the presence of other participants. Therefore, users are expected to examine better their opinions and biases while not hesitating to voice their genuine concerns and ideas.

4.3. Sense of community

The third final affordance of VR we are considering in our work is the sense of community. This specific affordance has been inherited from the former technologies such as online forums and social media, but it gains new meaning in the context of VR. Much has been said about the importance and effectiveness of online communities in the literature (Kim, 2000; Kozinets, 2003; Preece, 2000). In particular, the authors stress that in terms of social dynamics, physical and virtual communities are much the same. The social media platform leaders corroborate the former studies on online communities with their mission statement declarations dealing primarily with building a global community and supporting communities of interest.\(^4\) The newly emerging field of highly interactive social Virtual Reality leveraging immersive virtual simulated environments brings new opportunities to community building and engagement. Therefore, it is not a surprise that the leaders in the domain, such as Facebook, are also one of the most prominent investors in VR, primarily through their acquisition of Oculus – a leading VR gear hardware producer. The premise of VR contributing to a more robust community that benefits the participants is corroborated in literature (Yang et al., 2008). The grassroots of VR community-building emerged already in the form of social VR software platforms such as AltspaceVR\(^5\) (by Microsoft) or VRChat.\(^6\) Social VR platforms offer thematic events and dedicated spaces and environments for specific types of communities such as common interest groups (music, arts, developers) or support groups (like LGBTIQ). Here the two popular distinct social VR platforms apply different principles in terms of user representation.

While VRChat focuses on individualism and custom avatars, the AltspaceVR platform offers more unified, business-like avatars. Different participant representation has an impact on the communities present on those platforms. Therefore, VRChat has a more entertaining nature that attracts young people to play together. AltspaceVR brings more professionals to their virtual spaces. Also, the set of environments available to explore in AltspaceVR includes conference halls and board rooms with interactive screens that support a more professional engagement type than the game-like style of engagement in VR-Chat. Both platforms have their community guidelines published. From those documents, it is clear that VRChat appeals more to the young cohort of users who use platforms like Snapchat and Instagram daily: Every experience you’ll have inside VRChat is unique and probably a little weird but definitely enjoyable and even inspiring.\(^7\) Therefore, while VRChat aims to group “fun” and inspiration, AltspaceVR focuses on communication and communities interacting in specific events with relevant roles designated for

\(^5\)https://altvr.com/.
\(^6\)https://www.vrchat.net.
\(^7\)https://www.vrchat.net/community-guidelines.
community helpers. Moreover, AltspaceVR, an event-host moderation tool, enables the implementation of particular communication protocols. That allows the realisation of some of the discussed Online Dialogue Games rules leading to better collaborative learning.

We argue that the Sense of Community in VR is strongly supported. Evidence suggests that the sense of community is evolving towards more collaborative communities with better learning capabilities and inclusive support for Online Dialogue Games communication protocols.

The selection of VR Community tools presented is not exhaustive, but we have chosen the most popular yet very distinct Social VR platforms as a good example. In this elaboration, we do not include the Facebook Spaces VR app connected to Facebook as it only supports up to 4 people interacting simultaneously. That application has also been put on hold before the Facebook release of the successor VR platform, Facebook Horizon, which is expected to be available in late 2021.

4.4. Technical view and dependencies of selected VR affordances

Based on the literature and technology investigated, we consider Immersion as a strongly hardware-related property and the mode of delivery dependent affordance. Immersion relies on the performance of the infrastructure and improves as the audio-visual signalling between meeting participants is better quality, smoother and faster. Any interruptions and lags in processing may cause a mental disconnect of the participant, can induce fatigue and create disengagement. Depending on the specific technology components used for online VR communication, it may relate to 1) The quality of internet connection (latency, speed, interruptions), 2) Quality of audio which may depend on the microphone and headphones type and grade (can be part of the Head Mounted Display – HMD-integrated) 3) Quality of visuals which can relate to the type of display and other HMD-specific properties 4) The computing capacity of the main device, such as desktop computer or laptop connected to HMD (in case of standalone HMD it can be mobile processing unit onboard). Specifically, the main device may not be able to process high-quality audio-visual signals in time, creating lagging and crashing events that may result in discomfort and motion sickness. Relevant, strict guidelines in terms of minimal required hardware configuration are pivotal for smooth communication.

Presence is mainly a software property with an overlap to hardware. It depends on the capacity of the VR software and communication platform to allow robust interactivity and engagement between the participants in the absence of in-person contact. Therefore, it refers to affordances of the software platform used – availability of specific virtual interaction and collaboration tools. It may also refer to accessibility and security protocols, authentication, user management and moderation features. Ease of use and learning curve would be the major, not directly-feature related factor that can be decisive for users to feel comfortable on the platform.

Finally, the sense of community is a socio-technical affordance (with an overlap to software) that depends on the ability of participants to feel strong togetherness and a common identity. To some extent, that affordance may rely on the specific visual representation of participants (avatars, labels, badges) but also the particular architecture and arrangement of the virtual meeting venue, meeting organisation as well as specific communication protocols. It may also relate to the presence of elements supporting engagement and casual interactions. In the case of VR, that can be represented by a “VR coffee” space or similar venue for more informal interactions.

We argue that the new capabilities delivered by VR interaction enable an efficient online Dialogue implementation – VR-Discourse.

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5. VR-Discourse: The framework for VR-mediated serious communication

This section presents our attempt to combine and relate the four principles of effective Dialogue to key affordances of VR that can directly support those principles.

Specifically, we leveraged the Dialogue framework by O’Neill et al. (O’Neill & Peluso, 2013), who took the original four principles of Dialogue by Bohm – Participant, Coherence, Awareness and Enfoldment (Bohm & Peat, 1987) and reframed it with four principles proposed by Isaacs (Isaacs, 2002). The resulting principles, as elaborated in section 3, are: 1) Listening, 2) Respecting, 3) Suspending and 4) Voicing. We linked those principles to key serious communication affordances of Immersive VR: 1) Immersion, 2) Presence, 3) Sense of Community.

The linking was guided by the following implications:

1) The strong sense of Immersion can significantly improve VR group interaction capacity to Listening and participation thanks to complete isolation from the “real world”. Immersion helps to focus only on VR interaction, unlike in teleconferencing or social media solutions where participants are distracted and often carried away due to the “screen barrier” effect and intrusive messages from other system components or surrounding environment. It is common for other means of digital communications to face an issue of mentally disconnected participants (“can you please repeat the question” issue) and attention diffusion in the vast information and sensory overload.

2) The improved sense of Presence in VR can help users be more mindful and have a greater awareness of their inclusion in specific group engagement and environment with greater ability to Suspending and be more aware of the presence of other participants hence Voicing their genuine comments more openly. The discussed legacy online solutions face the issue of “passive contributors” and are limited to very few active participants in large group gatherings in teleconferencing. That is due to low demand for interactivity and often passive participation in larger groups. On social media, a low sense of presence often causes polarisation and bias in extensive conversations leading to unconstructive interactions.

3) Sense of Community – VR can offer a stronger sense of community derived from spatial properties of Immersive 3D venues, better interactivity and more means of interaction control supporting elements of Online Dialogue Games. That notion of more interactive and structured engagement creates an opportunity for more Respecting attitudes to online dialogue. VR can effectively simulate informal interactions in parallel to serious communication, and platform owners often underestimate the value of that aspect. Thanks to immersive spatial participant engagement and spatial sound, VR participants can “gossip” while watching a presentation or discuss in smaller groups without being disconnected from the main thread of the conversation in a way natural to in-person meetings in large venues. VR can offer “coffee break rooms” and support meeting people while passing by “in the hall”. Those elements pivotal to community building are difficult to implement in other means of communication due to missing 3rd dimension and lack of immersion.

Considering the specific alignment between the principles of Dialogue and VR affordances, we constructed the Framework for VR-Mediated Serious Communication (Fig. 3).

For a better understanding of our framework, we also present a supporting figure including the “gradient of” VR-Discourse and VR affordances (Fig. 4). In particular, we show that there isn’t a clear separation of components relating to hardware, software and social aspects in our framework. Instead, there is clear overlap and dependency between socio-technical elements of our framework. We further elaborate on those relations and dependencies in the context augmenting the existence of e-Participation initiatives.
6. Challenges for using VR-Dialogue in serious communication

Despite the expected benefits, before implementing VR-Dialogue widely to support serious communication online, some major challenges need to be addressed. First is the proliferation and availability of VR HMDs, which is still relatively low compared to popular computing technologies such as laptops or ubiquitous mobile devices. Moreover, an additional skill set is needed to operate the immersive VR technology that requires training, unlike the majority of the popular web interfaces or mobile apps. The year 2020 and the beginning of 2021 witnessed an unprecedented growth of VR headsets sales with exponential growth noted. The increase of adoption has been stimulated by pandemics-related restrictions and people seeking new ways of interaction and entertainment. By 2021 cumulatively, 16.4 million VR
units are expected to be sold. As elaborated before, the industry expects the full penetration of the market with VR/AR technologies by the end of the decade.

Despite the very increased uptake, VR communications are not considered the mainstream technology yet and not for another couple of years. Nevertheless, as with every new technology, such as smartphones, the early adopters pave the way for the future of communications. It is essential to address that group and structure and shape the domain at its early level. The serious communication technologies usually first make their way through corporate and business sector and then diffuses to the public sector. The following related challenge is for the companies and organisations to take a leap and embrace VR in their daily communications, which requires a specific new mindset and the vital role of the management to ensure efficient and constructive use of the technology. The role of upper management and the commitment of technology champions are pivotal to ensure the success of the new communication medium. The established serious communication technology providers must provide solutions that are accessible and intuitive for the user. As of 2021, the most prominent Social VR technologies are not oriented towards business communications with a strong focus on entertainment and informal engagements. Also, due to the lack of large deployments and limited user feedback, the interfaces and properties of the systems are still a work in progress that is evolving. Valuable business cases are also to be defined. In this context, we believe that our VR-Dialogue framework can help serious VR technology developers, innovators, researchers, and early adopters to understand better the serious communication context and related requirements and dependencies.

7. VR-Dialogue towards VR-Participation in the context of existing e-Participation initiatives

We designed the VR-Dialogue framework to support VR-Participation as a complementary component to classic e-Participation. The framework can help the existing e-Participation initiatives to adapt the emerging VR technologies to their existing initiatives allowing VR-Participation. As elaborated in the former section, some significant challenges must be addressed before VR-driven serious communication becomes mainstream. That also has a strong implication on the possible use of VR-Dialogue for e-Participation.

7.1. VR-Participation target group – the domain of youth

We envisage VR-Participation to emerge as a grassroots movement by pioneering national and local governments who wish to leverage the latest technology and be prepared for the imminent future. VR-Participation is not to replace e-Participation but rather complement it in specific use-cases, especially in direct consultations and city-hall-style meetings. Due to the demographics of the average VR user, which is primarily a cohort of young online gamers, the first VR-Participation government engagements should deal with problems important to youth that has been born to the digital reality. Eurostat has defined youth as people between the age of 15 and 29; however, we do not want to restrict our understanding of that target group. We argue that for youth, engagement through Virtual Reality would introduce a double benefit. First comes the advantage coming from the VR-Dialogue framework and the VR affordances of

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10https://ec.europa.eu/eurostat/web/youth#:%20context%2C%20young%20people%2C%20individual%20age..
strong presence, immersion, and an increased sense of community. The latter benefit spans from the fact that the government would reach to spaces where people are already, rather than forcing them to engage on their terms through limited, legacy modes of communication. That factor has been critical in the overall success of governments engagements through social media. We believe that specific citizen groups such as tech-savvy youth can significantly benefit from extending the highly passive communication on social media by lifting it to synchronous VR engagement in a game-like environment that would capture more of their attention. Social VR is already a grassroots place where tech-savvy citizens discuss politics. Nevertheless, the government representation in those engagements is missing; neither there is a structure to support that type of serious communication.

7.2. Implementing VR-Dialogue – practical guidelines for building VR-Participation

We wish to discuss strategically important capabilities that need to be implemented to support the next generation of e-Participation with VR-dialogue implementation in VR-Participation.

7.2.1. Listening

The efficient implementation of Listening in Dialogue through greater Immersion in VR requires e-Participation stakeholders to ensure that fast-broadband is widely available to support uninterrupted and smooth communication. While VR communication requires less bandwidth than teleconferencing (only telemetric and voice data is sent instead of data-heavy video), the connection still must be smooth to ensure solid immersion. That emerging need may coincide with the roll-out of 5G Wireless technologies that can supply broadband level speed and reliability to vast areas without costly fibre connectivity.

Another challenge has been the cost of computer-driven HMDs. The standalone solutions, such as the newest Oculus Quest 2 platform, are proven to deliver sufficient performance to major VR applications at a very affordable price. At the $300 price tag that “space-age” technology today matches a medium-lower class smartphone price. It should be a matter of principle for governments to intensify people acquiring those novel devices through appropriate incentives or providing access to those devices through standard networks of libraries, universities and schools.

7.2.2. Suspending and voicing

In terms of implementation of Suspending and Voicing via Presence in VR, we argue that the existing Social VR platforms such as freely available AltspaceVR or Open-Source – Mozilla Hubs already provide enough high-quality, audio-visual stimulation capabilities to realise the foundation for VR-Dialogue in e-Participation and make the first step into building efficient VR-Participation. The Open-Source platforms, in particular, should be used by e-Participation stakeholders and researchers to create relevant, interactive collaboration tools and moderation tools to fine-tune Social VR experiences for e-Participation. While the quality of the Social VR improves in line with the new VR hardware developments, at current technological progress, the next decade is expected to bring photo-realistic, near-real experiences on top of simplified yet robust environments of today. More encouragement and incentive should be given to researchers and businesses to start developing solutions for the emerging VR platforms.

7.2.3. Respecting

Finally, in terms of implementing Respecting through Community Building, once the grassroots VR-Participation platforms are in place, e-Participation stakeholders should make sure that the virtual venues are designed to allow semi-informal meetings and more casual communication in parallel to standard
serious engagements. More emphasis should be put on community building and linking directly with citizens who should be made co-owners of those venues.

Now, dependable on the specific context (culture, geographic location or pandemics situation) and resources available (technical & financial), the e-Participation initiatives’ owners may decide to “invest” into specific components of VR-Discourse implementation whether it is supporting Listening (Immersion), Suspending and Voicing (Presence) or Respecting (Community Building). Listening is the most challenging to address since that element shows to be firmly rooted in the wide availability and accessibility of specific technologies. Suspending and Voicing has been relatively well covered in their basis by existing Social VR platforms, but developing relevant extensions or building new platforms may prove to be a challenge. Therefore, since e-Participation owners will rather leverage the existing state-of-the-art, off-the-shelf solutions in terms of VR Systems (including platforms and hardware), it is apparent that the largest space for contribution lies in the Respecting where relevant communication protocols need to be put in place. In this context, Virtual Reality and e-Participation researchers should investigate further what elements of Online Dialogue Games can be implemented as effective VR-Discourse hence supporting the improved VR-Participation. Therefore, we would envisage more emphasis given researching and developing new 3D-spatial-communication protocols incorporating semi-informal communication in parallel to serious engagements.

7.3. The use of the framework for research

e-Participation researchers and practitioners should consider adopting the VR-Discourse-driven VR-Participation as a complementary component extending the existing set of e-Participation communication and collaboration channels. e-Participation initiatives can continue building upon existing methods and tools for citizen engagement and augment it with improved, immersive experiences that introduce new means of e-Participation to specific citizens.

We argue that the links identified and expressed in the framework design can help structure future research on serious communication in Virtual Reality in various contexts. Therefore, if researchers would like to investigate how to support better Listening, they can experiment with better immersion at the VR system level. Similarly, suppose more insights are sought in Suspending and Voicing in the group. In that case, researchers can provide a better presence by delivering additional interactivity and additional sensory inputs or impulses and feedback mechanisms. Finally, when the community struggles with Respect among participants, that can be alleviated by manipulating the VR environment towards greater affinity (could be through the VR space design or common or identical avatars). That can also be corroborated by applying some of the specific communication protocols (present in Online Dialog Games) to ensure maximum respect and professionalism in interactions.

8. Discussion

This study presents a general overview of the potential use of emerging Immersive VR technologies to augment the existing serious communication and improve e-Participation in specific areas. We developed a theoretically grounded framework that structures VR-mediated serious communication affordances around established concepts from communication science in the domain of Dialogue. Specifically, our contribution focuses on delivering the framework for VR-Mediated Serious Communication that combines and relates well-established principles of Dialogue with specific VR-affordances: 1) Immersion, 2), Presence
and 3) Sense of Community. We argue that our framework can help prepare relevant socio-technical background and grassroots components for building more efficient serious VR-communication and ensuring more engagement, hence helping to address some of the gaps of contemporary e-Participation. We do not envisage VR-Participation to replace the classic or social-media-driven e-Participation but rather augment digital communication in particular engagement scenarios for specific target audiences, especially youth. That approach will help pave the way for future developments once VR technologies mature and become mainstream and accessible to the majority of the population. Through progressing media convergence, VR is expected to achieve the capacity to absorb all contemporary digital communication channels and expand them with new features; therefore, the broader extension of e-Participation with VR-Participation should happen organically. Our research and the framework presented can help e-Participation owners to plan and embrace the emerging VR technologies and harness them for more effective public deliberations with youth. We argue that the application of the VR-Discourse framework to VR-Participation can help to bring more legitimacy to e-Participation by a more direct and engaging encounter with citizens, allowing near in-person, conscious experience regardless of physical and organisational limitations. In particular, the intense immersion and proven increased sense of co-presence followed by the sense of community creates avenues for more trusting and open engagements between government and citizen participants.

We cannot claim the absolute completeness of our framework; however, we argue that our work can help structure serious communication developments, particularly in the context of VR-Participation and related research in the domain. The major limitation of this work is that it is mainly theoretical and is also drawing from limited empirical evidence, and relevant extensive experimentation must be conducted to corroborate the premises elaborated in this paper. Therefore, our future work will focus on leveraging the existing Social-VR platforms to organising VR-Discourse-driven events as part of VR-Participation efforts and analyse the participant behaviour in terms of efficiency and user satisfaction. We intend to employ state-of-the-art AI technologies to learn relevant user-behavioural models and support appropriate dialogue moderation in various e-Participation contexts. Future experimentation will help us further stratify our framework and elicit more explicit parameters important for the dialogue in VR-Participation.

We are aware of substantial works done in the domain of Virtual Reality and e-Government, especially in the field of planning and training. However, there is a lack of research dealing with immersive VR in serious communication in e-Participation. This work extends the understanding of “Virtual Communities”, in the e-Government domain, as Online Communities, into the emerging Immersive VR field and paves the way for the new line of social VR research for e-Participation.

9. Conclusion

In this paper, we elaborated upon the possibility of using Immersive VR technologies for serious communication in e-Participation. Drawing from our past research in online communication for e-Participation, we presented a conceptual journey starting from e-Participation definitions and principles, heading towards the Dialogue principles and VR technologies affordances as pre-requisites of emerging VR-Participation. First, we articulated some of the challenges facing contemporary e-Participation. Aiming to provide a complementary, Immersive VR-technology-based, serious communication component, we investigated the key Dialogue principles that, if implemented correctly, should help alleviate some of the e-Participation challenges in specific use-cases. To support the next-gen e-Participation research and development, we presented a relevant framework for VR-mediated Serious Communication that combines and relates specific Immersive Virtual Reality affordances to established Dialogue principles. We elaborated on how the resulting framework can help e-Participation initiatives’ owners and stakeholders...
to start working with VR-Participation by employing existing off-the-shelf solutions. We also presented guidelines on how to make more informed strategic decisions and long-term policies allowing embarking on the emerging social VR technologies and harnessing them for e-Participation with youth.

Even though our work is primarily limited to theoretical elaboration, it is built upon well-established theories, concepts and our past peer-reviewed research in the domain, contributing towards a robust conceptual framework. We focused on providing helpful know-how for practitioners, e-Participation stakeholders and researchers who struggle to grasp the difference between different Virtual Reality technologies and their potential for e-Participation applications. Our analysis shows that the latest technological achievements in Immersive VR deliver promising capabilities for improving serious communication with application to e-Participation.

In our future work, we intend to employ extensive, AI-aided experimentation with Social VR-based e-Participation. We will validate the links identified in our framework and further stratify the dependencies and relations between specific VR affordances and Dialogue principles. We argue that our contribution helps progress e-Participation towards more comprehensive and efficient next-generation solutions drawing directly from the latest emerging technologies and the benefits of advancing media convergence.

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