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# Understanding multi-platform Social VR Consumer Opinions: A case study in VRChat using topics modeling of reviews

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## INTRODUCTION

Virtual reality (VR) is an immersive, multimodal technology that immerses users in and allows them to interact with environments that are not physically present to them [1] [2]. Social VR refers to the applications that allow users to communicate with one another in virtual spaces using head-mounted displays (HMDs) [3]. People may already communicate remotely via text, voice, or video thanks to the widespread use of social networking programs like Facebook and Zoom. However, compared to face-to-face communication, these forms of communication do not offer an immersive communication environment, which makes users feel less present and deprives them of opportunities for physical and emotional closeness as well as interaction with their surroundings and objects. With VR, an emerging alternative, users can "meet" in a shared, immersive virtual environment and engage with virtual versions of each other, improving communication experiences [4] and consequently, for example, collaborative efforts.

Commercial VR applications such as VRChat, Rec Room, AltspaceVR, and Facebook Spaces have recently drawn a large user base to engage in social interaction on both flat screens and VR displays [4]. These applications are being used in a variety of fields, including employment, education, counselling, and entertainment [5]. Platforms such as Mozilla Hubs have thus been increasingly used in professional and educational contexts, driving the need for understanding user experiences, and fostering consumer satisfaction and efficient use of the medium.

The rapid evolution of VR technology and social VR applications raise social VR consumers' expectations of their experience in the applications (Yoo et al., 2023). According to the expectation confirmation theory, if the actual performance of the applications does not meet users' expectations, users' satisfaction will decrease, which will impact users' intention to continue the use of social VR applications (Park, 2020). To improve user experience and intention to use social VR applications, it is essential to understand users' expectations on social VR and their perceived performance of the applications.

To study users' expectations on social VR and assess user experiences, research is predominantly based on laboratory experiments in different communication contexts [4] [6]. For example, they let participants play roles in collaborative tasks, talking tasks, competitive tasks, etc., and assess their communication efficiency [3] [7] [8]. In social VR research, experiments are suitable to test theories about user interaction in VR environments in controlled settings with little intervention from reality. However, their limitation for practical implications lies in the severe restriction to the experiment context and commonly a one-time experience, with uncertain generalizability of findings outside of laboratory conditions [9].

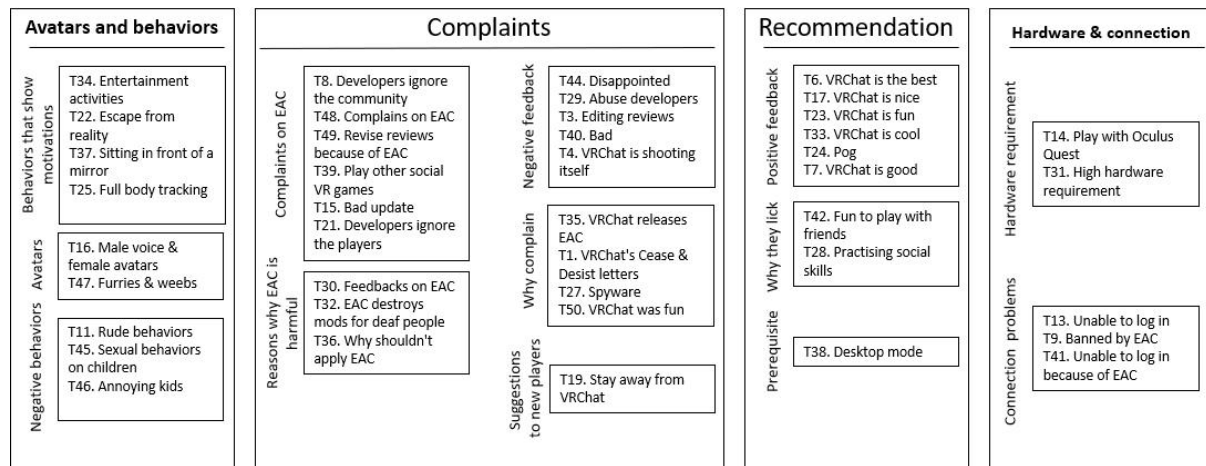
One way to fill these limitations is to conduct big data case studies on typical social VR applications. Since social VR is still a relatively new area of study, case studies could be used to give rich data describing phenomena involving communication in VR environments. Research that focuses on describing and understanding particular phenomena as well as constructing a hypothesis or theory utilizing grounded-theory methodologies is particularly well suited to case studies [9].

Most social VR applications as experiential products have many customers who like sharing their reviews online, which helps form social VR communities. To match new trends in social VR, there is a high demand for online review analysis and user profiling [10]. End-user evaluations of existing applications with a wide and diverse consumer base, such as video games, can offer helpful insights that designers can use to advance their applications [11].

To further the understanding of the advantages and pitfalls of social VR features, this study employs a data mining approach on a large dataset of users' reviews to explore: **what factors impact consumers' user experience in social VR applications.**

## MAIN RESULTS

This study attempted at contributing to filling this gap by using a freely available and popular social VR application as the case study (namely, *VRChat*), applying topic modeling to its consumer reviews, and discussing them primarily through the lenses of the technology-acceptance model (TAM) and expectation-confirmation theory (ECT) [12] and needs satisfaction as outlined in the self-determination theory (SDT) [13]. Through our analysis, we devised the following themes: avatars and behaviors, complaints, hardware and connection, and recommendation. Finally, we discuss them from the perspectives of hardware and platform affordances and drawbacks, continuing with those relevant specifically to head-mounted virtual reality uses, and in the end, we focus on the application's social aspects' influence on consumer attitudes.



**Figure. 1.** Affinity Diagram: thematic grouping of the found topics. Titles with a dash are topics, boxes are groups or subgroups.

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