Redefining the Digital Paradigm for Museums-Considering the COVID-19 Pandemic

Towards Interactive and Engaging Experiences in Virtual Museums

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Abstract. Museums offer an immersive and effective well-curated learning experience that helps visitors develop an understanding of their history, while showcasing and giving rise to their identity. Utilizing historical, cultural, and scientific artifacts, museums are predominantly focused on a physical 'brick-and-mortar' presence to preserve, create and disperse knowledge for the public. However, the COVID-19 pandemic has created an unforeseen barrier for in-person interactions and the physical distancing measures led to an unprecedented downturn in the global tourism and in-turn the museum sector [1]. This serves as a wake-up call to the urgency of a well-defined digital paradigm for museums.

Digitizing museums democratizes access and education for people regardless of location, resources, and age. The digital medium is a powerful learning medium but is significantly underutilized by the museum sector. Some popular museums, such as the Smithsonian National Museum of History, offer a virtual free-roam experience but lack in interactive experiences. Swartout et al. [4] specifically emphasize on designing interactive methods for facilitating engagement and learning in younger museum visitors who sometimes ignore the exhibits. Current practices of developing virtual museums can be categorized as brochure museums and content museums [3]. They are mostly limited to a digital collection of images, A/V files and text documents which scarcely inspire learning. Our study focuses on the unique potentials of the digital medium and redefining the digital paradigm for virtual museums to develop an interactive and engaging learning experience.

We conducted multiple rounds of a focus group study, with the members of the board of trustees of the Liberation War Museum (LWM) of Bangladesh. The LWM has a strong 25-year presence within the community and rich history of research on museology. Utilizing the discussions from the focus group, we explore and compare three methods for developing an engaging, interactive and immersive web-based 3D Virtual museum experience for the new generation of visitors. The three methods to explore are— "free-roam", "avatar-guide", and "game-based" experience. The "free-roam" experience facilitates visualization of virtual exhibitions in the form of 3D galleries and lets the virtual visitor walk around at their own pace and explore the artifacts. The "avatar-guide" experience is created by developing a virtual museum guide that uses natural language interaction to explain the 3D virtual artifacts and have a realistic appearance. The "game-based" experience utilizes the gamification technique for making the 3D virtual artifacts interactive and part of a puzzle game/scavenger hunt for conveying a story. We use learning as a metric for evaluating the three methods compared to a real-life museum experience.

We explore the "free-roam" experience as this is currently the most prevalent format in web-based virtual museums. Current avatar-guide museum experiences, such as the Ada and Grace experience [4], dictate to users virtually, but are in a physical museum. We aim to integrate this into the virtual museum experience. Game experience for virtual museums is a growing body of research, which integrates content into game-based learning due to the proven positive effects of games on learning [2]. However, learning by gaming is not presently recognized by formal
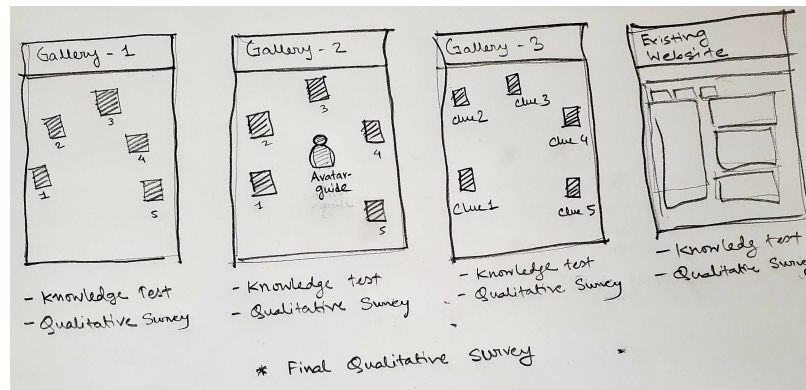
Fig. 1. User study– Concept sketch of three galleries– free-roam, avatar-guide, game-based

educational systems, primarily in low and middle-income countries, and games for museums are a relatively new concept. They require mechanics in the design where the experience is not only stimulating, by presenting a challenge, but also provide an educational experience for the user.

As a proof of concept, we developed a web-based 3D virtual museum, created in collaboration with the Liberation War Museum (LWM) of Bangladesh. It presents the journey of Bangladesh towards becoming a sovereign nation. We are working on conducting a user study with 30 Virginia Tech undergraduate students, which are United States citizens. We used Mozilla Hub, Unity Game Engine, Web3D, and Google Tour Creator for developing the three experiences of the museum.

The virtual museum consists of three galleries, with five different artifacts in each gallery (Figure 1). The three galleries are designed using the three methods for a 1-hour study. Participants explore each gallery for 10 minutes and then complete a knowledge-based test and a qualitative survey. First, in the free-roam experience, users walk around exploring the different artifacts. The second gallery has a avatar-guide that conveys information about the virtual artifacts and allows conversation. Finally, the third gallery has participants solve a puzzle by investigating artifacts to find information. As a baseline, the participants explore the existing LWM museum website and takes a knowledge-test with a qualitative survey. After participants finish experiencing the three galleries and the existing website, they take an overall qualitative survey to determine which experience was the most educational and enjoyable. We analyze the knowledge-based tests, qualitative surveys, and the final survey to compare the learnability of each approach.

Overall, we aim to identify and put together best practices for curating the virtual museums by utilizing the unique potentials of the digital medium in the post-pandemic world.

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