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Immersive Experiences: Utilizing Technology to Reimagine Heritage Interpretation Quality in Historical Precincts: A Case of First War of Independence in Lucknow

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ABSTRACT

The landscape of heritage interpretation is undergoing a significant transformation driven by the emergence of immersive technologies. Traditional methods of heritage interpretation, often relying on static displays, text panels, and guided tours, face limitations in capturing visitor attention and fostering a deep connection with the past. These methods can be passive, one-dimensional, and struggle to compete with the distractions of the modern world. Visitors may find it challenging to visualize historical events based on static exhibits, potentially leading to a shallow understanding of the historical context and emotional impact of events.

Immersive technologies, such as VR and AR, offer a compelling alternative to traditional interpretation methods. VR experiences can transport users into meticulously recreated historical spaces, allowing them to virtually walk-through battlegrounds, explore the interiors of buildings and witness key moments from the 1857 Uprising. This spatial immersion fosters a deeper understanding of the scale and layout of historical sites, enhancing the visitor's ability to connect with the events that transpired there.

AR technology, on the other hand, can overlay historical information and narratives onto real-world locations. Imagine a visitor standing in Lucknow's present-day streets, holding a smartphone or tablet. An AR application could superimpose a virtual recreation of the city during the uprising onto the user's view, highlighting key buildings, battlegrounds, and routes taken by historical figures. This interactive approach allows visitors to explore the city at their own pace, uncovering the layers of history hidden beneath the modern landscape.

Immersive experiences go beyond simply presenting information; they actively engage users in the learning process. Immersive simulations can place visitors in the midst of historical events, allowing them to experience the sights, sounds, and even emotions associated with the 1857 Uprising. Imagine standing on the virtual battlefield, hearing the roar of cannons and musket fire, and witnessing the bravery of both the Indian sepoys and the British defenders. This visceral experience can create a lasting impression and significantly enhance knowledge retention compared to traditional methods.

Focusing on the 1857 Uprising (First War of Independence) in Lucknow, India, the paper argues that immersive experiences can offer a more engaging, interactive, and emotionally resonant approach to understanding this pivotal historical event. The paper examines the specific ways in which immersive experiences can be utilized to reimagine heritage interpretation in Lucknow. It explores potential applications for VR in recreating key battlegrounds and prominent buildings like the Residency.
Additionally, the paper discusses how immersive technology can be used to overlay historical information and narratives onto real-world locations, enriching visitors' exploration of the city's historical sites.

This approach would create a more engaging and interactive learning experience for a wider audience. The case of Lucknow demonstrates the potential of immersive technologies to revolutionize heritage interpretation, transforming how we engage with the past and fostering a deeper appreciation for historicalevents.

Keywords: Immersive Experiences, Heritage Interpretation, 1857 Uprising, Lucknow, interpretation, immersive technology

1. INTRODUCTION

Travel is essential for economic, social, and religious activities and tourism resulting from travel plays a significant role in countries' prosperity (Baggio, 2008; Frias et al., 2015).

Traditional museums and historical sites have long served as valuable repositories of history, offering static displays and guided tours. However, in today's dynamic world, capturing the attention and fostering a deeper understanding of the past requires innovative approaches. This is where immersive technologies are revolutionizing the visitor experience at heritage sites. Buildings stand not just as structures, but as testaments to resilience, sacrifice, and the complexities of the conflict. (Gutiérrez et al., 2020)

In this paper, we establish a strategic plan for utilizing immersive technologies to enhance visitor engagement and historical interpretation in Lucknow's 1857 Uprising heritage precincts . This research examines techniques to utilize these elements as a foundation for engaging narratives.

This study's main objective is to identify the integration of cutting-edge technologies like augmented reality (AR), virtual reality (VR), and projection mapping to create interactive and multi-sensory experiences.
Visitors can step back in time and witness historical events unfold, interact with virtual representations of people and objects, or gain deeper understanding through interactive storytelling.

However, the integration of technology requires careful consideration. Balancing historical accuracy with the need for an engaging experience is crucial. Additionally, responsible data collection practices become paramount within these historical spaces. This research will explore ethical considerations and best practices for integrating technology in a way that respects the architectural integrity and historical significance of heritage sites.

Ultimately, this study will shed light on the power of architecture and technology to transform heritage sites. By creating immersive experiences that are interactive, engaging, and informative, we can foster a deeper connection with the past for all visitors. The paper will conclude with potential benefits for heritage sites, including increased visitor engagement, enhanced knowledge retention, and a revitalization of public interest in historical preservation. Through the lens of immersive experience technology, we envision an immersive experience that transcends passive observation. Visitors will be transported back in time, not just to witness the grandeur of these monuments, but to experience the sights, sounds, and narratives that unfolded within their walls.

2. LITERATURE REVIEW

Tourism represents a product of modern, complex society and is traditionally defined as people travelling to a destination outside of their usual home and work environments for leisure(United Nations World Tourism Organization (2021) International tourism and COVID-19).Technology can offer new experiences in a simulated environment (e.g. immersive technology) without requiring physical travel. Immersive technology thus provides a suitable environment for tourism promotion, experience enhancement, or education.
Advances in foundational technology now blur the boundary between the real world and the virtual environment by giving users an experience with a sense of immersion. From this perspective, immersive technology enables tourism stakeholders to enhance tourists' satisfaction since consumers can choose and
modify such an experience to a degree that was once considered impossible (Pratisto, E. H., Thompson, N., & Potdar, V).

Heritage tourism offers experiences that involve visiting or engaging with places, artefacts and activities which, although often contested, authentically represent the past. Heritage tourism can include cultural and indigenous history, natural resources stories and historic infrastructure and events (Gravari-Barbas, M., Bourdeau, L., & Robinson, M. (2016).

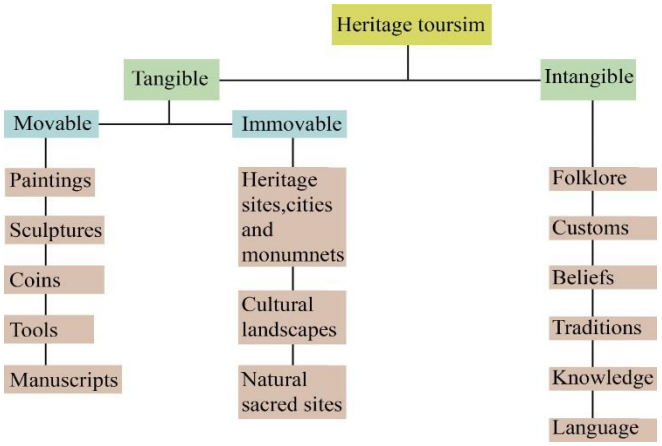


Image: components in heritage tourism

Source: Tudoricu, Anca & Fernández, Nerea & Agra, María & Allievi, Monica & Spagnoli, Silvia & Penone, Annamaria & Vignati, Cristina & Olari, Mattia & Rodio, Simone & Casali, Giuseppina & Paiva, Ana & Carrito, Elisabete & Jorge, Lúcia & Donescu, Eliza & Grădinaru, Sabina & Dumbraveanu, Daniela. (2022). HERITAGE AT PLAY.

Heritage sites offer a tangible connection to the past, fostering understanding and appreciation of history and culture. Heritage interpretation serves as the bridge between these historical sites and the public, aiming to communicate their significance in a meaningful and
engaging way. Heritage interpretation plays a critical role in fostering public understanding and appreciation of the past. It encompasses the various methods used to communicate the significance of cultural and historical sites, artefacts, and traditions to diverse audiences (McClellan, K. (2008)). Effective heritage interpretation goes beyond simply presenting facts and figures. It aims to create a meaningful connection between visitors and the past, fostering a sense of place and sparking curiosity (Ham, S., & Graham, B.
(2007)).

Thus, visitors to historical sites are considered very important to the tourism and recreation industry (Chandler & Costello, 2002; Griffin & Raj, 2017), as these visitors to historical and religious sites tend to vary somewhat from visitors to new cities or nature (Li & McKercher, 2016; Sharpley, 2018).

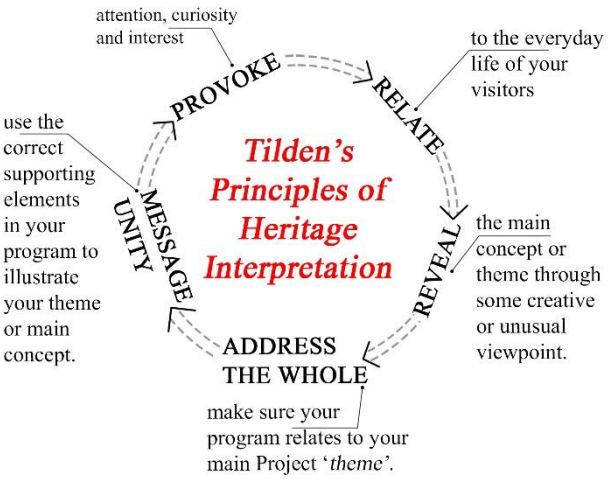


Figure: Tilden's principles of heritage interpretation, Source: Author

Compelling narratives are central to engaging audiences and bringing history to life (Tilden, F. (1957). Interpreting Our Heritage (4th ed.). University of North Carolina
Press.). Heritage interpreters use storytelling techniques to weave facts into a captivating narrative, allowing visitors to connect with historical events and figures on an emotional level. Engaging multiple senses can enhance visitor learning and memory (Bortolini, E., Pascuale, F., & Callieri, M. (2019)). Heritage interpretation techniques can incorporate tactile experiences with objects, evocative soundscapes, or visual aids like photographs or historical maps. Effective interpretation involves considering the needs and interests of diverse audiences (Flinter, S. (2010)). Interactive exhibits, hands-on activities, or guided tours tailored to specific age groups or interests can promote deeper engagement. Historical accuracy and responsible representation of the past are fundamental principles of heritage interpretation (Stone, P., & Rogerson, R. (2008)) Collaboration with historians and subject matter experts can ensure a balanced and truthful presentation of history, while acknowledging multiple perspectives and avoiding cultural bias.

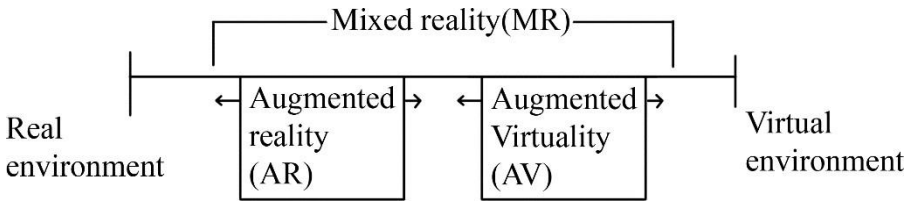


Figure: Milgram's reality-virtually continuum, Source: Albourae, A. T.,Armenakis, C., and Kyan, 2017()

Technology	**Brief description**	**Sources**
Virtual Reality (VR)	VR creates a fully immersive environment by blocking out the real world and surrounding the user with a virtual one. Users wear headsets equipped with screens and sensors, allowing them to navigate and interact with virtual objects and environments. VR experiences can be incredibly powerful for historical re-enactments or transporting users to different locations and time periods.	(Biocca, D., & Delaney, B. R.(2015)
Augmented Reality (AR)	AR overlays digital information onto the user's view of the real world. This is achieved through smartphones, tablets, or specialized glasses. AR can provide contextual information about objects, locations, or even people in the user's immediate surroundings. Imagine pointing your phone at a historical building and seeing information about its construction and past inhabitants appear onyour screen.	(Azuma, R., Baillot, Y., Behringer, R., Chrysler, L., Dance, L., Féjus, N., ... & Wagner, M. (2001)

Mixed Reality (MR)	MR combines elements of both VR and AR, creating a mixed environment where virtual and real objects coexist and interact. Users can manipulate virtual objects within the real world, making MR highly interactive. This technology allows for experiences that seamlessly blend the physical and digital, offering exciting possibilities for historical interpretation.	(Krueger, M. W. (1991). Artificial reality II. Addison-Wesley Longman Publishing Co., Inc.)
360° Videos	These videos capture a full sphere of a scene, allowing viewers to look around in any direction. 360° videos provide a sense of presence in a location, even if physically absent. They can be viewed on smartphones, tablets, or with VR headsets for a more immersive experience, offering virtual tours of historical sites.	(Yi, J., Li, H., & Dai, Y. (2016).
Holographic Displays	Holographic displays project three-dimensional images that appear to float in mid-air. These displays can be used to create interactive experiences or showcase historical objects in a visually appealing way. However, holographic technology is still under development and not as widely available as other immersive technologies.	(Kaino, W., & Hoshi, H. (2000)
Binaural Audio	This technology creates a realistic 3D soundscape that replicates how humans naturally hear sound. By using headphones and manipulating	(Rumsey, F., & Wearden, M. T.(2001)

	audio cues like timing and phase differences, binaural audio can create a sense of immersion that traditional stereo audio cannot.	
Multisensory Experiences	This approach combines various immersive technologies (like scent, wind, and vibration) to create a multisensory experience that engages more than just sight and sound. For example, imagine feeling a gentle breeze on your face while experiencing a VR simulation of a historical battle.	(Schifferstein, H. N. (2012)
Cave Automatic Virtual Environments (CAVEs)	CAVEs are projection-based VR systems that create a room-sized immersive environment. Users wear lightweight tracked glasses and interact with the virtual world by moving around the physical space. This technology could be used to create highly detailed and immersive experiences of specific locations.	(Cruz-Neira, R., Leigh, J., Hayes, A., & Papka, R. (1992).
Haptic Feedback Suits	These suits are worn by users and provide tactile feedback in response to their actions within a virtual environment. This technology could be used to allow visitors to "feel" the texture of historical artefacts (virtually) or even the vibrations of historical battles.	(Monheit, G., & Sundar, S. (2010)
Brain- Computer Interfaces(BCIs)	BCIs are still under development but hold potential for the future of immersive technologies. These interfaces can detect brain activity and translate it into computer commands. Imagine a historical VR experience where visitors' emotions directly influence the narrative or environment, creating a more personalized and emotionally engaging experience.	(Wolpaw, E. W., Wolpaw, N. R., Regan, D. P., & Pile-Spellman, P.(2002)

Table 1: types of technologies and a brief description about them

Vision provides us with information about the shape, colour, distance, and movement of objects in our environment. It allows us to interpret and understand our surroundings, recognize faces, read, and appreciate art and aesthetics. (Spence, C. (2017).Hearing enables us to detect and interpret sound waves, allowing us to communicate with others, perceive music, detect danger, and localize the source of sounds. It plays a crucial role in social interaction, language development, and environmental awareness. (Schäfer, T., & Jaeger, S. (2014). Taste allows us to discern the flavour of substances by detecting chemicals in food and drink. It helps us to evaluate the nutritional value and safety of what we consume and contributes to our enjoyment of eating. Smell is closely linked to taste and enables us to detect and distinguish various odours in our environment. It helps us to identify food, recognize potential threats or sources of pleasure, and can evoke strong memories and emotions. Touch provides information about pressure, temperature, texture, and pain. It allows us to explore our surroundings, interact with objects, perceive physical sensations, and experience physical intimacy and comfort. (Reisinger, Y., & Steiner, C. J. (2006) . Immersive technologies (ITs) like virtual reality (VR), augmented reality (AR), and mixed reality (MR) are transforming the interpretation and experience of cultural heritage sites. However, integrating these technologies successfully requires careful consideration of the existing architectural context.

Enhanced Visualization: Immersive technologies enable architects to visualize designs in three dimensions,

allowing stakeholders to experience spaces before they are built. This facilitates better communication and collaboration throughout the design process(Kumar, S., & Reddy, V. S. (2020).

User Engagement: By incorporating immersive technologies into architectural design, architects can create engaging and memorable experiences for users (Bermudez, J. (2016). Interactive features, such as virtual walkthroughs and interactive displays, encourage exploration and interaction within built environments.

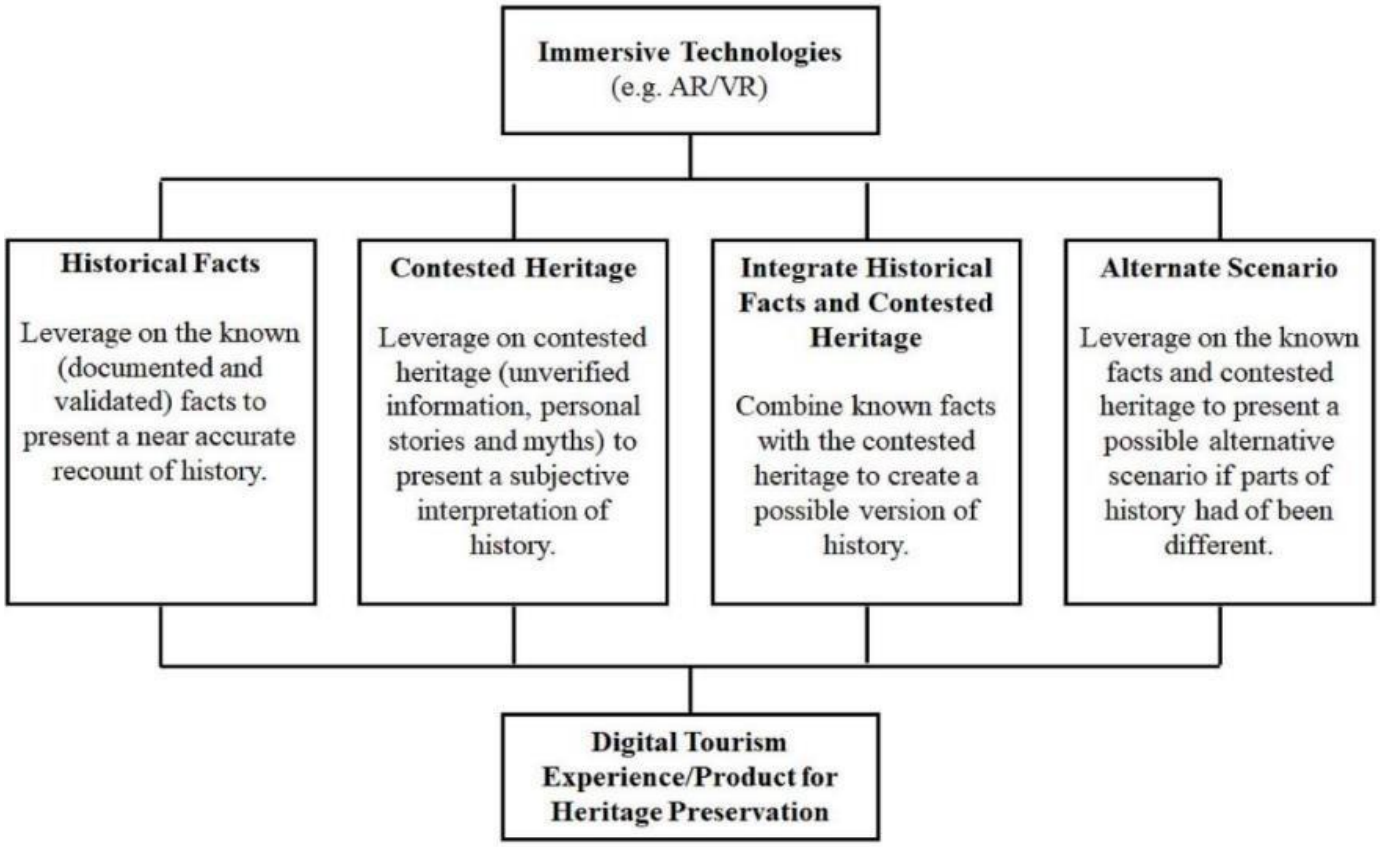


Figure: immersive technology and heritage interpretationSource: Albourae, A. T., Armenakis, C., and Kyan (2017)

Customization and Personalization: Immersive technologies allow for customization and personalization of spaces based on user preferences and requirements (Cheng, N., Salehi, F., & Kong, J. S. (2018). Users can interact with digital elements to modify architectural features and adapt spaces to their needs.

Simulation and Analysis: Architects can use immersive technologies to simulate environmental conditions and analyse the performance of buildings in various contexts (Hu, X., & Fazio, P. (2017). This enables designers to optimize building designs for factors such as daylighting, thermal comfort, and energy efficiency.

The historical integrity of a heritage site remains paramount when integrating ITs. Studies emphasize minimizing physical alterations (McClellan, K. (2018). Opting for non-permanent fixtures or projection mapping techniques can help preserve the architectural fabric (Ioannides, A., Frangoudis, P., & Tsichritzis,
D. (2019). Aesthetics also play a role – Ioannides et al (Fernandes, A. S., Teixeira, J. P., & Jorge, H. M. (2020). suggest using lightweight headsets or unobtrusive displays that complement the architectural style. Furthermore, the immersive experience should not overshadow the historical reality (Ioannides, A., Frangoudis, P., & Tsichritzis, D. (2019). As McClellan (Callieri, M., Dellepiane, M., & Scoczą, A. (2018) highlights, ensuring the technology complements the narrative and avoids creating a fictionalized version of the past is crucial. Beyond historical integrity, successful integration requires optimizing the spatial experience.

When considering the technology (VR vs. AR), the physical limitations of the space are crucial (Ioannides, A., Frangoudis, P., & Tsichritzis, D. (2019). Yarime et al. (Yarime, M. Y., Aziz, A. A., & Mohamad, D.
(2019) suggest VR might be better suited for smaller areas, while AR can overlay information onto larger spaces. Accessibility and visitor flow are also important. The design should ensure clear pathways and designated areas for using the technology, considering alternative options for visitors who cannot utilize specific technologies (Fernandez, A. S., Teixeira, J. P., & Jorge, H. M. (2020). Additionally, user comfort and safety require providing adequate space for movement and addressing potential issues like ventilation and lighting in VR experiences (Usoh, H., Mohamad, D., & Ibrahim, S. (2010). Presence and Comfort in Immersive Virtual Environments.).
Immersive experiences have emerged as a promising approach in various domains, including entertainment, education, training, and tourism. These experiences aim to engage participants fully by surrounding them with a multisensory environment that simulates real-world situations. While immersive experiences offer numerous potential benefits, they also present certain challenges that need to be addressed for successful implementation.

Outcome	**Brief description**
Enhanced Engagement	Research has shown that immersive experiences can significantly enhance engagement levels compared to traditional methods (Slater, M., & Sanchez-Vives, M. V. (2016).By stimulating multiple senses simultaneously, immersive environments capture participants' attention and encourage active participation
Improved Learning Outcomes	Immersive technologies, such as virtual reality (VR) and augmented reality (AR), have been found to improve learning outcomes by providing realistic and interactive learning environments. These technologies facilitate experiential learning, allowing users to explore concepts and scenarios in a hands-on manner. (Huang, W. H., & Chiu, C. Y. (2019).
Enhanced Customer Experience	In the context of tourism and entertainment, immersive experiences offer the potential to create unforgettable and personalized experiences for visitors (Kim, S. Y., Ko, E., & Lee, C. K. (2018). By immersing guests in captivating narratives and environments, attractions can differentiate themselves and attract a wider audience.
Increased Empathy and Perspective-taking	Immersive experiences have been shown to foster empathy and perspective-taking by allowing participants to step into the shoes of others. This has applications in various fields, including diversity training, social justice education, and healthcare. (Fox, J., Arena, D., & Bailenson, J. N. (2018).
Cost and Accessibility	Implementing immersive experiences can be costly, particularly when using advanced technologies such as VR and AR (Lee, J. H., Jeong, Y. S., & Kim, D. (2020). Additionally, accessibility issues, such as the need for specialized equipment or facilities, may limit the reach of immersive experiences to certain demographics.

Table 1: effect of technology on people

Immersive technologies are still evolving, and they may be subject to technical limitations such as hardware constraints, motion sickness, and graphical fidelity (Beilenson, J. N. (2018). Ensuring a seamless and comfortable user experience requires careful consideration of these factors. Immersive experiences raise ethical concerns related

to privacy, consent, and the portrayal of sensitive content (Tussyadiah, I. P., & Wang, D. (2016). Designers and developers must navigate these ethical dilemmas to ensure that immersive experiences adhere to ethical standards and do not harm participants. Integrating immersive experiences into existing systems and workflows can be challenging, particularly in organizations with established processes and technologies (Brigham, T. J., Biddle, R., Kennedy, A., & Chan, J. (2019).Resistance to change and the need for additional training may hinder adoption and implementation efforts.

3. METHODOLOGY

3.1) Description of Study Area

Lucknow, the City of Nawabs, boasts a captivating history that unfolds like a vibrant tapestry. From its contested origins to its emergence as a cultural gem, the city's past isrich with stories waiting to be explored.

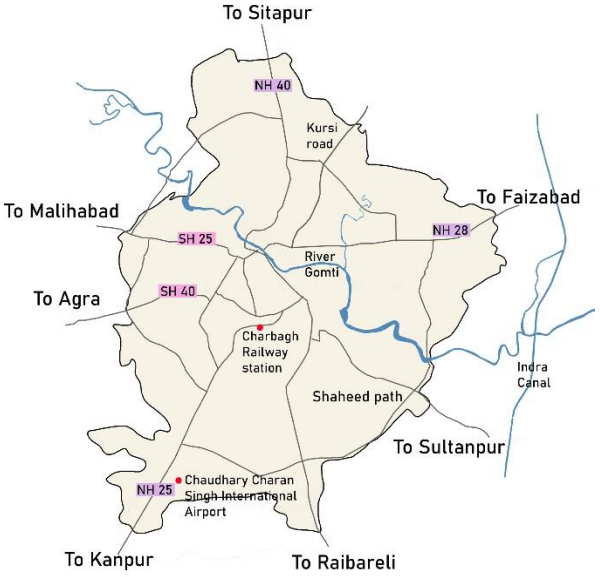


Image: Map of Lucknow, Source: Author

The best time to visit Lucknow is between October and March, when the weather is pleasant. Lucknow has a well-developed transportation system, including buses, taxis, and auto rickshaws. Hindi and Urdu are the most spoken languages in Lucknow, but English is also spoken by many people.

Several theories shroud Lucknow's origins in mystery. Some trace it back to the Ramayana, linking it to Lakshmana, Lord Rama's brother (Yadava, 2017). Another narrative credits a local chieftain, Lakhan Ahir, with establishing a fort that later evolved into the city (Singh, 2018). Archaeological finds suggest settlements in the area date back to 3000 BC, with the city's foundations potentially laid in the 13th century AD (Lucknow Cantonment Board, n.d.).

Image: Evolution of Lucknow, Source: Puneet, Ar &Ar, Sharma & Shree, Venu. (2011)

The 16th century witnessed a significant shift. The Mughal emperor Babur conquered Lucknow in 1528, and under Akbar's reign, itbecame part of the Oudh province (Begley, 1984).

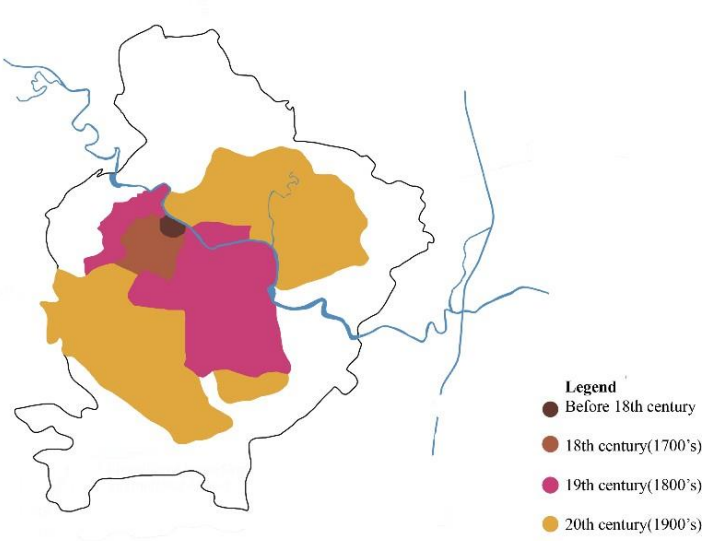


Image: Shift of capital to Lucknow, Sourcehttps://shorturl.at/umKy0

A pivotal moment arrived in 1775 when Asafal-Dawlah, the Nawab of Oudh, chose

Lucknow as his capital (Hasan, 2004). This ushered in the Nawabi era, a period synonymous with cultural and architectural brilliance.

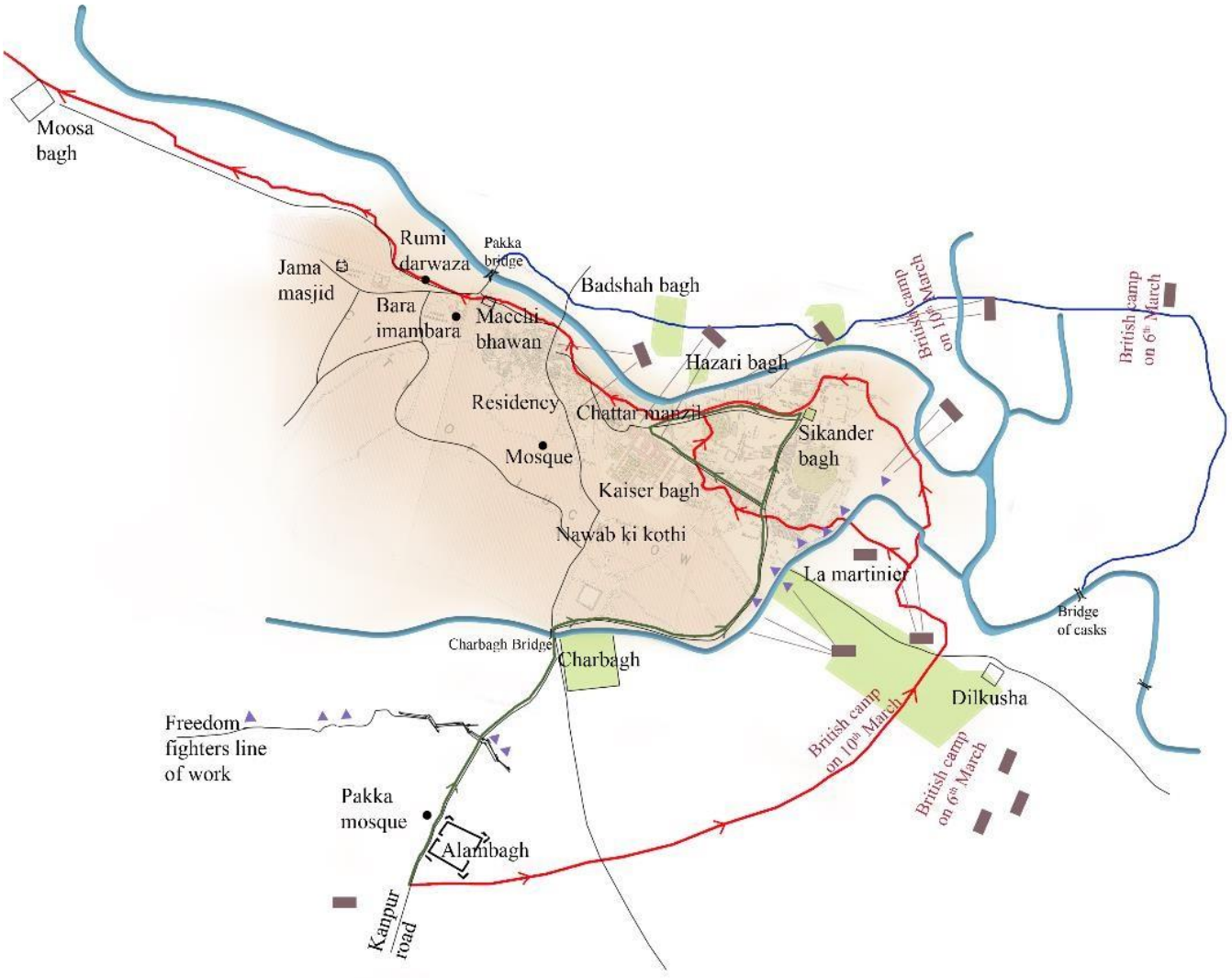
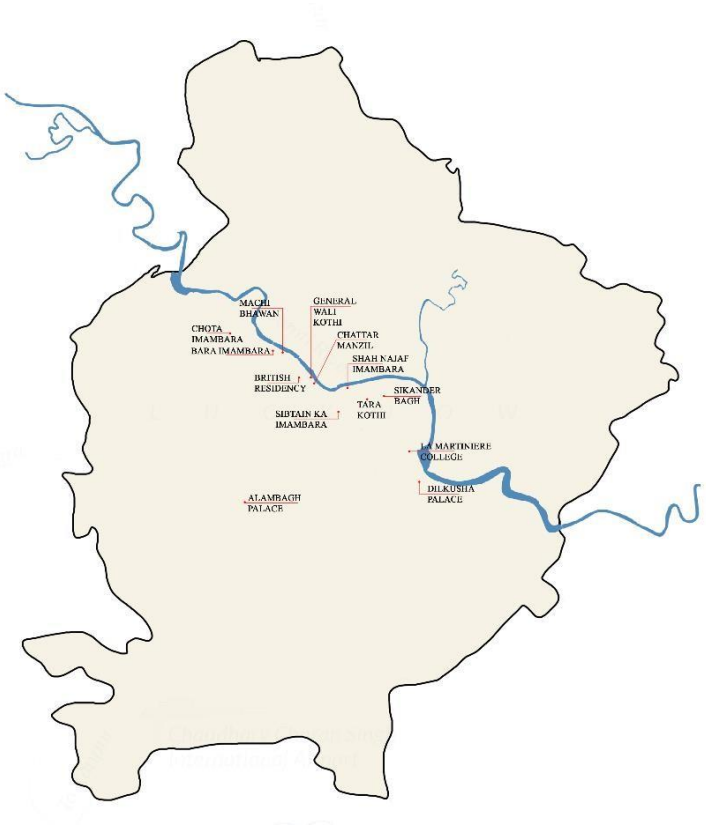


Image: Uprising in Lucknow Source: Author

The Nawabi period (1775-1857) stands out as a golden age in Lucknow's history. The city flourished as a center of refined etiquette, exquisite poetry, and delectable cuisine (Yadav, 2018). Shia Muslim culture flourished, with iconic structures like the Bara Imambara and the Chhota Imambara becoming symbols of this rich heritage (Hasan, 2004).

Image: Second relief of Lucknow Source:https://shorturl.at/5uncd

Lucknow played a defining role in the Indian Rebellion of 1857. The city actively resisted British rule, with the siege of the Residency emerging as a defining moment in the struggle for independence (Singh, 2016).



List of buildings:

BUILDINGS THAT SUFFERED DURING THE UPRISING OF 1857								
BUILDING	ALAMBAGH PALACE	DILKUSHA PALACE	TARA KOTHI	LA MARTINIERE COLLEGE	SHAH NAJAF IMAMBARA	QADAM RASSOL	SIBTAIN KA IMAMBARA	IMAMBARA HAZRAT ABBAS
USAGE	Begums palace building	Hunting Lodge	Observatory	College	Active religious building	Active religious building	Active religious building	Active religious building
CURRENT STATUS	Place in ruins and forgotten state for years until its recent conservation		Building is being used as headquarter for SBI	An active college building	An active religious building used for congregations and ceremonies by the community			

BUILDING	MACHI BHAWAN	CHATTAR MANZIL	GENERAL WALI KOTHI	BARA IMAMBARA	CHOTA IMAMBARA	SIKANDER BAGH	BRITISH RESIDENCY	QAISERBAGH PALACE
USAGE	Nawabs official residence	Nawabs official residence	Official residence for Commander of army	Active religious building	Active religious building	Memeorial gardens	British officer's official residence	Nawabs official residence
CURRENT STATUS	The building does not exist anymore	The building is vacant and in a desperate need of conservation	The building is reuses as a museum	An active religious building used for congregations and ceremonies by the community		Majority of the garden was destroyed and a small of the garden stands till date.	The complex is well preserved and is managed by ASI	Majority of the buildings in the complex doesn't exist anymore. The remaining buildings are being reused for various other purposes.

Following the rebellion's suppression, the British East India Company took complete control, and Lucknow remained under British dominion until India's independence in 1947 (Copland, 1958).Today, Lucknow is a bustling metropolis that thrives on its historical legacy.

The city retains its cultural vibrancy, renowned for its Chikan embroidery, mouthwatering kebabs, and lively festivals. From its contested origins to its emergence as a center of resistance, Lucknow's past offers a glimpse into the enduring spirit of a city that continues to captivate hearts.

Image: buildings marked on Lucknow mapSource: Author

sno	Building	Typology	Picture
1	Lucknow's Alambagh Palace, built in the 18th century, was a royal retreat for Nawabs. European and Mughal styles blend in its architecture, with intricate details and spacious interiors. Lush gardens complete the picture of opulence. The palace witnessed the 1857 Rebellion and later housed British officials. Now partly in	A Queens palace located in a dense neighbourhood	 *Figure: Alambagh Palace, source: author*
	ruins, restoration efforts aim to preserve this gem and turn it into a heritage site, showcasing Lucknow's rich past.		
2	Lucknow's Dilkusha Kothi, an 18th- century palace ruin, whispers of Nawabi grandeur. Built in contrasting English Baroque style, it served as a hunting lodge and summer retreat. The once-majestic structure featured patterned walls and a central doorway, but 1857 uprising left only towers and walls. Despite the ruins, the vast gardens hint at its former glory. Restoration efforts aim to preserve this piece of Lucknow's history, with the potential to transform it into an open-air heritage site, a testament to the city's past.	A hunting lodge used by nawabs presently in ruins. Located and placed in a cantonment area.	 *Figure: Alambagh Palace, source: author*

3	Lucknow's Sikander Bagh, once an 18th- century paradise garden, became a battleground in 1857. Lush canals and grand structures like the Baradari pavilion filled the 40-acre complex. But tranquillity turned to war as Indian rebels used it against the British. The brutal siege left heavy casualties, marking the gardens as a symbol of rebellion. Today, a memorial park remembers the sacrifices. Bullet- marked ruins stand as reminders, while restoration efforts aim to preserve this link to Lucknow's past.	A leisure/ memorialgarden	 *Figure: Sikander Bagh, source: author*
4	Lucknow's Farhat Baksh Kothi, an 18th- century gem, stashed amidst the city, boasts a unique past. Built by Claude Martin, it transitioned from his residence to a haven for Awadh court women. Unlike Lucknow's grand palaces, this Kothi offered an intimate charm. Mughal influences adorned its facade - intricate stucco work, floral motifs, and airy courtyards. Time hasn't been kind, leaving parts in ruin. Yet, remnants - carved doorways, balconies, and faded frescoes - whisper of its former glory. Restoration efforts aim to preserve this gem and potentially transform it into a heritage site,	A private residence (of a French man).	 *Figure: Kothi Farhat Baksh, source: author*
	showcasing the lives of Lucknow's royal women and the era's artistic brilliance.		

5	Lucknow's Chattar Manzil, or Umbrella Palace, graces the Gomti River. Built in the 18th century, it served as a Nawabi residence. This Indo-European-Nawabi gem blends architectural styles. Its name comes from the "chattris" - the glistening umbrella domes crowning the palace. Red sandstone and marble adorn the facade, while intricate details decorate the interior (though much is lost). The palace witnessed Nawabi grandeur and the 1857 Rebellion. Now undergoing restoration, the Chattar Manzil has the potential to become a vibrant heritage site, showcasing Lucknow's rich history.	The king's residence placed along ariver.	 *Figure: Chattar manzil, source: author*

3.2) Data Collection

The core theme of this paper is to examine the stimulus factors in the site of Lucknow having a connection with the first war of independence. A survey was floated amongst the experts to examine the technology under investigation in detail, thus presenting sufficient flexibility in addressing various dimensions of the research. This contained a brief overview about the place and the type of technology. Experts can choose from the various types of technology offered to them and show the best one that can be used.

3.3) Data analysis

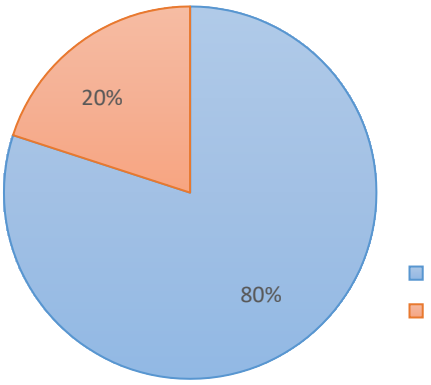
The interviews were conducted in English language. Thus, the obtained data were transcribed and documented according to the respondents. The obtained data was deeded into pie chart generators to create pie chart according to the responders. Efficacy and reliability were ensured by arranging and contrasting the results from all respondents. According to (Cobbinah & Aboagye, 2017), this process is useful in addressing gaps and inconsistencies that occur in the data analysis process.

4. *RESULTS AND DISCUSSION*

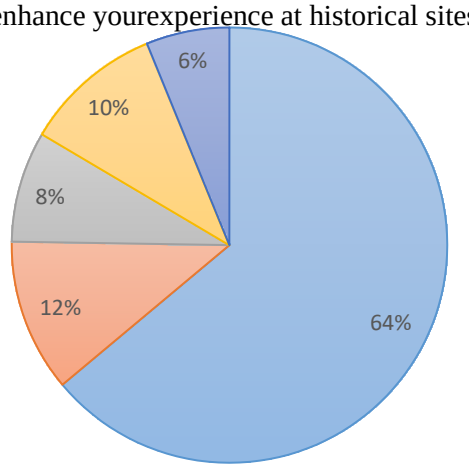
Survey involved 40 participants. The respondents were majorly people working in the field of conservation (mix of historians and conservational architect's).

A survey was floated to nearly around 65 people. Out of that 20%people don't know about the topic.

- Yes
- No



How interested are you in using technology to enhance yourexperience at historical sites



oVery interested
oSomewhat interested
oNeutral
oNot very interested
oNot interested at all

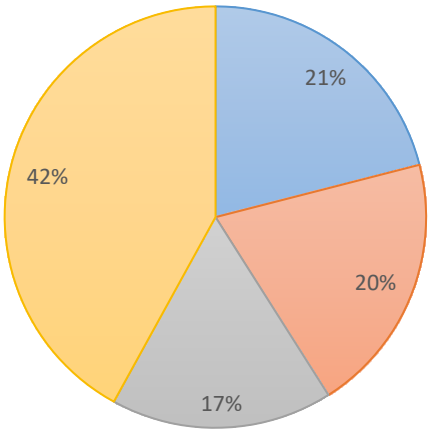
To create a truly immersive experience, which senses would you like the technology to engage? (Select all that apply)

o Sight (Visuals)

o Hearing (Soundscapes)

o Smell (Historical scents)

o Touch (Textures of objects or environment



COMPARATIVE CHART

Sno	Building	Technology									Result
		Virtual reality	Augment reality	Mixed Reality (MR)	360° Videos	Holographic Displays	Binaural Audio	Multisensory Experiences	Cave Automatic Virtual Environments	Haptic Feedback Suits	
1	Alambagh palace	3	1	7	6	7	4	4	5	0	For a built structure with majority of the building parts vandalised and lost. Recreating areas with technology are a best solution.
2	Dilkusha palace	3	3	3	6	8	7	6	4	0	A building that has a lot of messages and hidden secrets technology that can help to decode them addresses hearing can be effective.
3	Sikanderbagh	2	4	2	1	3	8	2	0	0	For a memorial garden that hold stories of victim's and bloodshed stories of the time audios are a best way to make tourist engage into history .
4	Farhatbaksh	7	6	6	7	5	7	7	8	0	A residence placed very close to the king's palace contains various stories and technologies needed in this place showcase life in these grand buildings.
5	Chattarmanzil	8	7.5	9	5	8	8	7	9	0	A king's palace can be incorporate with various technologies. This is because the place hold so much activities from the past that sticking on to only one technology won't do justice to the interpretation.

5. CONCLUSION

The landscape of heritage interpretation stands at a crossroads. Traditional methods, while valuable, struggle to compete for attention in a world saturated with digital distractions. Immersive technologies, however, offer a transformative approach, promising to rekindle visitor engagement and foster a deeper connection with the past. The case of the 1857 Uprising in Lucknow serves as a powerful example of how VR and AR can revolutionize heritage interpretation within historical precincts.

Beyond Static Displays: The Power of Spatial Immersion

Traditional interpretation methods often rely on static displays and text panels, presenting information in a passive and one-dimensional manner. Visitors may struggle to visualize historical events based on these displays, leading to a shallow understanding of the context and emotional impact of the past. Immersive experiences, however, transcend these limitations. VR simulations transport users into meticulously recreated historical environments, allowing them to virtually walk through battlegrounds, explore the interiors of buildings, and witness key moments from the uprising. This spatial immersion fosters a deeper understanding of the scale and layout of historical sites. Imagine standing on the virtual battlefield of Lucknow, experiencing the chaos and tension of the conflict firsthand. Such an experience allows visitors to connect with the events on a deeper level, fostering a sense of "being there" those traditional methods cannotreplicate.

Augmenting Reality, Enriching Exploration:

AR technology offers a complementary approach by overlaying historical information and narratives onto real-world locations. Imagine a visitor standing in Lucknow's present-day streets, holding a smartphone or tablet. An AR application could superimpose a virtual recreation of the city during the uprising onto the user's view, highlighting key buildings, battlegrounds, and routes taken by historical figures. This interactive approach allows visitors to explore the city at their own pace, uncovering layers of history hidden beneath the modern landscape. AR can be particularly valuable in urban environments where many original historical structures no longer exist. By superimposing virtual recreations, visitors can gain a more completepicture of the city's historical fabric.

Active Learning and Enhanced Knowledge Retention:

Immersive experiences go beyond simply presenting information; they actively engage users in the learning process. VR simulations can place visitors in the midst of historical events, allowing them to experience the sights, sounds, and even emotions associated with the 1857 Uprising. Imagine standing on a virtual battlefield, hearing the roar of cannons and musket fire, and witnessing the bravery of both the Indian sepoys and the British defenders. This visceral experience can create a lasting impression and significantly enhance knowledge retention compared to traditional methods of reading text panels or listening to audio guides.
Immersive experiences encourage active participation, prompting users to ask questions, make connections, and form their own interpretations of historical events. This deeper engagement leads to a more meaningful learning experience.

Accessibility and Democratizing Heritage:

Immersive technologies have the potential to democratize access to heritage interpretation. VR experiences can transport visitors from anywhere in the world to historical sites like Lucknow, overcoming geographical

limitations. This can be particularly beneficial for students, educators, and history enthusiasts who may not have the opportunity to travel to physical locations. Additionally, AR experiences can be developed to be accessible on a wider range of devices, such as smartphones and tablets, potentially reducing financial barriers to entry. By making heritage interpretation more accessible, immersive technologies can foster a broader understanding and appreciation of history.

Emotional Connection: Fostering Empathy and Understanding

One of the most powerful aspects of immersive experiences is their ability to foster emotional connection with historical events. VR simulations can place users in the shoes of historical figures, experiencing the sights, sounds, and emotions associated with the 1857 Uprising. Imagine feeling the tension and fear during the siege of the Residency, or witnessing the bravery of the sepoys fighting for independence. This emotional engagement can lead to a deeper understanding of the human cost and motivations behind the conflict. AR experiences can also evoke emotions by presenting personal stories and accounts of those who lived through the uprising. Imagine a visitor standing at a specific location, and through AR, they can hear a first-hand account of a battle or the daily life of a resident during that time. These personal narratives personalize history, allowing visitors to connect with the past on a human level.

The Road Ahead: Challenges and Considerations

While immersive technologies offer immense potential for heritage interpretation, challenges remain. Developing high-quality VR and AR experiences can be expensive, requiring expertise in 3D modeling, historical research, and user experience design. Collaboration between historians, educators, technologists, and heritage institutions is crucial to ensure the accuracy and effectiveness of these experiences.
Accessibility is another consideration. VR equipment might not be readily available to all visitors, and AR experiences need to be designed with inclusivity in mind, catering to users with disabilities. Furthermore, ethical considerations regarding

Annexure

Do you have any idea about immersive technology and ways it is implemented in heritage site?

- o Yes
- o No

How interested are you in using technology to enhance your experience at historical sites?

- o Very interested
- o Somewhat interested
- o Neutral
- o Not very interested
- o Not interested at all

To create a truly immersive experience, which senses would you like the technology to engage? (Select all that apply)

- o Sight (Visuals)
- o Hearing (Soundscapes)
- o Smell (Historical scents)
- o Touch (Textures of objects or environments)

Rate the options from a scale of 1-10 (0 being lowest and10 being highest)

Sno	**Building**	**Technology**								
		Virtual reality	Augment reality	Mixed Reality (MR)	360° Videos	Holographic Displays	Binaural Audio	Multi-sensory Experiences	Cave Automatic Virtual Environments	Haptic Feedback Suits
1	Alambagh palace									
2	Dilkusha palace									
3	Sikander Bagh									
4	Farhat baksh									
5	Chattar manzil									

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