

IMMERSIVE SERVICES GIVING LIBRARIES: A STUDY

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Abstract: Immersive Technology is working fabulously in defence, medical science, travel and tourism, real estate and games etc. so why not in the field of library? The answer is, rarely. Only a handful of libraries are using the Immersive Technology in the libraries. The investigator studied these handfuls of libraries and found out the possibilities to apply these services in other libraries. Most of the foreign libraries are giving the Immersive services. Immersive Technology is used in the form of virtual reality, augmented reality, mixed reality and haptic reality. After investigation, only two Indian libraries were found. In a foreign context, 04 libraries were studied. Virtual reality Tours, Maker Spaces, Digital sandbox, content in 360 degrees etc services are given by these libraries. The investigators investigated the hurdles to applying this technology in the Indian context.

Keywords: Immersive Technology, Immersive Services, Augmented Reality, Haptic Reality, Mixed Reality, Virtual Reality, VR Headset, Library Digital Sandbox

Introduction:

Immersive Technology is an emerging technology. It booms in all sectors basically medical, military, real estate, tourism, education etc. The person works in a virtual environment with virtual objects shutting down the real world. The person immerses themselves in that virtual environment. Nowadays day libraries are also adopting these services to enhance user satisfaction, enhance engaged learning with fun and update their high-tech tag. With this concept, the investigator took this topic to study. After investigation, the investigator has found many foreign libraries provide immersive services as compared to Indian libraries. For this study, the investigator has taken the four libraries for analysis. What are the devices, software, and Apps they are using, and through that what are the immersive services they offer to their user? This is the core research area of this paper.

Objectives: Following objectives are as follows.

1. To study the immersive services
2. To study the libraries which provide the immersive services
3. To study the technology in the field of reality\

Research Methodology:

The web-based research methods are used by the investigator. Nowadays all available equipment and services are mentioned on the library website. The investigator has studied library websites those who are giving immersive services

Literature Review:

According to **Indrashah Isa (2023)**“ AR, VR, and immersive technologies: The new mode of learning and the key enablers in enhancing library services” described the significance, and benefits of immersive services in the library, Challenges while implementing this technology in the library and strategies to overcome the challenges. with the help of the National Library Board (NLB), Singapore has conveyed the information to library professionals regarding effective, interactive and engaged library services those immersive services the National Library Board has given in their libraries.

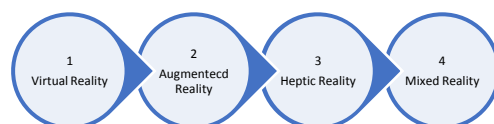
According to **Younghee Noh(2022)**“ A Study on the Plan of Activation of Library by Utilizing the Virtual Reality and Augmented Reality” described the core technology of AR and VR. With this the investigator studied this technology according to subject area e.g. area of entertainment, area of education, area of medical science, they also investigated foreign and domestic library application of immersive technology.

Immersive Technology:

A newly invented technology called immersion technology uses 360-degree environments to expand reality or create a new reality experience. Users of immersive technology can move the screen to look in any direction and see the content since it makes use of the 360 space/sphere. Some forms of immersive technology add to the experience of the user by superimposing digital visuals over their surroundings. Some isolate users entirely from the outside world and submerge them in a virtual world, creating a new reality. Mixed Reality, Haptic Reality, Augmented Reality, and Virtual Reality A few instances of immersive technology are these.

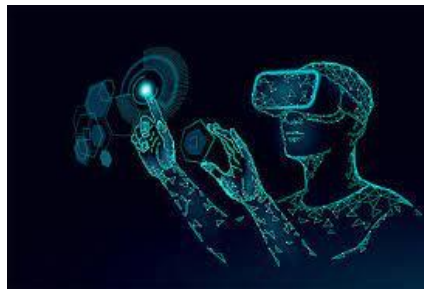
4.2 Types of Immersive Technology :

There are four types of immersive Technology are as following.



4.2.1 Virtual Reality:

Virtual reality is a simulated 3D environment. It allows you to see and touch a virtual object in a virtual environment. Your senses sense it. The environment is created by computer hardware and software. You need to put on a helmet or goggles to see and interact with the environment. Users are more likely to suspend disbelief and think a VR experience is real even if it's fantastic. The more fully you can immerse yourself in the experience and block out your physical environment, the better. Virtual Tour in 360 degree is an example of a VR.



4.2.2 Augmented Reality:

Digital visuals, sounds, and other sensory stimuli are blended with holographic technology to produce a more realistic, interactive representation of the outside world. Augmented reality (AR) is the combination of the digital and real worlds, real-time interaction, and accurate 3D object detection. Augmented reality offers a highly efficient means of producing, selecting, and distributing palatable instructions by overlaying digital content over real-world work environments.



4.2.3 Haptic Reality:

A user can simulate the sensation of touch with haptic technology by being subjected to forces, vibrations, or motions. These technologies have the potential to improve remote control of machines and devices (telerobotic), construct virtual objects in computer simulations, and control virtual objects. Tactile sensors that measure the user's forces on the interface may be included in haptic devices. "Tactile, pertaining to the sense of touch" is the definition of the word "haptic," which comes from the Greek (haptikos). Simple haptic devices are frequently seen in the form of joysticks, steering wheels, and game controllers.



4.2.3 Mixed Reality:

Augmented reality (AR) and virtual reality (VR) are combined to create mixed reality (MR). Mixed reality experiences are becoming more and more possible in the gaming world thanks to headgear like the Microsoft HoloLens. The cameras in these head-mounted displays continuously map the wearer's surroundings. Characters in games designed for these gadgets are able to move around the real world and even take a seat on your couch.

Role of Immersive Services in Libraries :

Immersive experiences are a key element of immersive services. They are specially designed to engage the user's senses of touch, and smell, creating a sense of presence and engagement that goes beyond traditional learning methods. For example, a library might offer a VR tour of a historical place and museum, allowing users to "visit" the site, explore it immerse in it. That can be impossible with traditional resources.

Immersive experiences can also be used to enhance traditional library services. For example, a library might use augmented reality (AR) to bring a book to life, allowing users to interact with the characters and set them in an innovative and exciting way. This not only makes the reading experience more engaging but also helps to develop a deeper understanding of the core content.

4. Libraries with Immersive Services:

Immersive services are designed to engage and immerse the users in a comprehensive, interactive way. In the context of libraries, this could mean anything from virtual reality (VR) tours of historical sites to interactive digital exhibits. The goal is to create an environment where users can fully engage with the content, rather than simply consuming it passively. Many libraries across the globe are giving immersive services to their patron. The investigator is going to study these libraries.

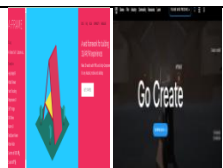
5.1 Indian Libraries:




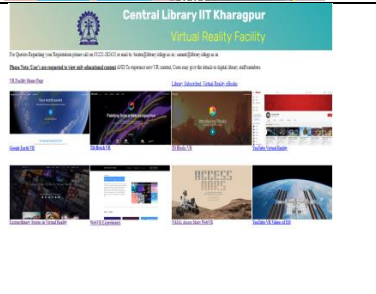

After online investigation, the investigator has found very few Indian libraries those are giving the immersive services are as followed.

4.1.1 Central Library, IIT Kharagpur

[:https://library.iitkgp.ac.in/pages/con/imlib/index.html](https://library.iitkgp.ac.in/pages/con/imlib/index.html)

The Central Library of IIT Kharagpur is one of the largest specialized libraries in Asia. It caters to the understudies of students, and postgraduates, inquiries about researchers, staff individuals and staff individuals of the different offices, centres, schools and inquiry Centres. It has created a full-fledged Advanced Library with different types of gear. It gives the immersive administration beneath the umbrella of a highly Technical Library.

Sr No	Immersive Services	Utilization	Screen print
1.	Test AR/VR Coding	Under this tap three AR and VR developing Software's link has given. The Faculty, Researcher and Students can design and develop Augmented reality (AR) as well as Virtual reality	

		(VR) Contents using following web tools such as- <u>A-Frame,Unity Tool kits,VuForia</u>	
2.	AR/VR Content Web Portal	Under this tap the faculty and researcher can upload their content on web portal repository and connect with VR device and publish it	
3.	Explore 360° Photo / Video Content Portal	Immerse yourself in a Central Library walk with Spin Panorama and turn it into an immersive virtual tour with realistic 360-degree views.	
4.	VR and AR Academic Content App	Many academic AR/VR content apps are available on paid based and free of cost. The central library is given the link of those apps under the Virtual Reality Facility. The list of apps has given below. Some apps are open access app and some apps are subscribed by the Library	
5.	VR Device	The Central Library has the VR Headset Facility. The Oculus Go VR headset user can book to access the VR Contents	

• **VR and AR Academic Content App:**

 **Central Library IIT Kharagpur**
The List of Apps and VR Contents Available

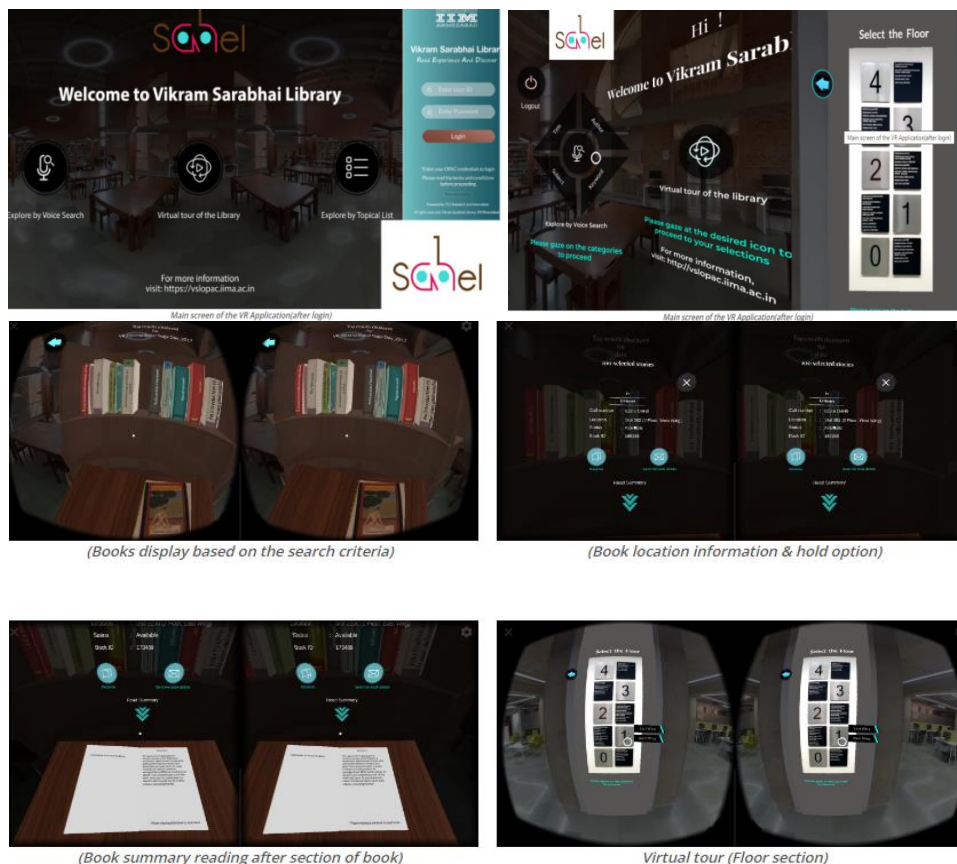
Sl No	Title of the App / VR Content	App Details	Genre	Steps to View
1	The Body VR	Virtual reality of Blood Cell of Human body	Educational App	Click on Navigation -> Library -> Then Execute App
2	Doctum Our Star System	Shows our solar System	Educational App	---- Do ----
3	Plant Cell	Shows details of Plant Cell	Educational App	---- Do ----
4	ML Chemistry	Virtual Lab Experiments with chemical particles	Educational App	---- Do ----
5	Guided Meditation VR	Meditation Virtual Reality	Meditation & Relax	---- Do ----
6	Solas VR	Meditation Virtual Reality	Meditation & Relax	---- Do ----
7	Flow VR App	Meditation Virtual Reality	Meditation & Relax	---- Do ----
8	Browser	For Web Browsing	Browsing Website	Click on Navigation -> Browser -> Then Type Website URL
9	Browse Google Arts and culture	Learn Arts and Culture	Educational Website	---- Do ----
10	Browse NASA Mars expedition	Learn about Planet Mars	Educational Website	---- Do ----
11	Wonders of the World	Play the fun game in VR	Fun Games	Click on Navigation -> Library -> Then Execute App
12	Within App	Experience various VR showcases by Within App	VR Showcase	---- Do ----
13	Oculus TV	View a TV Show	Entertainment	---- Do ----
14	YouTube VR	View YouTube 360 or VR Video	Entertainment	---- Do ----
15	Oculus Video	View Oculus VR Video	Video Show	---- Do ----

Above mentioned all app and VR Contents are available in IIT Kharagpur Library. In which some are subscribed and some are open access. All are linked IIT Kharagpur Central Library Website.



4.1.2 Vikram Sarabhai Library, IIMA: <https://library.iima.ac.in/service/virtual-reality--vr--app.html>

Vikram Sarabhai Library offers VR services with the Sahel app. Sahel is a virtual reality (VR) application. It is jointly developed and maintained by TCS Entrepreneurship Junction Labs and Vikram Sarabhai Library, IIM, Ahmednagar. By incorporating virtual reality (VR), libraries can provide access to the latest technologies and create unique learning experiences for their users. This app is protected by the user ID and password. The virtual tour of the library is provided by the floor provided by this app. OPAC (Online public access catalogue) can be accessed by this app. Voice search, Book Display, Book location information with hold option, Book summary Reading after section of book.

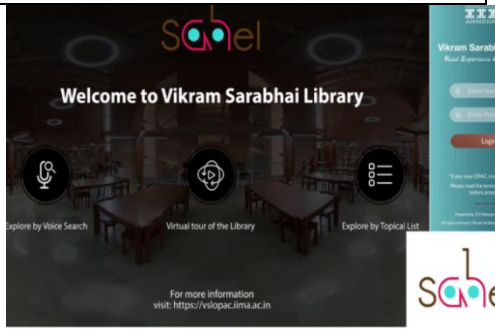


(Books display based on the search criteria)

(Book location information & hold option)

(Book summary reading after section of book)

Virtual tour (Floor section)

Sr No	Immersive Services	Utilization	Screenprint
1	Sahel is a Virtual Reality (VR) App.	Sahel is jointly developed and maintained by TCS Entrepreneurship Junction Labs and Vikram Sarabhai Library, IIM, Ahmednagar. By incorporating virtual reality (VR), libraries can provide access to the latest technologies and create unique learning experiences for their users.	
2	VR Tour in 360 degree	Virtually Vikram Sarabhai Library can be seen in 360 degree. https://www.iima.ac.in/the-institute/about-iima/virtual-tour	

5.2 International Libraries :

5.2.1 Toronto Metropolitan University Library

(Canada):<https://library.torontomu.ca/services/facilities/immersion/>

Toronto Metropolitan University Library is a very high-tech library in the world. It is located, in Toronto, Canada. It gives ample immersive services to their patron. The technology pulls users towards the library for engaged and immersive learning. The library has given the following immersive services.

5.2.1.1 Immersive studio:

Immersion Studio is an immersive projection space located in the TMU Library, and it is similar to themaker space for faculty and students to generate projects tailored to collaborative virtual reality (VR), shared immersive media experiences. The Unity or Unreal Software can be used in the immersive studio.

Features of studio:

- A complete 360° projection cylinder with a diameter of 6 meters and a height of 2.3 meters, which uses 5 ceiling-mounted projectors to combine images to create a seamless 360° image.
- Immersion Studio does not require a head-mounted device to view 360 or VR content, making it a more attractive option for 360 contents.
- especially for shared or collaborative VR experiences. The space is also equipped with two HTC Vive base stations for VR controls, a Microsoft Kinect V2 sensor for body controls, and a 5.1 surround speaker system for surround sound in addition to spatial audio.

- d. Various seating configurations are available, which can fit 12 people comfortably when seated on a chair, or 20 people when sitting on the ground.

5.2.1.2 Immersion Studio Layout:

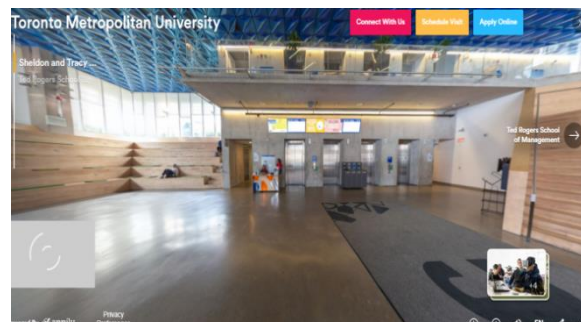
The layout of the Immersion Studio can be seen like below. The chairs are optional and can be added later if requested.



Devices Used : HTC Vive, Microsoft Kinect V2

VR Tour: <https://youvis.it/EgDd7D>

Software used Appily



Subject Areas to use in Immersion Studio?

The 360/panoramic photos, 360 videos, spatial audio, and 3D immersive experiences are the most frequent types of content used in the Immersion Studio. The list of prospective study topics that could benefit from the Immersion Studio is provided below, along with examples of use cases for each subject.

- Tourism and Hospitality (360-degree video tours)
- VR simulations in psychology
- Documentary Journalism (360-degree video)
- Digital, new, and media production (360-degree video, 3D settings)
- Virtual space design (interior design)
- Architecture (VR simulation 3D model)
- VR experience game design

5.2.2 ORU MCKEAN Library: <https://oru.libguides.com/avr>

The J.D. Mckean Library is situated in Oral Roberts University, United States. It is cutting edge technical library. It provides the immersive library services to their patron.

5.2.2.1 Immersive Services:

The J.D. Mckean Library is very advanced in immersive services. It made some activity station to give the immersive services in a very effective way. E.g. virtual Reality Activity Station, Digital Sandbox, and Global Learning Centre.

The VR services given by OUR Mckean library by the following activity Station.

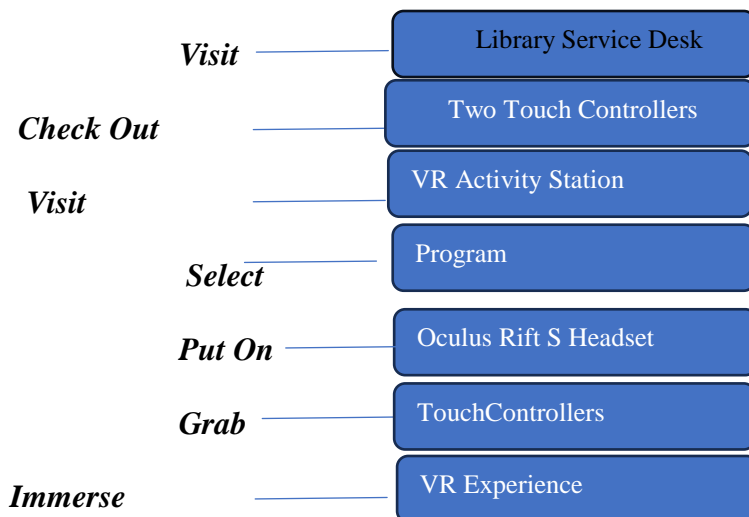
5.2.2.2 Virtual Reality (VR) Activity Station I

It is located in LRC-4. floor, Library Information Commons (LINC). The VR Activity Station offers a variety of experiences, e.g. Opens in a new Window Lone Echo, a VR adventure game on a space station orbiting Saturn, and Abode 2, a VR escape room puzzle, etc. The VR activity station is well-equipped with a variety of headsets and equipment.

Equipments:

- Oculus Rift S VR system with Headset and Touch Controllers
- VR Computer
- Steam Content Library
- Oculus Rift S

Steps to access the VR Activity Station



5.2.2.3 Library Digital Sandbox :

Digital Sandbox (DS) is a learning platform that participates in the world of software and hardware. It is powered by a microcontroller that can communicate with real inputs (such as light or temperature sensors) while controlling LEDs, motors and other outputs. It has

devices that provide users with a variety of immersive learning experiences. The appointment is not necessary. Help is available from the library's service desk.

Location: LRC 4th floor, LINC

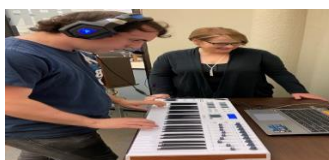
Steps to use Digital Sandbox:

1. Visit the library service counter.
2. Check out the VR controllers and room key for the Digital Sandbox using student ID. (Until you check in the room key and controllers, the student ID will be retained.) The VR1 or VR2 controllers will be provided to you. Use the VR station (VR1 or VR2) in the Digital Sandbox that corresponds to the controllers you received at the desk.
3. Upon completion, return the controllers and room key and obtain your student ID.



5.2.2.4 Music Workstation:

The Music Workstation is located in the Library's Digital Sandbox, LRC, 4th Floor LINC. This is the Arturia KeyLab Essential 49 MIDI keyboard controller (see video). Laptop, and headphones are essential. Ableton Live 10 software sequencer and digital audio workstation (DAW) that offers users five software instruments, 34 sound effects and eight MIDI effects. The finale music notation software for capturing inspiration and creating music. Printers are available.



This well-equipped and easy-to-use workstation allows many ORU musicians not enrolled in the music department to learn the basics of digital composition and recording. Users can create, edit, listen and share music.

To Use: Check out the Digital Sandbox room key at the Library Service desk.

5.2.2.5 ZSpace :

It is available in Library Digital Sandbox, LRC, 4th floor, LINC. The ORU Mckaen library provides the zSpace laptop to the patron. It provides a unique, personalized experience that eliminates the barrier between the user and content by combining elements of augmented reality (AR) and virtual reality (VR) in one platform that permits the user to explore and create lifelike experiences. It is not required a head-mounted display. Users experience 3D content through a 3D computer screen, aided by head-tracking technology and a stylus.



5.2.2.6 Augmented and Virtual Reality Room (AVR Room):

Location:

A room to the right of the new book display on LRC-4th floor. It is dedicated to current or retired ORU faculty and students using academic VR software such as 3D Organon VR and TiltBrush. Faculty and AVR space are available during library hours, including evenings and weekends. It comes with one HTC Vive VR Drive, Alienware Gaming PC, HTC Vive Headset with Deluxe Soundtrack, Steam Content Library, Zoom, Kaltura, Adobe Creative Suite and more. Students can also use it.

5.2.2.7 Augmented & Virtual Reality (AVR): 3D VR Videos

The library provides the 3D VR videos in AVR Room it look like 3D movies. It required some hardwares to immerse with the content.e.g. Sharkk VR goggles, cellphone, Homido Mini VR Glasses, Google Cardboard VR goggles.The patron can cheak out these things.



Sharkk 3D VR Goggles



Homido Mini VR Glasses

5.2.2.8 Virtual Tour:

The ORU MCKEAN Library has made the virtual reality tour in 360 Degree. Through this the patron virtually visits each section of library. Virtual Tour Link : <https://oru.edu/virtual-tour/index.php>



5.2.2.9 Augmented & Virtual Reality (AVR): 3D Graphics/Simulations 3D Graphics, Models and Software:

3D visualizations are 3D graphics and simulations that add depth of dimension and enable the viewer to interact, rotate, and view 3D displays in multiple perspectives. No VR headset is required.

Following programs are available in the Faculty & AVR Room:

Sr No	Applications	Utilization
1	BioDigital Human	Explore the Human - a free app that visualizes anatomy, disease and treatment with dynamic interactive 3D graphics and simulations.
2	MakerBot Print	A free software to discover, prepare, and manage and share 3D prints. (For use with the Library's 3D printer.)
3	Maya 3D Animation Software	Enables creation of professional 3D cinematic animations.
4	Maya Suite	3D modeling program.
5	Mudbox 3D Sculpting Software	a digital sculpting and texture painting software for 3D
6	Sketchfab	"Publish & find 3D models online" - A free app with ~3 million models to experience in AVR with iPhone 7 and up and androids.
7	Sketchup	Free software to create 3D models of buildings or any structure, such as sports facilities. (Tubidyapp - mobile and pc for Sketchup files)
8	3D Warehouse	Millions of free pre-made 3D models to download and use in SketchUp. Search, sort and filter models, collections, or both. Share and download your SketchUp 3D models for architecture, design, construction, and fun.
9	Google Earth and VR	You can fly over a city, stand at the top of the highest peaks, and even soar into space. You can reach any place and move it by 360 degrees.
10	Youtube Virtual Reality	With the YouTube VR app, you can easily find and watch 360-degree videos and VR content on your headsets and devices.
360 Videos :		
Sr No	360 Videos	Utilization
1	Amarna: 3D	Virtual recreation of the main city complex of the ancient Egyptian city of Akhetaten, presently known as Tel el Amarna.
2	Autism 360°	View a list of 360° videos that give you a look through the eyes and challenges of a person with autism.



3	Elephant Encounter in 360	National Geographic Video
4	Solo 360	National Geographic Video, Climb Yosemite El Capitan with Alex Hannold
5	Museum of the Bible	Take a 360 virtual tour of D.C.'s Museum of the Bible.
6	The Octagon Project	360 videos are included in the free interactive eBook, The Octagon Tour, available at OctagonProject.org. The ebook "gives readers complete tours through all Biblical sites related to the life of Jesus,

VR Rooms and Software and their Experiences :

Sr. No	VR Rooms	Experiences
1	Global Learning Center (GLC)	offers various Immersive Learning technologies using special virtual reality rooms and devices provide students with an "unparalleled learning experience.
2	EON Icube	Located in GLC VR room 303, the Icube is an immersive virtual reality experience for up to four people. It includes Apache Helicopter, Condo, Castle Square, Christmas, Sleigh Experience, Discovery World (WI City), Dolphins, Anatomy of the Eye, Heart, Solar System, etc.
3	EON Icatcher 3D and Virtual Display	EON Icatcher software is an "immersive display and 3D interactive authoring software." It includes following Immersive experiences include: <ul style="list-style-type: none"> • City explosion • Chinese village • Eye Sim Opthamology VR -A an in-depth look at the eye and a simulated eye exam provides students with classroom practice. • ISS explodes • Jerusalem Tour • Jet Engine

Comparative Study of Libraries :

Sr. No	National /International	Libraries	VR Tour	Self-Developed App	Subscribe d App	Free App	VR Lab	Headset
1	National	Central Library, IIT Kharagpur	✗	✗	✓	✓	✗	✓
2	National	Vikram Sarabhai Library, IIM A	✓	✓	Self Developed app	✗	✓	✓



3	International	Toronto Metropolitan University Library	✓	✗	✓	✓	✓	✓
4	International	ORU MCKEAN Library	✓	N.A	✓	✓	✓	✓

Conclusion:

The investigator investigated four libraries in this study. After investigation she found followings facts and findings.

1. Foreign libraries are so high-tech in immersive services and technologies.
2. Only IIM and IIT libraries are aware and apply this technology in their libraries.
3. Only three libraries have created the VR Tour of Library
4. All Libraries have subscribed VR Apps
5. All libraries have headsets
6. Only three libraries have the VR labs to give immersive services.
7. The Vikram Sarabhai Library, IIMA, India has developed their own VR app.
8. ORU MCKEAN Library is very much high tech in immersive sector.

Limitations :

Immersive Technology is 21st Century emerging technology. It is need of hour to engaged and effective learning but its application is the challenge for libraries.

1. Headsets, Apps and Software are so costly. Small libraries cannot afford it
2. Lack of technical and skilled staff

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