FUTURE OF SHOPPING WITH METAVERSE

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Abstract—*The use of metaverse shopping applications has the potential to enhance the customer experience and drive increased sales and customer satisfaction. A metaverse shopping application is a 3D program that allows users to browse and purchase products in a virtual world. These applications can be created using technologies such as Mozilla Hubs, Three.js, and A-Frame, which offer powerful tools for creating immersive and interactive shopping experiences. The concept of a metaverse has been popularized in science fiction literature and has been used to describe a collective virtual shared space, created by the convergence of virtually enhanced physical reality and physically persistent virtual space, including the sum of all virtual worlds, augmented realities, and the internet. These technologies can be used to create virtual storefronts, animate and interact with products, and integrate e-commerce systems for making purchases within the virtual environment. This research paper aims to explore the possibility of online shopping using a metaverse shopping application, a collective virtual shared space where users can interact with each other and with virtual objects and environments.*

Keywords— Metaverse, Augmented Reality/Virtual Reality, 3 Dimensional modeling, online shopping, virtual environment, Non Fungible Tokens, Blockchain, ecommerce platform

I. INTRODUCTION

The term "metaverse" refers to the shared virtual space created by the convergence of virtual augmented physical reality and physically persistent virtual space, including the sum of all virtual worlds, augmented reality, and the Internet. The concept of the Metaverse has become commonplace in science fiction literature and refers to the convergence of virtually augmented physical reality and physically persistent virtual space, including all virtual worlds, augmented reality, and the sum of augmented reality. is used to describe the collective virtual shared space created by and the internet. The term was coined by science fiction writer Neal Stephenson in his 1992 novel Snow Crash. In the context of virtual reality, the metaverse is often used to represent a shared virtual space that users can access and interact with in real time using their avatars or digital representations. This space can be used for a variety of purposes including socializing, entertaining, teaching, and working. The metaverse is sometimes called a "virtual world," "virtual reality," or "virtual space." The concept of the metaverse has received a great deal of attention in recent years due to rapid technological advances and the growing popularity of virtual and augmented reality. Many companies and organizations are exploring the potential of the Metaverse as a platform for new forms of communication, collaboration, and entertainment, and are investing in research and development to expand the possibilities of virtual and augmented reality technologies.

A blockchain is a decentralized decentralized database that maintains an ever-growing list of records called blocks. Each block contains a timestamp and a link to the previous block, forming a chain of blocks. The database is managed by a peer-to-peer network that collectively adheres to protocols for validating new blocks. Once recorded, the data in a block cannot be retroactively changed without changing all subsequent blocks and obtaining approval from the network. This makes it a safe and transparent way to store and transfer data and ensures that data stored on the blockchain is tamper-proof. The first and most famous application of blockchain technology is the cryptocurrency Bitcoin, created in 2009.

However, the possible uses of blockchain technology extend far beyond cryptocurrencies and financial transactions. Other potential applications include supply he chain management, voting systems, and the creation of virtual worlds and avatars in the metaverse. Blockchain technology is based on the use of cryptography to secure transactions and verify the authenticity of data. It relies on a decentralized network of computers rather than a central authority to maintain

the integrity of data stored on the blockchain. This decentralized structure makes it difficult for individuals or groups to manipulate data on the blockchain and ensures that the information stored on the blockchain is accurate and up-to-date.

A non-fungible token (NFT) is a type of digital asset that represents ownership of a unique item or asset. NFTs are unique in that they are stored on the blockchain and are not 1:1 exchangeable with other tokens or assets. This is in contrast to "fungible" tokens, such as cash or cryptocurrencies, which can be exchanged one-for-one with other tokens of the same type. NFTs are commonly used to represent ownership of digital art, collectibles, and other virtual items. It can also be used to represent physical assets such as real estate or rare collectibles. NFT uniqueness is verified on the blockchain, providing a permanent record of ownership and authenticity. NFTs have gained a lot of attention in recent years as they are used to sell digital art and collectibles for large sums of money. They are also used in various other applications such as creating virtual properties and representing in-game items in online games. The use of NFTs has the potential to revolutionize the way digital and physical assets are bought and sold, creating new opportunities for creators to monetize their work.

II. Related Work

Janna Anderson and Lee Rainie in their research [8] discuss the potential future of the metaverse as a virtual world where users can interact in real-time. The research explores the potential impact of the metaverse on various industries and society as a whole. It suggests that the metaverse has the potential to revolutionize these industries and provide benefits such as enhanced social interactions, improved education, and increased accessibility. However, it also highlights the potential negative impacts such as addiction and breakdown of social cohesion.

Overall, the paper suggests that the metaverse has the potential to be a major computing platform in the future and will likely have a significant impact on society and various industries.

Vitalik Buterin[9] introduces Ethereum, a decentralized platform for smart contracts built on blockchain technology. It allows developers to create and deploy decentralized applications (DApps) on a global, decentralized network. Ethereum is designed to be more general-purpose than Bitcoin and features smart contracts, and self-executing agreements that automate business processes and reduce intermediaries, making transactions faster and more efficient. The paper presents Ethereum as a decentralized platform for building and running DApps and smart contracts, enabling new forms of collaboration and value creation

Another author explains[10] that Non-fungible tokens (NFTs) are unique digital assets that cannot be exchanged like-for-like, making them ideal for use in fields such as virtual events, digital collectibles, play-to-earn games, and metaverses. Focuses specifically on the gaming industry, including play-to-earn games and metaverses, which are immersive and shared virtual worlds that allow users to engage in various activities and trade items using their own economy and currencies.The authors use a combination of traditional financial analysis and network analysis to study the play-to-earn and metaverse token market, finding that it exhibits high volatility and strong correlations between different tokens. They also find that the market is influenced by both external factors, such as the overall cryptocurrency market, and internal factors specific to the gaming industry.

Sir Burke discusses the potential of virtual shopping, also known as online shopping, and its potential to revolutionize the retail industry[7]. He explores the benefits of virtual shopping for both consumers and retailers, including convenience, lower costs, and the ability to offer a wider range of products. Burke also discusses the challenges that virtual shopping poses, including issues of security and privacy, and the need for retailers to adapt their marketing strategies to the virtual environment. Overall, the paper presents a detailed analysis of the potential of virtual shopping and its impact on the retail industry.

Davis et al and Cagnina [2,6] examined the relationship between online store atmospherics (i.e., the sensory and psychological cues in an online shopping environment) and shopper responses. The authors developed a model to test this relationship and conducted a study to test their model using an online survey. The results of the study indicated that online store atmospherics had a significant impact on shopper responses, including affective responses (e.g., feelings of pleasure or arousal), behavioral intentions (e.g., intention to purchase), and actual purchasing behavior. The study also found that different types of online store atmospherics (e.g., visual, auditory, and tactile) had different effects on shopper responses. Overall, this study suggests that online retailers should consider the impact of online store atmospherics on shopper behavior and carefully design their online shopping environments to optimize the shopping experience for their customers.

The evolution of e-business models and the emergence of virtual worlds as a new platform for online business. The authors argue that virtual worlds offer unique opportunities for businesses to create immersive and interactive experiences for their customers and that they represent the next stage in the evolution of e-business.

The article also discusses the challenges and limitations of virtual worlds as a business platform, including security, privacy, and intellectual property issues. The authors conclude by discussing the potential future developments of virtual worlds as a platform for e-business and the potential impact on businesses and consumers.

From the study of available literature on Metaverse, blockchain, and NFTs, it has been concluded that a wide range of items, including virtual real estate, art, and collectibles, can be used in a metaverse, which is a virtual world where users can interact and engage with each other. The use of NFTs in a metaverse allows for the creation of unique, scarce, and tradable digital assets that can be used for various purposes, including shopping. Moreover, it has been identified that existing techniques or methods are not collaborative enough to provide a great experience and ease of use. This includes audio and video best practices for creating immersive and engaging shopping environments, as well as strategies for leveraging the unique features and capabilities of a metaverse to create a seamless and enjoyable shopping experience for users.

The introduction (section I) provides an overview of the main topic of the paper and introduces some of the key concepts or terms that will be discussed in the paper.

Section II discusses previous research in the field, including research on blockchain, NFTs, and the metaverse, and how it relates to the topic of shopping in the metaverse.

The process flow diagram (section III) likely outlines the steps or stages involved in the project or research described in the paper.

The implementation (section IV) likely describes how the project or research was carried out, including any methods or techniques used.

The results (section V) likely present the findings or outcomes of the project or research.

The references (section VI) likely list the sources cited in the paper, including any previous research or resources used.

III. Process Flow Diagrams

The overall approach is broadly divided into two models as

A. Collaborative ecommerce website as shown in Fig 1.1

B. Metaverse for businessmen as shown in Fig 1.2

Both of these models combined solve a lot of crucial problems which will be discussed in the further sections. The structure of these models are as follows.

Model A is how the various users will see our portal as. The platform is broadly divided into multiple categories which connect to a room, which contains all the products of that particular category, where users can talk, view each other and select an avatar while roaming around the room.

For example in Fig. 1.1, Rooms 1,2,3…n represent Electronics, Sports and Gym, …, Grocery respectively. The total number of rooms can be taken as n, where each n is a collection of 'm' products and the detail of each product.

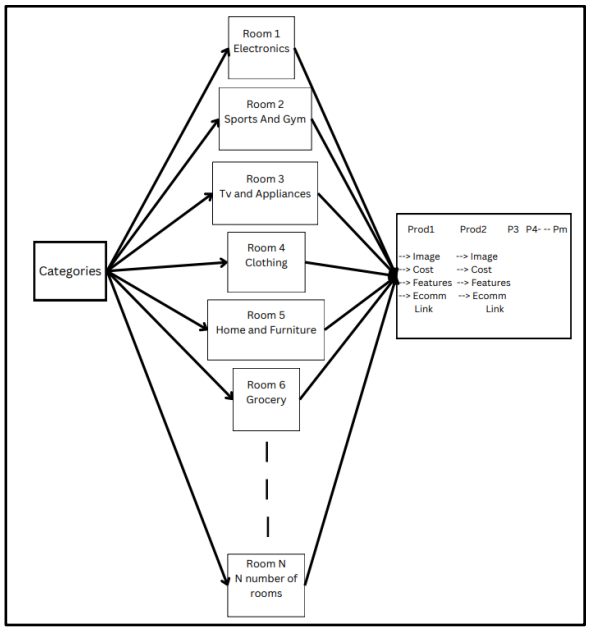

Fig. 1.1 Process flow for collaborative ecommerce platform

Model B explains how the portal will work for businessmen who want to buy a piece of land in our metaverse. They will be able to buy /purchase a land area with the help of smart contracts by connecting their e-wallet to the portal. Now that that area is theirs, they can customize it however they want with the help of a developer and can customize their shop in multiple possible ways. The process has been shown in Fig. 1.2, where each NFT represents a piece of land. The no. of NFTs can be taken as 'n' where each n has properties like position and measurements stored at the backend.

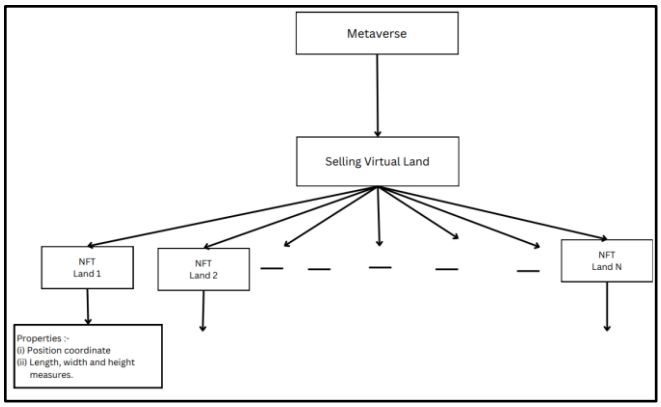

Fig 1.2 Process flow for Metaverse for businessmen

IV. Implementation

To implement collaborative ecommerce website - study aims to explore the potential use of the metaverse in the fields of virtual shopping and collaborative shopping. To do so, we developed a virtual reality (VR) simulation of a training scenario in a specific part of an already existing shopping web portal, flipkart online shopping website.

The simulation was developed using the library Three.js with javascript, Mozilla Hubs and Spoke. The simulation consisted of a series of actions and portals which were most intuitive in order for the elderly people to navigate through the shopping website instinctively. It is designed to be least intimidating. The tasks were designed to mimic real-world scenarios and were meant to cooperate with the users' knowledge and skills along with their instincts.

The mentioned simulation aims to develop a project-based learning to explore the potential of the metaverse as a platform for creating a collaborative online shopping experience, which the current portals clearly lack, an approach that emphasizes the improvement of the whole experience through the completion of authentic and meaningful virtual rooms created with the help of Mozilla Hubs Spoke. To conduct the study, we implemented a project-based learning approach in a virtual reality environment within the metaverse.

It has been tested with a diverse student population. A total of 20 users tested the demo, where the group included people from varying ages and backgrounds. The demo was designed to be interdisciplinary and focused on problem-based learning.

To implement metaverse for businessmen - a land was created and a smart contract, written in solidity, was developed on mix.ethereum.org to set up buildings and configure their properties, such as dimensions and position coordinates, on the land. The contract was then deployed on the Polygon Mumbai test network and connected to a portal, allowing the NFTs representing the land to be displayed in a metaverse and purchased by business owners who can mint them.

V. Result

The result analysis has been done by comparing the existing scenario to the proposed scenario with respect to few properties as shown in Table 1.1.

Table 1.1 Comparing existing and proposed scenario for model A

Domain	Existing Scenario	Proposed Scenario
User Preferences	poorly designed or difficult to navigate a cluttered or confusing layout can make it difficult for users to find what they are looking for and can contribute to this frustration.	Make shopping more interactive, appealing to younger consumers and providing a sense of community and social interaction.
Collaborative Environment	difficult for multiple people to shop together and make decisions about purchases in real-time.	real-world setting. Collaborative environments have the potential to enhance the future of online shopping by addressing all issues.
Differently abled Friendly	Offline shopping can be difficult for differently-abled individuals due to physical barriers, a lack of accessibility features, limited product selection, and social isolation.	in the future could provide accessibility features, convenience for individuals with mobility impairments or those in rural areas, socialization opportunities, and customization options.

The detailed discussion has been done in further section.

Inferences from the model A :

1. User preferences:

In current scenarios, poorly designed or difficult to navigate e-commerce websites can frustrate users and discourage purchases. This can be caused by a cluttered or confusing layout.

An e-commerce site with a cluttered or confusing layout can be difficult for users to navigate and find what they are looking for. This can lead to frustration and users leaving your site without making a purchase.

In future scenarios, the proposed interface can make shopping more interactive and enjoyable. This is especially appealing to younger consumers who are used to interactive and immersive experiences.

Many gamified shopping experiences include elements of competition and collaboration, so new user interfaces can provide a sense of community and social interaction. This could make shopping less isolated and more appealing to consumers.

Many gamified shopping experiences include tailored recommendations and offers based on consumer preferences and behavior, allowing platforms to provide a sense of personalized attention and customization.

2. Collaborative Environment:

In the current scenario, online shopping lacks a supportive environment in several respects

. It can be difficult for multiple people to shop together and make real-time purchasing decisions. In brick-and-mortar stores, it's easy for friends and family to discuss and decide together what to buy. However, in an online environment, this kind of conversation and collaboration can be more difficult.

Another reason online shopping lacks a collaborative environment is the lack of social interaction. When shopping in brick-and-mortar stores, it's common to have conversations with store clerks and other customers who can assist in decision-making and add a social element to the shopping experience.

In addition, online shopping lacks a collaborative environment as it is difficult to get a sense of how items will look or fit in the physical environment. There is a possibility. It's easy to try on clothes and see how furniture fits in a physical store, but not in an online environment. This allows people to make informed decisions and It can be difficult to collaborate with other users when making purchases.

Overall, online shopping offers many benefits in terms of convenience and efficiency, but may lack the collaborative and social elements of shopping in stores.

Collaborative environments have the potential to greatly improve the future of online shopping. Here are some potential benefits of a collaborative environment for future online shopping: Improved decision-making:

In a collaborative environment, shoppers make more informed purchasing decisions by sharing opinions and reviews, comparing prices and features, and seeking advice. I can. from others.

Enhanced Social Experience: Collaborative environments are more social by allowing users to browse and shop with friends and others, and receive recommendations and advice from others. Give your users an interactive shopping experience.

Increased accessibility: Collaborative environments make online shopping more accessible for people with disabilities and mobility issues, as people can shop from the comfort of their homes instead of going to a physical store.

Increased Convenience: Collaborative environments allow shoppers to shop anytime, anywhere, providing greater convenience than traditional brick-and-mortar stores. Personalized Recommendations: Collaborative environments allow online shopping platforms to collect data about shopper preferences and behavior and use that information to provide personalized recommendations to personalize the shopping experience. Adjustable.

Overall, collaborative environments shape the future of online shopping by improving decision-making, providing a more social and interactive shopping experience, improving accessibility, and providing more convenient and personalized recommendations. It has the potential to be greatly improved.

The result analysis for Model B has also been done by comparing the existing scenario to the proposed scenario with respect to few properties as shown in Table 1.2.

Table 1.2 Comparing existing and future scenario for model B

Domain	Existing Scenario	Proposed Scenario
Reach and ability to scale	Offline marketplaces have limited	Online marketplaces have a wider

	customer reach due to physical location.	customer reach due to internet accessibility.
Ability to customize or personalize the shopping experience	Do not offer the same level of customization or personalization as online marketplaces, which can make it more difficult for sellers to tailor their products to the specific needs and preferences of their customers.	Online marketplaces offer more customization options than offline, allowing sellers to better meet specific customer needs and preferences.
Ability to offer a wide range of payment options	Offline marketplaces are not very friendly regarding varied payment options.	An online metaverse shopping portal can include all the possible payment options.

The detailed discussion has been done in further section.

Inferences from the model B :

1. Reach and ability to scale

In the current scenario, one of the main limitations of offline marketplaces is that they are limited to the physical location of the marketplace. This means that sellers can only reach customers who are physically present at the market location.

This is in contrast to online marketplaces, which can be accessed from anywhere with an internet connection. This allows sellers to reach a much wider audience, expand their business, or reach new markets with ease.

2. Ability to customize or personalize the shopping experience

An offline marketplace is a physical location where sellers can sell their products and services directly to customers. It's a convenient and effective way for sellers to reach customers, but it can also have some limitations when it comes to customization and personalization compared to online marketplaces.

One of the main limitations of offline marketplaces is that they may not offer the same level of customization and personalization as online marketplaces. This can make it difficult for sellers to tailor their products and services to the specific needs and preferences of their customers.

For example, online marketplaces often offer sellers a wide range of customization. We can provide her options for your product. B. Different size, color or material. This allows sellers to better serve the specific needs and preferences of their customers. In contrast, offline marketplaces may offer fewer customization options, making it difficult for sellers to meet their customers' specific needs and preferences.

3. Ability to offer a wide range of payment options

One of the main limitations of offline marketplaces is that they cannot offer as many payment options as online marketplaces. This can limit seller flexibility and make it difficult to accommodate customer preferences.

For example, online marketplaces often allow sellers to offer a wide range of payment options, including: B. Credit cards, debit cards, e-wallets, mobile payments. This allows sellers to better meet their customers' specific payment preferences. In contrast, offline marketplaces may not offer as many payment options, limiting the flexibility of sellers and making it harder to accommodate customer preferences.

Additionally, online marketplaces often allow sellers to process payments more quickly and efficiently. This is more convenient for both sellers and customers. In contrast, offline marketplaces can require more time and effort to process payments, which can be an inconvenience for both sellers and customers. Marketplaces can be a convenient and effective way for sellers to reach customers, but they can limit a seller's flexibility and make it difficult to accommodate preferences when it comes to payment options. It also presents some challenges and limitations that it has. of their customers.

VI. Future Scope

The work discussed here can be incorporated with more collaborative shopping experiences into the metaverse and work towards customizable avatars and storing them with a user's ID. The NFT-based Virtual Space can be improved by creating profiles for sellers/businessmen and making the process of buying and selling virtual lands accessible to them. This section can also be worked upon by making it scalable, requiring a good world building around it and having an endless

scope of creativity. The collaborative shopping experience can be made better by focusing on finding a way to execute collaborations that is more suitable for scalability and can handle a large audience at once. The current method of creating rooms with Mozilla Hubs (Spoke) is seen as convenient but not ideal for scalability as it can't handle large audiences at once.

VII. Conclusion

The limitations of current online shopping experiences and the potential benefits of incorporating collaborative environments in the future of online shopping has been discussed in this work. The current online shopping experiences can be frustrating for users due to cluttered or confusing layouts and lack of social interactions. The proposed interface can make shopping more interactive and fun, providing a sense of community and social interaction, and a sense of personalized attention and customization. Collaborative environments in online shopping can improve decision-making by allowing shoppers to work together and share opinions and reviews, enhance social experience by providing more social and interactive shopping experience, increase accessibility for people with disabilities or mobility issues, provide greater convenience, and tailor the shopping experience to individual users through personalized recommendations. Overall, it has been inferred that collaborative environments have the potential to greatly enhance the future of online shopping.

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