

# VIRTUAL COMMERCE: THE NEW FRONTIER FOR ENTREPRENEURS

Gohar Khan, Zayed University

## ABSTRACT

*This conceptual paper delves into Virtual Commerce (v-commerce) as the new frontier for entrepreneurs, emphasizing its role in transforming the retail landscape. It introduces key virtual platforms like Decentraland, Second Life, and The Sandbox, where entrepreneurs can create, manage, and monetize digital assets in rapidly growing virtual economies fueled by blockchain and cryptocurrency. The paper provides a historical perspective, highlighting the evolution from e-commerce and social commerce to mobile commerce, setting the stage for v-commerce's emergence. It then explores how v-commerce is reshaping entrepreneurship by enabling innovative business models and immersive consumer experiences through technologies such as VR, AR, and AI. These advancements offer real-time customization, interactive engagement, and unique economic opportunities, bridging the gap between digital and physical commerce.*

**Keywords:** Virtual Commerce (v-commerce), Virtual Entrepreneurship, Immersive Retail, Blockchain Economies, Virtual Reality (VR) in Retail

## INTRODUCTION

The concepts of virtual worlds, virtual marketplaces, and virtual economies have significantly evolved alongside advancements in digital technology, with their origins stretching back to early online environments. These spaces have not only transformed how individuals interact, socialize, and engage in commerce but have also created dynamic economic ecosystems that continue to grow in size and complexity.

### Virtual Worlds

The definition of virtual worlds has undergone considerable change over the years, much like the virtual worlds themselves. One of the earliest definitions close to the modern concept comes from Klastrup (2003), who described a virtual world as a "persistent on-line representation that offers the possibility of synchronous interaction between users, and between the users and the world, in the frame of a space designed as navigable universe." This definition highlights the online, interactive, and immersive nature of virtual worlds, while also emphasizing their persistence—meaning they continue to exist and evolve even when users are not actively participating.

Around the same time, Bartle (2003) offered another definition, describing virtual worlds as environments where their inhabitants are "auto-contented," suggesting that users generate their own satisfaction and experiences within the world. Although these early definitions provided a foundation, they did not fully capture some of the key elements present in modern virtual worlds,

such as the immersive quality of presence and co-presence, which allows users to experience the illusion of being fully immersed in the world, as well as the social and collaborative nature of these environments.

Castronova (2006) expanded the concept by describing virtual worlds as "artistic spaces in the computer that have been designed to contain a large number of people," emphasizing the creative and populous nature of these environments. Spence (2008) defined them as "persistent, tridimensional, and not game-oriented spaces," while further noting that they are primarily social spaces, where interactions extend beyond mere gameplay into socialization and commerce. Oyarzun et al., (2011) further refines the understanding of virtual worlds by defining them as persistent, immersive environments designed to facilitate multi-user interactions in real-time through avatars. These digital environments allow users to experience presence and co-presence, interacting with both the environment and each other in a shared, persistent space. This definition underscores the role of virtual worlds in shaping virtual economies, as these environments provide the infrastructure for economic activities like trading virtual goods, real estate, and services. For example, platforms like Second Life and Decentraland allow users to engage in economic transactions using digital currencies, further integrating virtual economies into mainstream digital commerce.

By defining virtual worlds as spaces that persist over time and allow dynamic user interactions, Oyarzun and colleagues contribute to the foundational understanding of how these environments support both social and economic exchanges. This aligns with discussions on how virtual economies operate with characteristics closer to true market economies, driven by low transaction costs, real-time information, and flexible supply and demand systems. Virtual worlds today, such as Second Life, Decentraland, and The Sandbox, incorporate many of these elements, creating persistent, immersive environments where users can socialize, work, create, and trade. These virtual worlds are the backbone of the emerging virtual economy.

## Virtual Marketplaces

A virtual marketplace is a digital platform within a virtual world or online environment where users can buy, sell, and trade virtual goods and services. These marketplaces often mimic the dynamics of physical marketplaces but operate entirely in virtual spaces. Users in these marketplaces can interact with vendors, browse virtual products, and engage in transactions, all within a digitally immersive environment.

For example, Second Life—one of the earliest and most prominent virtual worlds—features a vibrant marketplace where users can buy and sell virtual clothing, accessories, and even real estate. Similarly, blockchain-based virtual platforms like Decentraland and The Sandbox have introduced decentralized virtual marketplaces where users can trade assets like virtual land, NFTs (Non-Fungible Tokens), and other digital assets using cryptocurrencies. These platforms are now at the forefront of v-commerce, enabling new forms of ownership and economic exchange.

In virtual marketplaces, the line between producers and consumers often blurs, with users creating, customizing, and monetizing their digital creations. This user-generated economy is a hallmark of virtual worlds and represents a significant departure from traditional marketplaces.

## Virtual Economies

A virtual economy refers to the economic systems that operate within virtual worlds, where users engage in the buying, selling, and trading of virtual goods and services. These economies mirror real-world economic activities but are confined to digital platforms. Virtual economies are often driven by the principles of supply and demand, but unlike physical economies, they operate without the limitations of tangible goods. Instead, the "products" in these economies include virtual assets, such as clothing for avatars, virtual land, and digital collectibles.

One notable feature of virtual economies is that they often transcend the boundaries of their virtual worlds. For example, users in platforms like Fortnite or Roblox can earn, purchase, and trade virtual assets both within and outside of these environments, with real-world currency sometimes playing a role in these transactions.

Data on the size of virtual economies provides a glimpse into their rapidly growing significance. According to Statista (2023), the value of the global virtual goods market is expected to reach \$189.76 billion by 2025, driven by the growing popularity of virtual platforms and the increasing integration of VR and AR technologies. In the realm of NFTs alone, NonFungible.com (2022) reported that the NFT market grew to \$17 billion in 2021, with a significant portion of this market driven by virtual goods and assets traded in virtual worlds.

Another key component of virtual economies is cryptocurrency. Many virtual platforms, particularly decentralized ones like Decentraland and The Sandbox, operate on blockchain technology and utilize cryptocurrency as the medium of exchange. For example, Decentraland uses its native token, MANA, to facilitate transactions in its virtual world, where users can purchase virtual land, NFTs, and services. This decentralized approach to virtual economies adds a layer of transparency and security through the use of blockchain and smart contracts, further solidifying the role of virtual economies in the broader digital ecosystem.

## The Significance of Virtual Economies

Virtual economies are not just confined to entertainment and gaming but are increasingly influencing real-world economic trends. Many businesses are now exploring virtual worlds as a way to engage with customers, market products, and even host virtual events. For example, fashion brands such as Gucci and Balenciaga have released virtual clothing lines that users can buy and wear in virtual environments, signifying the potential of virtual economies to create new revenue streams for traditional businesses.

As virtual economies grow, they provide unique opportunities for users to generate income, especially through play-to-earn models in games like Axie Infinity, where players earn cryptocurrency by engaging in gameplay. These models are giving rise to new forms of work and income generation, where users can make real-world earnings through their participation in virtual worlds.

## Virtual Economies as the True Market Economies

The argument that virtual economies are closer to true market economies than real-world economies is rooted in several key aspects of classical and modern economic theory. Virtual economies exhibit many characteristics that align closely with the ideals of a perfectly

competitive market, which classical economics often regards as the purest form of a market economy. However, due to various market imperfections, real-world economies rarely achieve this ideal. Below, we will explore this logic by integrating examples and theories from both classical and modern economic thought.

### ***Perfect Information and Transparency***

Classical Economics posits that in a true market economy, there should be perfect information—all participants have complete access to relevant data, such as product prices, quality, and market conditions. In the real world, information asymmetry is a major issue, with buyers and sellers frequently having unequal access to important information, leading to inefficiencies such as adverse selection (Akerlof, 1970) and moral hazard.

In virtual economies, however, the concept of perfect information is often closer to reality. Take the example of auction houses in games like World of Warcraft or virtual asset marketplaces like OpenSea (for NFTs). Players or users have instant access to prices, transaction histories, and trends across the virtual economy. Platforms provide real-time data on supply and demand, allowing users to make more informed decisions. Additionally, blockchain-based virtual economies (like those involving cryptocurrencies and NFTs) are designed around decentralized transparency, where every transaction is publicly verifiable, ensuring trust in the system.

Thus, while real-world economies struggle with imperfect information, virtual economies come much closer to fulfilling this condition of a true market economy.

### ***Minimal Transaction Costs***

According to Ronald Coase's Transaction Cost Theory (Coase, 1937), real-world markets often suffer from inefficiencies due to transaction costs, which include search and information costs, bargaining costs, and enforcement costs. These transaction costs prevent real-world economies from functioning as true market economies.

In contrast, virtual economies often have significantly lower transaction costs. For example, in online gaming economies (like in Fortnite or Roblox), users can trade virtual goods or currency almost instantaneously, with minimal fees. Furthermore, platforms such as Decentraland (a virtual world where users can buy and sell virtual real estate) leverage blockchain technology to minimize transaction costs related to ownership verification and transfer, reducing the need for intermediaries and paperwork, which are common in real-world real estate transactions.

In real-world economies, transaction costs—whether legal, logistical, or informational—create barriers to achieving the efficiency of a perfectly competitive market. Virtual economies, however, can more closely approximate the low-transaction-cost ideal.

### ***Perfect Competition and Low Barriers to Entry***

In classical economics, a perfectly competitive market is characterized by free entry and exit, meaning there are no significant barriers preventing new firms from entering or exiting the market. In real-world economies, barriers to entry are often high due to factors like capital requirements, regulation, and monopolistic behaviors (Porter, 1980).

However, virtual economies, particularly in virtual marketplaces, feature much lower barriers to entry. For example, in virtual environments such as Second Life or The Sandbox, users can create and sell virtual goods with relatively little investment. The costs to enter these markets are far lower than in physical industries because digital tools for creating and selling virtual goods (like 3D modeling software or NFTs) are widely accessible. In this sense, virtual economies provide a more level playing field, closer to the theoretical market economy where firms can enter and exit freely.

### ***Lack of Government Intervention***

In laissez-faire economics, a true market economy operates with minimal government intervention, allowing supply and demand to naturally find equilibrium. In practice, real-world economies are heavily influenced by government policies, including taxes, subsidies, and regulations, which often distort market dynamics.

Virtual economies, by contrast, are largely self-regulated and operate in a laissez-faire manner, where platform creators or market participants establish their own rules. For instance, in cryptocurrency markets, decentralized finance (DeFi) systems allow users to trade, borrow, and lend without the involvement of traditional regulatory bodies. Blockchain-based economies such as Ethereum operate with minimal external intervention, creating a purer form of market dynamics where supply and demand interact without interference from centralized authorities.

This limited intervention brings virtual economies closer to the theoretical model of a true market economy envisioned by classical economists like Adam Smith.

### ***Flexible Supply and Demand***

In real-world economies, supply and demand are often inflexible due to physical constraints on production, scarcity of resources, or logistical delays. These frictions prevent markets from quickly responding to changes in demand, leading to inefficiencies like shortages or surpluses.

In virtual economies, supply and demand can adjust far more rapidly. For example, in the virtual economy of EVE Online, a massively multiplayer online game (MMOG), the supply of virtual goods can be almost instantly adjusted by the in-game market, which is driven by player activities. Virtual worlds are not bound by the physical limitations of real-world production, and new goods or services can be created in a matter of minutes by programming them into existence.

This flexibility means that virtual economies are more responsive to changes in demand, allowing prices to adjust more freely and bringing these economies closer to the perfectly elastic supply curves found in theoretical market economies.

### ***Digital Property Rights and Ownership***

One of the hallmarks of a functioning market economy is the clear definition and enforcement of property rights. In real-world economies, property rights can be complex and often lead to disputes, with ownership sometimes unclear due to legal loopholes, bureaucracy, or fraud.

In virtual economies, particularly those using blockchain technology, digital property rights are clearly defined and automatically enforced through smart contracts. NFTs, for example, provide indisputable proof of ownership over digital assets, whether it's digital art, virtual real estate, or in-game items. The use of decentralized ledgers ensures that ownership is secure, transparent, and easily transferable without the need for legal intermediaries. This ensures a closer approximation to a pure market economy where property rights are clear and trade is efficient.

### ***Automation and Reduced Human Bias***

Behavioral economics highlights how real-world markets are often influenced by irrational behaviors, emotional decision-making, and cognitive biases (Kahneman & Tversky, 1979). In contrast, virtual economies can be designed to reduce the influence of human error and bias through automation and algorithm-driven systems.

For example, in blockchain-based virtual economies like DeFi platforms, smart contracts automatically execute transactions based on predefined conditions, reducing the potential for human error, manipulation, or emotional decision-making. These automated systems enable smoother, more predictable market dynamics, closely aligning with the rational-agent models found in classical economics.

## **DEFINITION AND SCOPE OF V-COMMERCE**

V-commerce, represents the next frontier in digital retail, blending immersive technologies such as VR, AR, AI, and blockchain to create more engaging, personalized, and interactive shopping experiences. As this field rapidly grows, a clear definition of v-commerce is essential to understanding its potential and its differentiation from traditional e-commerce.

Several scholars and experts have contributed to defining v-commerce, each highlighting different aspects of this transformative concept. For instance, Luo et al. (2011) describe v-commerce as "an immersive and interactive form of online shopping that leverages VR, AR, and AI to provide personalized consumer experiences." This definition underscores the immersive and personalized nature of v-commerce, made possible by technologies that allow users to interact with virtual environments and products in ways that mimic or even surpass real-world shopping.

Loureiro et al. (2019) extend this concept by integrating v-commerce with the digital and physical worlds, noting that it operates at the intersection of e-commerce and virtual environments. In these spaces, users can explore digital representations of physical stores, interact with virtual products in real time, and complete purchases using integrated online systems. This view emphasizes how v-commerce merges digital and physical elements, creating a seamless shopping experience that enhances customer engagement.

Swan (2015) adds another dimension to v-commerce by discussing its role within blockchain-enabled ecosystems, where digital assets like NFTs (Non-Fungible Tokens) are traded on decentralized platforms. This definition points to the growing use of blockchain and cryptocurrencies in virtual economies, allowing for secure transactions and transparent ownership of virtual goods.

Finally, Jung and Pawlowski (2021) focus on the social and experiential aspects of v-commerce, describing it as the "convergence of digital and physical commerce within virtual

spaces," where users engage with brands and products through immersive, three-dimensional environments. They emphasize the role of real-time feedback, social interaction, and personalized experiences, highlighting how v-commerce fosters deeper engagement with consumers.

### **Synthesizing a New Definition**

Building on these perspectives, we can define v-commerce as an immersive, interactive form of digital commerce that operates within virtual worlds and platforms, offering users a seamless shopping experience that blends the physical and digital. Powered by technologies like VR, AR, AI, and blockchain, v-commerce enables users to interact with virtual storefronts, customize products in real time, and purchase both virtual and physical goods in a decentralized, secure environment. It goes beyond traditional e-commerce by offering a more engaging and personalized experience, with real-time customization, social interaction, and blockchain-secured ownership of digital assets like NFTs.

In this sense, v-commerce is not just an evolution of e-commerce but a new paradigm that reshapes how consumers interact with brands, products, and each other. It reflects the increasing integration of immersive technology into retail, creating new economic models and blurring the lines between the digital and physical worlds.

The scope of v-commerce is vast, stretching beyond mere transactions to include the entire shopping experience. It integrates social interactions, entertainment, and personalized recommendations, creating a seamless blend of digital and physical retail spaces. This new paradigm offers retailers unprecedented opportunities to engage with customers, foster brand loyalty, and drive sales in innovative ways.

## **THEORETICAL FOUNDATION**

E-commerce and social commerce are two fundamental pillars of the modern digital economy, each grounded in specific theories that explain how online transactions and social interactions drive consumer behavior and business strategies. As commerce has increasingly moved into virtual environments—such as virtual worlds, online games, and social platforms—these theories have been adapted to explain the unique dynamics of v-commerce.

### **E-Commerce Theories**

One of the foundational theories in e-commerce is transaction cost theory (Williamson, 1981), which posits that companies and consumers will conduct transactions online if the cost of doing so is lower than the cost of conducting the same transaction offline. This theory is particularly relevant in virtual environments, where digital platforms reduce transaction costs by providing a seamless, integrated experience for buying and selling virtual goods. For instance, online marketplaces like *Amazon* or *Alibaba* reduce search, negotiation, and enforcement costs by centralizing these processes within their platforms. Similarly, in virtual environments like *Steam* or *Roblox*, users can effortlessly purchase virtual goods, with the platforms facilitating instant transactions, secure payments, and automated delivery.

Network effects theory is another key concept in e-commerce, where the value of a product or service increases as more people use it (Katz & Shapiro, 1985). This theory is highly

applicable in virtual environments, especially in virtual marketplaces and social platforms. For example, the value of a virtual world like *Second Life* or a social gaming platform like *Roblox* increases as more users join and participate, creating a thriving economy of virtual goods and services. As the user base grows, the variety and quality of virtual goods increase, attracting even more users and creating a positive feedback loop that enhances the platform's value.

## Social Commerce Theories

Social commerce is grounded in the integration of social media and e-commerce, where social interactions and user-generated content influence buying decisions. Social capital theory (Coleman, 1988) is central to understanding social commerce, as it emphasizes the value of social networks and the trust, reciprocity, and shared norms that emerge within them. In virtual environments, social capital manifests through communities where users exchange information, reviews, and recommendations about virtual goods. Platforms like *Facebook Marketplace* or *Instagram Shopping* leverage social capital by allowing users to share and discover products within their social networks, thereby enhancing trust and driving purchases.

Social influence theory (Kelman, 1958) also plays a crucial role in social commerce, explaining how individuals' behavior can be shaped by the opinions and actions of others. This theory is particularly relevant in virtual environments where users often rely on the recommendations of influencers, friends, or community members when deciding to purchase virtual goods. For instance, in virtual worlds like *Fortnite* or *Minecraft*, social influence is evident when players purchase skins or items based on what popular influencers or peers are using, reinforcing trends and driving sales.

## Application to Virtual Environments

In virtual environments, the theories of e-commerce and social commerce are not only applicable but often amplified due to the immersive and interactive nature of these spaces. Transaction cost theory is evident as virtual marketplaces streamline the process of buying and selling virtual goods, minimizing friction and enhancing UX. Platforms like *Decentraland* and *OpenSea* exemplify this by enabling users to buy, sell, and trade virtual real estate and NFTs with minimal transaction costs, facilitated by blockchain technology that automates and secures transactions (Swan, 2015).

Network effects theory is particularly powerful in virtual environments, where the value of the platform is intrinsically linked to its user base. As more users join and engage in platforms like *Roblox* or *Second Life*, the demand for virtual goods increases, driving innovation and diversity in the marketplace. The success of these platforms relies heavily on their ability to attract and retain users, creating a self-reinforcing cycle of growth and value.

In the domain of social commerce, virtual environments provide a fertile ground for the application of social capital and social influence theories. The communal nature of virtual worlds allows users to build networks of trust and reciprocity, where recommendations and reviews significantly impact purchasing decisions. Social influence is amplified in these settings, where the visibility of virtual goods and the actions of peers or influencers can rapidly shape trends and drive consumer behavior.



## A BRIEF HISTORY OF VIRTUAL REALITY

The history of VR is a fascinating journey that spans several decades, marked by technological innovation, creative experimentation, and evolving concepts of immersive experiences. Table 1 provides a summary of the historical development of VR.

1960s-1970s: Early Concepts and Prototypes: In 1962, Morton Heilig, a cinematographer, developed the "Sensorama," a multi-sensory machine designed to immerse viewers in a virtual environment (Figure 1). Though not a VR headset, it was one of the earliest attempts to create an immersive experience using visual, auditory, and tactile stimuli.



**Figure 1**  
**SENSORMA**  
*source: www.engadget.com*

In 1968, Ivan Sutherland, a computer scientist, and his student Bob Sproull created the first head-mounted display system, often referred to as "The Sword of Damocles." This device, connected to a computer, allowed users to view simple virtual 3D objects superimposed on the real world, making it one of the earliest forms of AR as well.

| <b>Table 1</b><br><b>HISTORY OF VR</b> |                              |   |
|--|------------------------------|---|
| <b>Year</b>                            | <b>Milestone</b>             | <b>Description</b>  |
| 1962                                   | Sensorama                    | Morton Heilig developed a multi-sensory machine for immersive experiences, an early VR precursor. |
| 1968                                   | The Sword of Damocles        | Ivan Sutherland and Bob Sproull created the first head-mounted display, a rudimentary VR system.  |
| 1987                                   | Coining of "Virtual Reality" | Jaron Lanier popularized the term "virtual reality" and founded VPL Research to develop VR tech.  |
| 1991                                   | Sega VR                      | Sega announced a VR headset for gaming, but it was never released due to technical issues.        |

|       |                                   |   |
|-------|-----------------------------------|---|
| 1995  | Nintendo Virtual Boy              | Nintendo launched a 3D portable console with limited success due to discomfort and lack of color. |
| 2007  | Google Street View                | Google introduced panoramic 360-degree imagery for virtual exploration of real-world locations.   |
| 2012  | Oculus Rift Kickstarter Campaign  | Oculus VR's Kickstarter campaign marked a significant push for consumer-grade VR headsets.        |
| 2014  | Facebook Acquires Oculus VR       | Facebook's acquisition of Oculus VR indicated a major investment in the future of VR technology.  |
| 2016  | Consumer VR Headsets Released     | The HTC Vive, Oculus Rift, and PlayStation VR made VR more accessible to consumers.               |
| 2020s | Mainstream Adoption and Expansion | VR technology is widely adopted in gaming, education, healthcare, and social interaction.         |

1980s: The Birth of the Term and Commercial Experiments: Jaron Lanier, founder of VPL Research, coined the term "virtual reality" in 1987. Lanier's company was one of the first to develop and sell VR products, including the DataGlove (a glove that tracked hand movements) and the EyePhone (a head-mounted display). During the late 1980s, VR gained attention from various industries, particularly in aviation, where flight simulators began incorporating VR technology for training purposes.

1990s: Commercial Interest and Gaming: The 1990s saw a surge in public interest in VR, primarily driven by the gaming industry and popular media. Movies like "The Lawnmower Man" (1992) fueled the public's imagination about VR's potential. In 1991, Sega announced the Sega VR headset for its gaming consoles, though it was never commercially released due to technical limitations. Following the trend in 1995, Nintendo launched the Virtual Boy, a portable console that used 3D graphics to create a virtual experience. However, the device was a commercial failure due to its uncomfortable design and lack of color.

2000s: Development and Refinement: The 2000s were a period of refinement and gradual progress in VR technology. Companies like Oculus VR (founded in 2012 by Palmer Luckey) began to push the boundaries of what was possible, focusing on improving the resolution, field of view, and latency of VR headsets.

In 2007, Google introduced Street View, a feature of Google Maps that allowed users to navigate through panoramic, 360-degree imagery, providing a rudimentary form of virtual exploration.

2010s: The VR Renaissance: In 2012, Oculus VR launched a Kickstarter campaign for the Oculus Rift, a VR headset that garnered significant attention and funding. This marked the beginning of a new era for VR, with increasing interest from both consumers and developers. Facebook acquired Oculus VR for \$2 billion in 2014, signaling the tech industry's serious investment in VR.

The mid-2010s saw the release of several consumer-grade VR headsets, including the HTC Vive, PlayStation VR, and Google Cardboard, making VR more accessible to the general public.

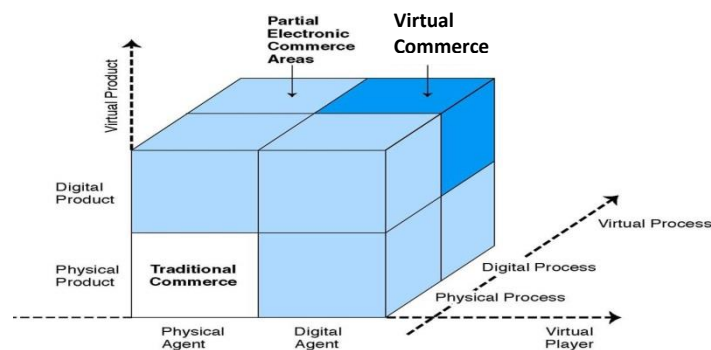
2020s: Mainstream Adoption and Beyond: By the 2020s, VR had become more mainstream, with applications expanding beyond gaming into areas such as education, healthcare, real estate, and social interaction. VR platforms like Meta's Horizon Worlds aimed to create immersive social spaces, while VR fitness apps began to gain popularity as alternatives to traditional exercise.

The ongoing development of AR and mixed reality (MR) technologies further blurred the lines between the physical and digital worlds, contributing to the broader ecosystem of immersive technologies.

The history of VR is a testament to human ingenuity and the persistent drive to create more immersive and interactive experiences. From early prototypes to the sophisticated systems we see today, VR has evolved dramatically and continues to shape how we interact with digital content and each other. As technology advances, VR's potential to transform industries and redefine reality remains vast and largely untapped.

## DIMENSION OF V-COMMERCE

The five dimensions of v-commerce—*virtual agents, products, processes, places, and virtual transactions*—are essential components that define the structure and operation of commerce in virtual environments. The V-commerce Cube (Figure 2) is a conceptual model that categorizes and analyzes business activities based on four fundamental dimensions: Product, Agent, Process, and Places.



**Figure 2**  
**V-OMMERCE CUBE**

### Product Dimension (Vertical Axis):

**Physical Product:** At the base of this axis are traditional, tangible goods, such as clothing, electronics, or food, which exist in the real world and are consumed or used physically.

**Digital Product:** Moving up the axis, digital products emerge. These are intangible goods, such as software, e-books, or digital media files, that are stored, delivered, and consumed electronically.

**Virtual Product:** At the top of the axis are virtual products, which exist entirely within virtual environments. Virtual products represent a significant economic aspect of v-commerce, with entire markets dedicated to buying, selling, and trading these items.

These products have no physical form but hold significant value within their virtual contexts. Examples include in-game items, virtual real estate, or Non-Fungible Tokens (NFTs):

**Virtual Goods:** Items like virtual clothing, accessories, or real estate within platforms like video games or virtual worlds.

**NFTs (Non-Fungible Tokens):** Unique digital assets that represent ownership of a specific virtual item, artwork, or piece of content, often used in virtual marketplaces.

**Subscriptions and Digital Services:** Access to digital content or services, such as virtual event tickets, streaming services, or in-game assets.

**Virtual Places:** Situated between digital and fully virtual processes, Virtual Places (not visible on the cube) represent specific environments where digital and v-commerce takes place. These are not just websites or apps, but immersive environments such as virtual worlds, online game spaces, or virtual marketplaces where transactions occur within a broader, often interactive digital context. Virtual places provide the context in which all other dimensions interact, offering a space for virtual agents to assist, virtual products to be displayed and sold, and virtual processes to be executed.

**Virtual Marketplaces:** Platforms like Decentraland, Roblox, or Meta's Horizon Worlds where users can browse, purchase, and interact with virtual goods and services.

**Virtual Stores:** Immersive, 3D retail spaces that replicate or go beyond traditional physical stores, offering interactive experiences that can be personalized for each shopper.

**AR Shopping Experiences:** Real-world environments enhanced with digital elements that allow users to try out products virtually before purchasing them, like AR fitting rooms or virtual showrooms.

#### **Agent Dimension (Horizontal Axis):**

**Physical Agent:** On the left side of this axis are physical agents—traditional intermediaries like retail stores or salespeople that facilitate transactions in the physical world.

**Digital Agent:** In the middle of the axis are digital agents, including online platforms, websites, or apps that act as intermediaries for digital transactions, such as e-commerce platforms like Amazon or Shopify.

**Virtual Agent:** On the right side of the axis are virtual agents. These entities operate within virtual environments, such as avatars or AI-driven bots, and facilitate transactions in fully virtual settings, like virtual worlds or online games. Virtual agents enhance the shopping experience by providing immediate, personalized assistance, improving customer engagement, and making the process more interactive and efficient. Examples include:

**Customer Support Bots:** Virtual agents that assist customers with inquiries, product recommendations, and troubleshooting in real-time, often simulating human interaction.

**Virtual Salespersons:** These agents help guide users through the purchasing process, offering personalized advice, answering questions, and even completing transactions on behalf of the customer.

**Virtual Influencers:** AI-generated personas that interact with users on social media and within virtual environments to promote products and brands, influencing consumer behavior.

### Process Dimension (Depth Axis):

**Physical Process:** At the front of this axis are physical processes, which involve traditional methods of transaction such as in-person payments, cash exchanges, or physical deliveries.

**Digital Process:** Moving deeper into the cube, digital processes appear. These include online payments, automated ordering systems, and other methods that digitize traditional transactions.

**Virtual Process:** At the back of the axis are virtual processes, where transactions occur entirely within virtual environments, often involving the use of virtual currencies or blockchain technology. These processes ensure the smooth operation of v-commerce, from the creation and distribution of virtual products to the management of customer interactions.

**Transaction Systems:** The backend systems that handle payments, verifications, and digital currency exchanges in virtual spaces. Virtual transactions encompass the financial aspects and methods of conducting business within virtual environments.

This dimension involves:

- **Payment Systems:** Integration of digital payment methods, including cryptocurrencies, virtual currencies, and traditional payment gateways adapted for virtual environments.
- **Transaction Security:** Measures to ensure the security and integrity of financial transactions, including encryption, fraud detection, and compliance with financial regulations.
- **Digital Ownership and Provenance:** Mechanisms for verifying ownership and tracking the history of digital assets, often through blockchain technology and smart contracts.
- **Supply Chain Management:** The digital management of virtual goods' creation, distribution, and delivery, ensuring that virtual products are available and accessible to users.
- **Customer Relationship Management (CRM):** Virtual systems that track and manage customer interactions, preferences, and behaviors to enhance the shopping experience and drive sales.

### Key Areas within the Cube

The cube is divided into several distinct areas, each representing different modes of commerce:

**Traditional Commerce (Bottom-Left Corner):** This area of the cube represents the most conventional form of commerce, where physical products are sold by physical agents through physical processes. An example is a local retail store where customers physically visit to purchase goods using cash or credit cards.

**Partial Electronic Commerce Areas (Middle Sections):** These sections illustrate scenarios where elements of traditional commerce blend with digital advancements:

**Physical products** sold through **digital agents** via **digital processes**—such as purchasing a book from Amazon.

**Digital products** sold via **physical agents** using a mix of digital and physical processes—like buying software in a retail store.

**Pure E-Commerce (Middle-Right Section):** The area where digital products are sold by digital agents through digital processes. This represents pure e-commerce, where the entire

transaction—from product delivery to payment—is conducted digitally. An example includes downloading software directly from an online store.

### **V-commerce Area (Top-Right Corner):**

The top-right section represents fully v-commerce, where virtual products are sold by virtual agents through virtual processes. This is the cutting edge of modern commerce, encompassing activities such as purchasing NFTs on platforms like OpenSea, buying virtual land in Decentraland, or engaging in transactions within VR environments.

### **Virtual Places (Middle-Depth Section):**

The section representing Virtual Places occupies a unique space in the Process Dimension. It includes environments where transactions are more immersive than in traditional digital processes but are not yet fully virtualized. Examples of Virtual Places include online game environments where virtual goods are bought and sold, virtual shopping malls within metaverse platforms, or interactive digital art galleries that support NFT sales.

## **KEY CHARACTERISTICS OF VC**

The key VC characteristic includes:

**Immersion:** Utilizes immersive technologies to create engaging and interactive shopping experiences that simulate or enhance real-world interactions.

**Interactivity:** Allows users to interact with virtual products and environments in a dynamic way, often through simulations, 3D models, and real-time feedback.

**Personalization:** Employs AI and data analytics to tailor shopping experiences to individual preferences and behaviors, providing customized recommendations and interactions.

**Digital Assets:** Involves the creation, trading, and management of digital assets and currencies, such as NFTs and virtual currencies, which are integral to the virtual economy.

**Global Reach:** Offers a platform for businesses and consumers to connect and transact regardless of geographical location, expanding the market beyond physical and traditional online boundaries.

## **EVOLUTION FROM TRADITIONAL TO V-COMMERCE**

**E-Commerce: The Starting Point:** The journey from traditional brick-and-mortar retail to v-commerce has been marked by several key technological and cultural shifts. The rise of e-commerce in the late 1990s and early 2000s was the first significant disruption, enabling consumers to shop online from anywhere at any time (Table 2). Companies like Amazon and eBay revolutionized the shopping experience by offering a vast array of products at competitive prices, accessible with just a few clicks.

**Social Commerce: Integrating Social Media and Shopping:** As the internet became more interactive and social networks gained popularity, the concept of *social commerce* (s-commerce) began to emerge. Social commerce involves using social media platforms to facilitate online buying and selling.

Platforms like Facebook, Instagram, and Pinterest started integrating shopping features, allowing users to discover and purchase products directly through their feeds. This blend of social interaction and e-commerce created new opportunities for brands to reach and engage with customers, leveraging the power of social influence and peer recommendations see table 2.

| <b>Era</b>         | <b>Time Period</b> | <b>Key Development</b>  | <b>Impact on Commerce</b>  | <b>Examples</b>   |
|--------------------|--------------------|---|--|---|
| Internet Emergence | Late 1960s-1980s   | Development of ARPANET  | Setting the stage for e-commerce.  | N/A   |
| World Wide Web     | 1990s              | Introduction of the WWW by Tim Berners-Lee.                     | Enabled widespread access to information and early online stores.        | First online stores like Amazon (1994) and eBay (1995).               |
| E-commerce         | Late 1990s-2000s   | Growth of online shopping platforms, secure payment systems.    | Revolutionized retail by allowing businesses to sell products online.    | Amazon, eBay, Alibaba.  |
| S-commerce         | Mid 2000s-2010s    | Integration of shopping features within social media platforms. | Merged social networking with e-commerce, enabling direct sales.         | Facebook Marketplace, Instagram Shopping, Pinterest Buyable Pins.     |
| M-commerce         | 2010s              | The rise of smartphones and mobile apps for shopping.           | Allowed consumers to shop from anywhere, driving convenience and growth. | Apple Pay, Amazon Mobile App, WeChat Pay.                             |
| V-commerce         | Late 2010s-Present | Development of VR/AR, AI, blockchain for immersive shopping.    | Creating interactive and personalized virtual shopping experiences.      | IKEA AR app, Decentraland, Shopify VR stores, Sephora Virtual Artist. |

A practical example of social commerce is Instagram's "Shop" feature, which allows brands to create a digital storefront within the app. Users can browse, save, and purchase products without leaving Instagram, making the shopping experience seamless and integrated into their social media activity. Social commerce not only revolutionized how consumers discovered products but also blurred the lines between social interaction and shopping, paving the way for more personalized and engaging retail experiences.

**Mobile Commerce: Shopping on the Go:** With the rise of smartphones in the 2010s, mobile commerce (m-commerce) became a dominant force. Consumers could now shop from anywhere, at any time, using their mobile devices.

The convenience of m-commerce, coupled with innovations like mobile payment systems (e.g., Apple Pay, WeChat Pay), led to exponential growth in online shopping. This era also saw the development of mobile-first shopping experiences and apps that catered to on-the-go consumers. Retailers began optimizing their websites for mobile devices, and apps like Shopify and Alibaba allowed consumers to shop on the go. This shift not only increased the convenience of shopping but also introduced new features like mobile payments and location-based services, further blurring the lines between online and offline retail.

**V-commerce: The New Frontier:** Building on these foundations, v-commerce began to take shape in the late 2010s as technologies like AR, VR, and blockchain started to mature. V-commerce moves beyond the traditional 2D online shopping experience, offering consumers immersive, interactive environments where they can explore products in a virtual space. For example, shoppers can now use AR to visualize how furniture might look in their homes before purchasing or experience a virtual fashion show in VR where they can buy items directly from the runway.

The current evolution into v-commerce is driven by advancements in VR, AR, and AI technologies. These tools are transforming how consumers interact with products and brands. For example, IKEA's AR app, IKEA Place, allows users to visualize furniture in their homes before making a purchase, bridging the gap between online and in-store shopping. Similarly, fashion brands like Gucci and Louis Vuitton have experimented with digital-only clothing lines and virtual fashion shows, catering to the growing demand for unique and immersive shopping experiences.

### V-COMMERCE VS., E-COMMERCE VS., S-COMMERCE

While e-commerce, social commerce, and v-commerce all involve buying and selling products online, they differ significantly in their approaches and the experiences they offer.

**E-Commerce:** Focuses primarily on the transactional aspect of shopping, providing a platform for businesses to sell products directly to consumers. The experience is typically linear and 2D, involving browsing online catalogs and completing purchases through a checkout process.

**Social Commerce:** Integrates shopping into social media platforms, leveraging social interactions to drive sales. It adds a layer of social proof and community engagement to the shopping experience, often influencing purchasing decisions through peer recommendations and influencer endorsements.

**V-commerce:** Moves beyond the traditional and social aspects of shopping, offering immersive and interactive experiences through AR, VR, and blockchain technologies. V-commerce allows consumers to engage with products and brands in entirely new ways, such as exploring virtual stores, visualizing products in their own environments, and participating in virtual events.

### THE ROLE OF TECHNOLOGY IN SHAPING V-COMMERCE

Technology is at the heart of v-commerce, enabling experiences that are not possible in traditional or even online shopping environments. VR creates entirely new shopping spaces, allowing customers to explore virtual malls or boutiques that offer personalized experiences based on their preferences. AR enhances the physical world by overlaying digital information, enabling customers to see how a product fits into their lives before they buy it. AI powers the personalization and recommendation engines that make these experiences more relevant and engaging for each individual shopper.

A practical example of this is the collaboration between Shopify and Obsess, a virtual shopping platform. Together, they have created virtual stores that mimic the layout and feel of physical stores, allowing customers to "walk through" the store, interact with products, and make



purchases—all within a virtual environment. This approach not only replicates the in-store experience but also enhances it with features like instant product information, personalized recommendations, and social shopping options.

Moreover, the integration of blockchain technology into v-commerce offers new possibilities for secure and transparent transactions. Cryptocurrencies and NFTs are beginning to play a role in virtual economies, where digital assets can be bought, sold, and traded in virtual marketplaces. These innovations are not only reshaping how we shop but also how we think about ownership and value in the digital age.

## PRACTICAL EXAMPLES OF V-COMMERCE

**IKEA Place:** IKEA has created an AR based application that allows customers to visualize how furniture would look and fit in their homes before making a purchase. This use of AR enhances the customer experience and reduces the likelihood of returns.

**Decentraland:** Decentraland is a prime example of how v-commerce is evolving. This blockchain-based virtual world allows users to purchase virtual land, create environments, and even open virtual stores where real products can be bought using cryptocurrency. Major brands like Atari and Sotheby's have already established a presence in Decentraland, offering virtual experiences that complement their physical counterparts. For instance, Sotheby's opened a virtual gallery in Decentraland where users can view and purchase digital art as NFTs, blurring the line between the digital and physical worlds.

**Sephora Virtual Artist:** Sephora has been a pioneer in integrating AR into the shopping experience. Their Virtual Artist app allows users to try on makeup virtually using their smartphone camera. The app analyzes the user's facial features and provides personalized recommendations, making it easier for customers to find products that suit them. This technology not only enhances the shopping experience but also reduces the uncertainty associated with purchasing cosmetics online, where color and texture can be difficult to judge.

## CONCLUSION

V-commerce is not simply an incremental development in retail—it represents a paradigm shift in how we engage with products, brands, and one another. As immersive technologies like VR, AR, AI, and blockchain continue to advance, they are reshaping the boundaries between the physical and virtual worlds, creating both new opportunities and unprecedented challenges for businesses and consumers. This conceptual paper has laid the groundwork for understanding how v-commerce stands at the forefront of this transformation, offering a glimpse into a future that is not only more personalized but also deeply interactive and immersive.

As we've explored, virtual economies, decentralized digital ownership, and immersive consumer experiences are becoming key drivers of the retail landscape. This shift will require businesses to adopt innovative approaches to engage consumers in entirely new ways—offering real-time customization, social interaction, and virtual goods that hold real-world value. The challenge ahead lies in navigating the complexities of data privacy, legal compliance, and ethical responsibilities in these digital environments.

Looking ahead, v-commerce is positioned to redefine the very fabric of consumerism, allowing businesses to build deeper connections with their audiences and providing consumers with richer, more interactive shopping experiences. As virtual worlds and digital platforms

continue to evolve, so too will the retail strategies that support them, creating a future of shopping that is limitless in potential, immersive in design, and intimately tailored to the individual.

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**Received:** 05-Sep-2024, Manuscript No. IJE-24-15328; **Editor assigned:** 06-Sep-2024, Pre QC No. IJE-24-15328(PQ); **Reviewed:** 20-Sep-2024, QC No. IJE-24-15328; **Revised:** 26-Sep-2024, Manuscript No. IJE-24-15328 (R); **Published:** 30-Sep-2024

