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Virtual world

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A **virtual world** is an online community that often takes the form of a computer-based simulated environment through which users can interact with one another and use and create objects.^[1] The term has become largely synonymous with interactive 3D virtual environments, where the users take the form of avatars visible to others.^[2] These avatars usually appear as textual, two-dimensional, or three-dimensional representations, although other forms are possible (auditory and touch sensations for example).^{[3][4]} Some, but not all, virtual worlds allow for multiple users.

The computer accesses a computer-simulated world and presents perceptual stimuli to the user, who in turn can manipulate elements of the modeled world and thus experience a degree of telepresence.^[5] Such modeled worlds and their rules may draw from the reality or fantasy worlds. Example rules are gravity, topography, locomotion, real-time actions, and communication. Communication between users can range from text, graphical icons, visual gesture, sound, and rarely, forms using touch, voice command, and balance senses.

Massively multiplayer online games depict a wide range of worlds, including those based on fantasy, science fiction, the real world, super heroes, sports, horror, and historical milieus. The most common form of such games are fantasy worlds, whereas those based on the real world are relatively rare.^[6] Many MMORPGs have real-time actions and communication. Players create a character who travels between buildings, towns, and worlds to carry out business or leisure activities. Communication is usually textual, but real-time voice communication is also possible. The form of communication used can substantially affect the experience of players in the game.^[7]

Virtual worlds are not limited to games but, depending on the degree of immediacy presented, can encompass computer conferencing and text based chatrooms. Sometimes, emoticons or 'smilies' are available, to show feeling or facial expression. Emoticons often have a keyboard shortcut.^[8] Edward Castronova is an economist who has argued that "synthetic worlds" is a better term for these cyberspaces, but this term has not been widely adopted.

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History

The concept of virtual worlds predates computers. In fact, it can be traced to the Roman naturalist Gaius Plinius, more commonly known as Pliny the Elder, who expressed one of the earliest recorded interests in perceptual illusion.^{[9][10]} In the twentieth century, the cinematographer Morton Heilig explored the creation of the Sensorama, a theatre experience designed to stimulate the senses of the audience—vision, sound, balance, smell, even touch (via wind)—and so draw them more effectively into the productions^[11]

Among the earliest virtual worlds implemented by computers were virtual reality simulators, such as the work of Ivan Sutherland. Such devices are characterized by bulky headsets and other types of sensory input simulation. Contemporary virtual worlds, in particular the multi-user online environments, emerged mostly independently of this research, fueled instead by the gaming industry but drawing on similar inspiration.^[12] While classic sensory-imitating virtual reality relies on tricking the perceptual system into experiencing an immersive environment, virtual worlds typically rely on mentally and emotionally engaging content which gives rise to an immersive experience.

Maze War (also known as The Maze Game, Maze Wars or simply Maze) was the first networked, 3D multi-user first person shooter game. Maze introduced the concept of online players in 1973-1974 as "eyeball 'avatars' chasing each other around in a maze."^[13] It was played on ARPANET, or Advanced Research Projects Agency Network, a precursor to the Internet funded by the United States Department of Defense for use in university and research laboratories. The initial game could only be played on an Imlac, as it was specifically designed for this type of computer.

The first virtual worlds presented on the Internet were communities and chat rooms, some of which evolved into MUDs and MUSHes. The first MUD, known as MUD1, was released in 1978. The acronym originally stood for Multi-User Dungeon, but later also came to mean Multi-User Dimension and Multi-User Domain. A MUD is a virtual world with many players interacting in real time.^[14] The early versions were text-based, offering only limited graphical representation and often using a Command Line Interface. Users interact in role-playing or competitive games by typing commands and can read or view descriptions of the world and other players. Such early worlds began the MUD heritage that eventually led to massively multiplayer online role-playing games, more commonly known as MMORPGs, a genre of role-playing games in which a large number of players interact within a virtual world.

Some prototype virtual worlds were *WorldsAway*, a two-dimensional chat environment where users designed their own avatars; *Dreamscape*, an interactive community featuring a virtual world by CompuServe; Cityspace, an educational networking and 3D computer graphics project for children; and *The Palace*, a 2-dimensional community driven virtual world. However, credit for the first online virtual world usually goes to *Habitat*, developed in 1987 by LucasFilm Games for the Commodore 64 computer, and running on the Quantum Link service (the precursor to America Online).^[15]

In 1996, the city of Helsinki, Finland with Helsinki Telephone Company (since Elisa Group) launched what was called the first online virtual 3D depiction intended to map an entire city. The Virtual Helsinki project was eventually renamed Helsinki Arena 2000 project and parts of the city in modern and historical context were rendered in 3D.^[16]

Virtual world concepts

Most accepted definitions of virtual worlds require that it be persistent; in other words, the world must continue to exist even after a user exits the world, and user-made changes to the world should be preserved.^[17] As defined by Mark W. Bell at Indiana University, a virtual world is a "synchronous, persistent network of people, represented as avatars, facilitated by networked computers."^[18] While the interaction with other participants is done in real-time, time consistency is not always maintained in online virtual worlds. For example, *EverQuest* time passes faster than real-time despite using the same calendar and time units to present game time.

As **virtual world** is a fairly vague and inclusive term, the above can generally be divided along a spectrum ranging from:

- massively multiplayer online role-playing games or MMORPGs where the user playing a specific character is a main feature of the game (World Of Warcraft for example).
- massively multiplayer online real-life games or MMORLGs, the user can edit and alter their avatar at will, allowing them to play a more dynamic role, or multiple roles.

Some would argue that the MMO versions of RTS and FPS games are also virtual worlds if the world editors allow for open editing of the terrains if the "source file" for the terrain is shared. Emerging concepts include basing the terrain of such games on real satellite photos, such as those available through the Google Maps API or through a simple virtual geocaching of "easter eggs" on WikiMapia or similar mashups, where permitted.

Economy

A virtual economy is the emergent property of the interaction between participants in a virtual world. While the designers have a great deal of control over the economy by the encoded mechanics of trade, it is nonetheless the actions of players that define the economic conditions of a virtual world. The economy arises as a result of the choices that players make under the scarcity of real and virtual resources such as time or currency.^[12] Participants have a limited time in the virtual world, as in the real world, which they must divide between task such as collecting resources, practicing trade skills, or engaging in less productive fun play. The choices they make in their interaction with the virtual world, along with the mechanics of trade and wealth acquisition, dictate the relative values of items in the economy. The economy in virtual worlds is typically driven by in-game needs such as equipment, food, or trade goods. Virtual economies like that of Second Life, however, are almost entirely player-produced with very little link to in-game needs.

The value of objects in a virtual economy is usually linked to their usefulness and the difficulty of obtaining them. The investment of real world resources (time, membership fees, etc.) in acquisition of wealth in a virtual economy may contribute to the real world value of virtual objects.^[12] This real world value is made obvious by the trade of virtual items on online market sites like eBay. Recent legal disputes also acknowledge the value of virtual property, even overriding the mandatory EULA which many software companies use to establish that virtual property has no value and/or that users of the virtual world have no legal claim to property therein.^[19]

Some industry analysts have moreover observed that there is a secondary industry growing behind the virtual worlds, made up by social networks, websites and other projects completely devoted to virtual worlds communities and gamers. Special websites as GamerDNA, Koinup and others which serve as social networks for virtual worlds users are facing some crucial issue as the DataPortability of avatars across many virtual worlds and MMORPGs.^[20]

Furthermore, economical actors are interested by virtual world like 3D video games, instant messaging, search engines and blogs because these are places where they can display targeted advertising, adapted to the people who will see it. Projects about coming video games planned to include advertisements inside the 3D environment.

Research

The number of people using virtual worlds is increasing at a rate of 15% every month and this growth does not appear to be stopping or slowing down anytime soon. (Hof, 2006d; Gartner, 2007 cited by Bray and Konsynski 2007). This is the same with research being carried out in virtual worlds. It is an ever increasing way for business and governments to use the resources to gather and collate information for their use. Research for information systems purposes is being carried out in virtual worlds for the look in open sourcing, providing tools without the need for sponsorship of corporate businesses. It provides a look into the virtual world creation and how it is able to spread itself around the internet for different people from different countries to interact and provide information. It provides an insight how people find the information and how that information is being used by different people. Governments are also beginning to interact in virtual worlds and are a discussion point for some in terms of governance and law. Virtual world is neither public nor private owned. It is the people interacting in it that make the world. Governments research into the use of virtual worlds by people as some have virtual property, amounting to a second life online in another world. This is where governments have to look into if it is viable or even feasible for them to tax those with a second life to govern them with taxes and laws. State of Play is an annual conference sponsored by the Institute for Information Law & Policy at New York Law School; since 2003 the conference has investigated the intersection of virtual worlds, games and the law.

Research in psychology has also been proposed and conducted in virtual worlds with key focus of the use of the innovative platform. Bloomfield (2007)^[21] has suggested that virtual worlds may be useful for examining human behaviour and traditional internet-world constructs (alongside other fields). For example, Doodson (2009)^{[22][23]} reported that offline- and virtual-world personality are significantly differ from each other but are still significantly related which has a number of implications for Self-verification, Self-enhancement and other personality theories. Similarly, panic and agoraphobia have also been studied in a virtual world^[24]

Virtual worlds and real life

Some virtual worlds have off-line, real world components and applications. Handipoints, for example, is a children's virtual world that tracks chores via customizable chore charts and lets children get involved in their household duties offline. They complete chores and use the website and virtual world to keep track of their progress and daily tasks.

Hardware

Unlike most video games, which are usually navigated using various free-ranging human interface devices, virtual worlds are usually navigated (as of 2009) using HIDs which are designed and oriented around flat, 2-dimensional graphical user interfaces; as most comparatively-inexpensive computer mice are manufactured and distributed for 2-dimensional UI navigation, the lack of 3D-capable HID usage among most virtual world users is likely due to both the lack of penetration of 3D-capable devices into non-niche, non-gaming markets as well as the generally-higher pricing of such devices compared to 2-dimensional HIDs. Even those users who do make use of HIDs which provide such features as six degrees of freedom often have to switch between separate 3D and 2D devices in order to navigate their respectively-designed interfaces.

Like video gamers, users of virtual world clients may also have a difficult experience with the necessity of proper graphics hardware (such as the more advanced graphics processing units distributed by Nvidia and AMD) for the sake of reducing the frequency of less-than-fluid graphics instances in the navigation of virtual worlds.

Application domains

Social

Although the social interactions of participants in virtual worlds are often viewed in the context of 3D Games, other forms of interaction are common as well, including forums, blogs, wikis, chatrooms, instant messaging, and video-conferences. Communities are born in places which have their own rules, topics, jokes, and even language. Members of such communities can find like-minded people to interact with, whether this be through a shared passion, the wish to share information, or a desire to meet new people and experience new things. Users may develop personalities within the community adapted to the particular world they are interacting with, which can impact the way they think and act. Internet friendships and participation in online communities tend to complement existing friendships and civic participation rather than replacing or diminishing such interactions.^{[25][26]}

Systems that have been designed for a social application include:

- Active Worlds
- Twinity
- Kaneva
- Smallworlds
- Onverse

Medical

Virtual worlds can also be used, for instance by the Starlight Children's Foundation, to help hospitalised children (suffering from painful diseases or autism for example) to create a comfortable and safe environment which can expand their situation, experience interactions (when you factor in the involvement of a multiple cultures and players from around the world) they may not have been able to experience without a virtual world, healthy or sick. Virtual worlds also enable them to experience and act beyond the restrictions of their illness and help to relieve stress.^[27] Disabled or chronically invalided people of any age can also benefit enormously from experiencing the mental and emotional freedom gained by temporarily leaving their disabilities behind and doing, through the medium of their avatars, things as simple and potentially accessible to able, healthy people as walking, running, dancing, sailing, fishing, swimming, surfing, flying, skiing, gardening, exploring and other physical activities which their illnesses or disabilities prevent them from doing in real life. They may also be able to socialise, form friendships and relationships much more easily and avoid the stigma and other obstacles which would normally be attached to their disabilities. This can be much more constructive, emotionally satisfying and mentally fulfilling than passive pastimes such as television watching, playing computer games, reading or more conventional types of internet use.

Psychologically virtual worlds can help players become more familiar and comfortable with actions they may in real-life feel reluctant or embarrassed. For example, in World of Warcraft, /dance is the emote for a dance move which a player in the virtual world can "emote" quite simply. And a familiarization with said or similar "emotes" or social skills (such as, encouragement, gratitude, problem-solving, and even kissing) in the virtual world via avatar can make the assimilation to similar forms of expression, socialization, interaction in real life smooth. Interaction with humans through avatars in the virtual world has potential to seriously expand the mechanics of one's interaction with real-life interactions.

Commercial

As businesses compete in the real world, they also compete in virtual worlds. As there has been an increase in the buying and selling of products online (e-commerce) this twinned with the rise in the popularity of the internet, has forced businesses to adjust to accommodate the new market.

Many companies and organizations now incorporate virtual worlds as a new form of advertising. There are many advantages to using these methods of commercialization. An example of this would be Apple creating an online store within "Second Life". This allows the users to browse the latest and innovative products. You cannot actually purchase a product but having these "virtual stores" is a way of accessing a different clientele and customer demographic. The use of advertising within "virtual worlds" is a relatively new idea. This is because Virtual Worlds is a relatively new technology. Before companies would use an advertising company to promote their products. With the introduction of the prospect of commercial success within a Virtual World, companies can reduce cost and time constraints by keeping this "in-house". An obvious advantage is that it will reduce any costs and restrictions that could come into play in the real world.

Using virtual worlds gives companies the opportunity to gauge customer reaction and receive feedback. Feedback can be crucial to the development of a project as it will inform the creators exactly what users want.

Using virtual worlds as a tool allows companies to test user reaction and give them feedback on products. This can be crucial as it will give the companies an insight as to what the market and customers want from new products, which can give them a competitive edge. Competitive edge is crucial in the ruthless world that is today's business.

Another use of virtual worlds in business is where you can create a gathering place. Many businesses can now be involved in business-to-business commercial activity and will create a specific area within a virtual world to carry out their business. Within this space all relevant information can be held. This can be useful for a variety of reasons. You can conduct business with companies on the other side of the world, so there are no geographical limitations, it can increase company productivity. Knowing that there is an area where help is on hand can aid the employees. Sun Microsystems have created an island in second life dedicated for the sole use of their employees. This is a place where people can go and seek help, exchange new ideas or to advertise a new product.

According to trade media company Virtual Worlds Management,^[28] commercial investments in the "virtual worlds" sector were in excess of USD 425 million in Q4 2007,^[29] and totaled USD 184 million in Q1 2008.^[30] However, the selection process for defining a "virtual worlds" company in this context has been challenged by one industry blog.^[31]

E-commerce (legal)

The legal part of “virtual worlds” in business will be focused on “selling goods” by a virtual interface (on-line shopping, on the Internet) and consumer rights. Goods can be anything except money.

The customer will access (usually via Internet) the shop : this is called E-commerce. The website has an obligation to show the state of business, the postal address (proof of geographical location) and a way to contact them directly (phone or email address). The website does not have to show the price of sold product. If prices are shown, then they must be displayed clearly, The differences between the product price with taxes and delivery costs must also be clear.

The goods are usually displayed thanks to one/many pictures, in which the seller should specify “Caveat Emptor”, which signifies in Latin “Buyer Beware”. That means the buyer might not receive exactly the same product that is displayed on the picture. The sold goods must be presented with a minimum of extra information: full reference, maker (if different from the seller), technical information. The accepted payment modes should be displayed before the subscription/registration.

Concerning delivery, information cannot be sent by another way than the website itself. After the transaction is complete, it is the responsibility of the seller to achieve delivery correctly. The full details must be displayed: including extra charges for customer (in case off-country delivery, unusual weight). The delay must be precise (it cannot be exact, so give an idea, i.e. “one week”).

No modification about the delay, price or delivery mode can be made after concluding the contract. The contract is defined by the terms and conditions. The customer can not buy the goods without accepting it; Unfortunately, it is often written in really small print and not really easy to read. These terms and conditions define the customer rights, for example these to cancel contract.

Canceling the contract: The customer has the right to cancel a contract concluded on-line by giving written-notice to the seller. The customer has seven days after the day when he receives goods. The customer can simply change his mind, so is allowed to cancel without justification.

As stated above, there are laws governing the purchasing and selling of products within a e-commerce environment. When it comes to virtual worlds, such as Second Life then there are no laws which you have to abide by. In some ways this can be seen as a positive thing, it gives users complete freedom to carry out their business or pleasure activities, with the knowledge that there are no repercussions. On the other hand there are downsides of course, people have moral, social and ethical responsibilities to other users. Whether this is keeping information up to date, or avoiding fraud. Even with these basic responsibilities to others, some people may take advantage of a situation such as this.

The lax rules surrounding taxation and e-commerce regulations on the popular game Second Life can be both a blessing and a curse. As seen in the example of Ginko Financial, a bank system featured in Second Life where avatars could deposit their real life currency after converted to Linden Dollars for a profit. When in July 2007 residents of Second Life crowded around the ATM's in an unsuccessful attempt to withdraw their money. After a few days the ATM's along with the banks disappeared altogether. Around \$700,000 in real world money was reported missing from residents in Second Life. An investigation was launched but nothing substantial ever came of finding and punishing the avatar known as Nicholas Portacarrero who was the head of Ginko Financial.^[32]

Entertainment

see also: MMOG

Single-player games

Some single-player games contain virtual worlds populated by non-player characters (NPC). Many of these allow you to save the current state of this world instance to allow stopping and restarting the virtual world at a later date. (This can be done with some multiplayer environments as well.)

The virtual worlds found in video games are often split into discrete levels.

Education

See also: Virtual learning environment#Virtual world learning environments

Virtual worlds represent a powerful new media for instruction and education that presents many opportunities but also some challenges.^[33] Persistence allows for continuing and growing social interactions, which themselves can serve as a basis for collaborative education. The use of virtual worlds can give teachers the opportunity to have a greater level of student participation. It allows users to be able to carry out tasks that could be difficult in the real world due to constraints and restrictions, such as cost, scheduling or location. Virtual worlds have the capability to adapt and grow to different user needs, for example, classroom teachers are able to use virtual worlds in their classroom leveraging their interactive whiteboard with the open source project Edusim. They can be a good source of user feedback, the typical paper-based resources have limitations that Virtual Worlds can overcome.

Virtual world can also be used with virtual learning environments, as in the case of what is done in the Sloodle project, which aims to merge Second Life with Moodle.^[34]

Virtual worlds allow users with specific needs and requirements to be able to access and use the same learning materials from home, as they would be receiving if they were in the presentation. This can help users to keep up to date with the relevant information and needs while also feeling as though involved. Having the option to be able to attend a presentation via a virtual world from home or from their workplace, can help the user to be more at ease and comfortable. The flexibility of virtual worlds have greatly improved the options for student study and business collaboration. Although virtual worlds are a good way of communicating and interacting between students and teachers, this is not a substitute for actual face-to-face meetings. When using virtual worlds, there are the downsides in that you lose the body language and other more personal aspects.

Adoption of the use of virtual worlds for education

In April 1999, Numedon Incorporated launched Whyville as the first virtual world explicitly designed to engage young students in a wide range of educational activities. With a player base of over 3 million.^[35] Whyville has been particularly successful in attracting young teens.^[36]

With respect to older students, a growing number of universities such as the open university and other educational institutions are exploring existing general purpose virtual world platforms as a means to extend and enhance their offerings to students. Typically, educators create an online presence where students can interact, using their avatars to learn about new assignments or create projects that are viewable within the virtual world. For example, students taking a computer manufacturing class can log into a virtual world in which they are the inhabitants of a burgeoning village that needs their expertise for the construction of houses, furniture, machines, and other goods. An example of such a program Outopia (<https://web.archive.org/web/20110917110743/http://www.outopia.co.uk/outopia/>) a second life community for distance learning

students of the open university another is AWEDU, a project started by *Active Worlds*, Inc. A number of educational institutions are now running virtual classrooms and discussion sections in worlds like *Second Life*.^[37] The British Open University has a strong presence in Second Life, where it is developing social and community links for students as well as practising teaching and learning.^[38]

Technologies can sometimes take up to 10 years to become fully incorporated within everyday life. For virtual worlds to be accepted, then it is vital that teachers and students alike adapt to new ideas and technologies and use them to their full potential and become a useful tool in education (Yukiko Inoue, Effects of virtual reality support compared to video support in a high-school world geography class). The best idea for a more complete and wider variety in learning techniques is to integrate both paper based and technology based methods.

Language Education

Main article: Virtual World Language Learning

Language learning is the most widespread type of education in virtual worlds,^[39] with many universities, mainstream language institutes and private language schools using 3D virtual environments to support language learning.

Business education

Virtual worlds is used in today's business environment for the training of employees for which it represents an excellent venue.^[40] In particular, virtual worlds environment (such as Second Life) have been used in business schools as an extension of the classroom.^[41] In some other cases virtual worlds have been used for creating business games^[citation needed]. Since the growth of the Internet, employees have been able to learn and to follow online trainings. This is a major breakthrough and helps to overcome problems such as distance, infrastructure or appointment. There are different methods in which this can be carried out: Video Conferencing is probably the most common tool. People can stay in their office to attend a live conference or a recorded meeting. This new way of training raises some questions: Is virtual training as effective as real trainings? Are people happy with virtual training and does this method encourage people to learn?

Using technologies can affect people's behaviour in many ways. First of all they can seem more interested in using virtual modes as a study method and because of this their learning satisfactions can be higher when compared to traditional classroom techniques. Despite the fact that people are not in a face to face meeting and thus are not creating social links, the efficiency is not really affected. Actually, adults need this autonomy and need to learn by themselves with more self-direction than younger students.

Virtual training has a lot of advantages compared to the traditional classroom and meetings. Thanks to the rise of the Internet people can now interact with the information through a more user-friendly environment which allows them a greater level of involvement and creativity. A large number of websites offer tutorials and the possibility to test user knowledge with interactive online tests (using multiple choice questions). Virtual training is not so different from usual training in terms of content. Thus, it is not difficult to adapt the existing course to fit with virtual tools. This of course would not only save the company time but also money (no flight, accommodation costs etc.).

Virtual training is becoming a more widely accepted form of training and is being used more often. One example is made by the INSR-Institute competence in the area of occupational risk prevention: protecting workers' health and safety and preventing occupational accidents or diseases. They have created a program to warn people about the chemical risk of products using interactive support. INSR used 3D environment show clearly a professional situation and involve people through this interactive support.

In addition to the use of virtual training, virtual reality can also provide useful tools. One of the widest uses of this technology is maybe the use of 3D environment to allows virtual visits. The concept is used by many companies and is usually divided into two purposes. The main use for a company is to provide a virtual preview of their tour. Moreover some public places allow free access to their facilities, thus allows people who cannot visit the location for real are due to personal constraints, are able to visit virtually. This allows an easy access to knowledge and it becomes a real alternative to video or picture.

Due to the ease of learning brought by the spread of virtual worlds, learning may become lifelong and the curriculum is in perpetual evolution (David Davies, The virtual university: a learning university), each employee being able to learn through virtual world, no matter where he lives or how old he is.

In fiction

The concept of a virtual world has become a popular fictional motif and setting in recent years, although science-fiction writers have been portraying similar ideas (for example, cyberspace) for decades. Among the most prominent virtual worlds in the literature are the ones written about by William Gibson. Virtual worlds were prominent in such movies and books as *TRON*, *Neuromancer*, *The Lawnmower Man*, *The Lawnmower Man 2*, *Epic*, *Snow Crash*, *.Hack//Sign*, *Real Drive*, *Summer Wars*, *The Matrix* and *Ghost in the Shell*. There are many other examples of the virtual world; for example Lyoko in the French animated television series *Code Lyoko*.

Series 4 of the smash hit New Zealand TV series, *The Tribe* featured the birth of Reality Space and the Virtual World that was created by Ram, the computer genius leader of The Techno's.

In 2009, BBC Radio 7 commissioned *Planet B*, set in a virtual world in which a man searches for his girlfriend, believed to be dead, but in fact still alive within the world, called "Planet B". The series is the currently the biggest ever commission for an original drama series.^[42]

Future

According to K Zero, a virtual world consultancy service, there are over 1 billion (1,009,000,000) people worldwide registered in virtual worlds today.^[43]

Rita J. King, CEO of Dancing Ink Productions, a strategic creative content development and research company, believes virtual worlds will augment what she calls "the Digital Culture."

"I envision virtual worlds evolving for business and cultural development as the medium becomes more ubiquitous."

"Chatting in a two-dimensional platform can be fun, informative and valuable," argued King. "But co-creating and inhabiting a three-dimensional space that can then be collaborated upon cannot be matched. This allows people to 'be together' despite geographical location, age, gender, ethnic or sociopolitical affiliation."

"But interactions will only be as developed as the imaginations and motivations of the people involved."

Ideally, King believes we will move to a position where people can augment their physical lives with virtual realities. This may ultimately affect our perceptions of physical 'wants'.

See also

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