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VIRTUAL TECHNOLOGY TOWARDS FUTURE LEARNING AND
DIGITAL TRANSFORMATION

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Abstract

The concept of virtual technology is the application of various technologies in a wide range of operations with an aim to maximize the benefits when working in a virtual learning environment. This advanced technology is directly beneficial to users as it can create more accessible experiences through input devices and 3D rendering devices by accessing virtual spaces and learning through virtual community. Virtual technology is considered a technological advance that not only supports the world's changes but also encourages learners to focus on self-directed learning and active learning. Plus, real-time interaction enables users to visualize results instantly, which can promote interaction and collaboration and meanwhile increase learning efficiency and learning skills. All of these are indispensable for digital learners because these skills shall enable them to respond well to the digital transformation in the future. Nowadays, instruction management usually applies several formats of virtual technology, e.g., learning through virtual classrooms, operation through virtual laboratories, searching for learning resources through virtual libraries or virtual museums, etc. The said application refers to the application of current technologies in conjunction with input devices and 3D rendering devices and virtual learning environments, such as augmented reality technology, virtual reality technology, mixed reality technology, extended reality technology, artificial intelligence technology, Internet of Things, machine learning, metaverse, etc. These are all regarded as important elements of today's virtual technology, which are very popular and widely discussed.

Keywords: Virtual Technology, Future Learning, Digital Transformation, Virtual Community

Introduction

The advancement of technology is one of the factors that result in digital transformation, in which digital technologies are widely utilized in various sectors (Phoonsawat et al., 2022). Especially in learning, advanced technologies can integrate knowledge from different sources in a creative manner and develop innovations that can fulfill the needs of society and prepare education for Thailand 4.0. In order to create such education innovations for further practical use, it is highly important that learners should have more

engagement in learning. This can be achieved by making use of current technological advances to promote active learning, experiential learning, thinking skills, and learning from situations under suitable environments (Chatwattana & Phadungthin, 2019). Education 4.0 is an education system focusing on development and creation of innovations that can satisfy the needs of society. The emphasis is also placed on collaborative learning, small group discussion, and integration of interesting ideas and principles to create new bodies of knowledge or theories on the basis of existing technologies. Also, this education system is expected to support learning formats and situations that are about to take place in the future.

The transition to a digital society seems to occur continuously and rapidly to both people and things surrounding. Digital transformation is the application of digital technology to all corporate sectors, which is believed to lead to new and different changes. Technologies that enable new styles of learning have reduced the reliance on on-site learning; as a result, many educational institutions have begun to promote freedom of knowledge and access to knowledge sources. Meanwhile, the said institutes are also preparing themselves to respond to such leaping changes of technologies and digital innovations, which brings about the so called education transformation (Thanachawengsakul & Thanyavinichakul, 2020), in which learning sources are increased, new forms of learning are employed, and action learning is emphasized so that learners can acquire necessary skills in the future and achieve balanced and sustainable growth.

Today, virtual technology has played an important role in everyday life, and it has been applied in a wide range of operations with an aim to maximize the benefits in working. For instance, virtual technology has been employed in medical field for therapy for phobias, physical therapy, surgery, etc. It has been also used in conjunction with entertainment; for example, this technology can simulate such virtual environments in the games that players will have much more enjoyment and entertainment. Moreover, it can be applied in scientific and architectural fields because it allows for more accurate and precise calculations. In education field, this technology is also used to support instruction under virtual learning environments (Chatwattana, 2020). These advances are directly beneficial to users as they can create more accessible experiences through input devices and 3D rendering devices by accessing virtual spaces and learning through virtual community.

Virtual technology is considered a tool that can encourage learners to have more commitment and more motivation to learn (Kerawalla et al., 2006). Researches on this technology have paved new ways for instruction and education of present days and in the future. There are many case studies that address the use of virtual technology in educational environments. However, such researches often focus on too specific experiences and topics because there are not yet any obvious tendencies to integrate this technology in educational processes in a stable manner. Additionally, there are still some obstacles; for instance, certain instructors do not accept the adoption of new technology because they want to maintain their comfort zone, including the matter of various expenses related to the use and the maintenance of this technology (Dunleavy, Dede & Mitchell, 2009). Nonetheless, the rapid evolution of mobile technology,

such as smartphones and tablets, has made it easier for educational institutions and students to access these devices with much lower cost than before. Hence, it is advisable to understand the advantages and disadvantages of using this technology in educational environments, as well as its important role to render a learning society, which is important for learners in digital era.

Virtual technology and future learning

Virtual technology is a technological advancement that can support the changing of the world. This technology encourages learners to focus on self-directed and active learning. Furthermore, real-time interaction enables users to visualize results instantly, which can promote interaction and collaboration and meanwhile increase learning efficiency and learning skills (Kotranza et al., 2009). Currently, virtual technology has been used in new learning styles such as learning through **metaverse**[*]. This kind of learning is a brand-new dimension in borderless education management as it uses virtual technology to increase the accessibility to learning resources. Meanwhile, the learning activities of this method are created in immersive learning environments, enabling learners to achieve deep learning by means of self-directed and experiential learning (Wannapiroon, 2022).

Figure 1 Virtual technology and learning

(Meta, 2021 Retrieved from: https://www.youtube.com/watch?v=KLOcj5qvOio)

After having studied, analyzed, synthesized, and literature review can be summarize the advantages of virtual technology into four main points as follows: (1) Virtual technology increases learners' motivation and engagement as it enables them to receive immersive experiences while learning with 3D models, which are believed to enhance learning experiences. (2) Virtual technology gives learners the freedom to interact with virtual objects and other learners. (3) Some devices for use in virtual technology are inexpensive and affordable. Today's advancements in technology have made it easier to access this technology with smartphones, tablets, and video game devices with no need of any complicated equipment. (4) Virtual technology facilitates more interaction than any other conventional learning material. In other words, learners can feel immersed while interacting with concepts, objects, and processes through headsets, tactile gloves, and motion sensors. This immersion enables learners to learn in different environments with virtual objects, which cannot be accessed by any other approaches.

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[*]**Metaverse** is an exchange of information in 3D virtual world through diverse activities with the aid of AR and VR. (Definition can be found to the section of "The application of virtual technology for future learning: Metaverse".

Digital disruption has stimulated many sectors to learn and adapt themselves by leaps and bounds. In particular, several educational institutions have promoted learning by using virtual technology in education so that learners can create learning experiences by their own and eventually achieve continuous learning. Currently, there are many case studies that address the use of virtual technology in educational environments, such as learning through virtual classrooms, learning through virtual laboratories, learning through virtual museums, retrieving information through virtual libraries, etc.

1. Virtual classroom is an online learning environment that encourages instructors and learners to interact with one another in the virtual world. It is an online space created in the form of virtual classroom that allows learners to interact with virtual objects or surroundings therein (Chatwattana et al., 2020) with the aid of efficient and affordable devices or technologies.

2. Virtual laboratory is a kind of instruction management that enables learners, with the aid of potential technology, to practice on their own through virtual experiences (Wattanasin et al., 2021). This technology supports the instruction activities that encourage learners' engagement; and at the meantime, it emphasizes the teaching of both theories and practical experiments by employing computer programs to simulate the work results and allowing learners to have interaction by themselves (Laohajaratsang, 2002). In addition, there are virtual simulations that can increase learners' attention and motivation to learn and explore. And this will eventually make them well-equipped with the ability to think, take actions, and solve any problems (Chatwattana & Phadungthin, 2019).

3. Virtual museum is a form of museum exhibition created in a virtual environment by the advancement of 3D computer technology (Sakhajun, 2014).

Figure 2 Virtual national museum, Thailand

(National Museum Bangkok, 2015)

4. Virtual library is a simulation of a "real" library in a virtual world to serve as a source of books and information. Virtual library applies technologies that can interact virtually with users in the library environment through a computer. Thereby, users are always in the form of 3D avatars and the books in this virtual library are in the format of electronic files.

Key technologies with a vital role in the implementation of virtual technology

Information technology has become so widely recognized that it is regarded as part of our daily life. It has made a huge difference in learning for people in the 21st century. Education today relies on a number of innovations and technologies that offer many more opportunities in education and reduce limitations of time and place. Moreover, it is believed these technologies can promote and generate the full potential of learning through media and technologies that can provide an environment similar to the real learning environment, resulting in a learning society without borders. The key technologies that play an important role in the implementation of virtual technology include:

1. Augmented reality technology (AR) is a combination of physical world and virtual reality along with the aid of softwares and devices, such as video cameras or other relevant equipment. The virtual images produced by this technology are usually displayed on the computer screens or other display devices (Unjanam & Roungrong, 2020). Augmented reality technology is considered a new dimension of learning media that will arouse learners to have more interest, prefer to learn new things, create new experiences, and have more engagement in learning. There are four main components of augmented reality technology, i.e., markers or sensors, cameras, softwares or processing systems, and displays (Khummin et al., 2022).

Figure 3 Application of Augmented Reality Technology
(Sheldon et al., 2019)

2. Virtual reality technology (VR) is a computer-based simulated environment with 3D graphics, in which users can interact instantly with the virtual environment by using standard input devices, e.g., keyboard or mouse, or using the so-called multi-dimension devices, such as sensor gloves, haptic gloves, 3D joysticks, etc. (Chatwattana, 2020). Virtual reality technology can be divided into 3 types, i.e., Fully-Immersive VR, Semi-Immersive VR, and Non-Immersive VR or Desktop VR.

Figure 4. Virtual reality technology and physical therapy

(Chatwattana, 2020)

3. **Mixed reality technology (MR)** is a combination of augmented reality technology and virtual reality technology. Mixed reality technology allows users to see and interact with virtual objects by means of some technologies, such as HoloLens. Users can see holograms or 3D images through HoloLens and interact with them with finger touch and touch interaction.

4. **Extended reality technology (XR)** is a virtual technology with the combination of multi-dimensional environments, like real environments and digital environments. This includes the interaction between humans and machines innovated by computer technology and wearable hardwares (Wannapiroon, 2022). The four components of extended reality technology are applications, input and sensing devices. processing devices, and display devices.

Figure 5 Mixed reality technology and extended reality technology

(Retrieved from: https://tips.thaiware.com/1888.html)

5. **Artificial intelligent technology (AI)** is a processing system with artificial intelligence created for the non-living things to think and act like humans. The processing system herein is somewhat similar to human brain and it can render some actions (Phoonsawat et al., 2022) like speech recognition, language translation, automatic response, etc. Artificial intelligence is like human neural networks and it is created by combining science and technologies with purposes to provide convenience, reduce labor or risks from work, and interact in multiple languages.

6. Internet of Things technology (IoT) is a concept and a paradigm that consider the existence of a variety of things or objects in various environments, in which they can interact with one another by means of both wireless and wired connection (Patel K.K & Patel S.M., 2016). The objective of IoT is to make such variety of things stay connected anytime and anywhere, and meanwhile they can be accessed through all networks and services. There are 6 characteristics of IoT, which include (1) Anything any device, (2) Anyone anybody, (3) Any service any business, (4) Any path any network, (5) Any place anywhere, and (6) Anytime any context. There are 3 types of IoT, which include (1) People to people, (2) People to machine/things, and (3) Things/machine to things/machine, Interacting through internet.
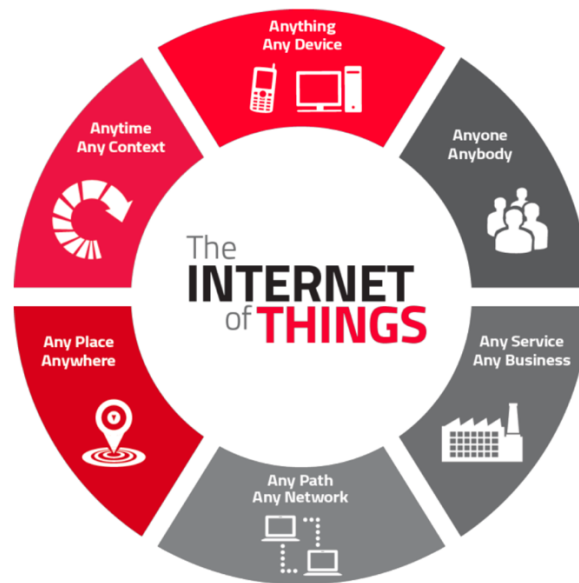

Figure 6. Characteristics of Internet of Things technology (IoT)
(Patel & Patel, 2016)

7. Machine learning (ML) is another field of AI learning that applies advanced statistics to learn and to identify patterns of data, and then make predictions from the said patterns. This can be conducted by teaching computer systems to learn by themselves based on "data". The techniques of machine learning can be summarized as follows: (1) Linear Digressions is a technique that devises linear equations to predict the most likely learning success. (2) Reinforcement Learning is a technique that lets computers work randomly first, and then users shall determine whether what the AI has done is right or wrong. (3) Neural Network or Deep Learning (DL) is a technique that allows computers to learn from simple concepts with little complexity first, and then from more and more complicated concepts with more details until the said computers are able to learn more difficult things.

The application of virtual technology for future learning: Metaverse

Due to the rapid growth of technologies together with the rapid evolution of data presentation via virtual technology, this technology is considered an alternative that can be applied in future learning

thanks to its convenience, speed, and easy connection. Not only that, virtual technology is compatible with small portable devices, which means it can be accessed anywhere and anytime.

Metaverse was first developed and implemented in 1992. **Metaverse** is an exchange of information in 3D virtual world through diverse activities with the aid of augmented reality technology (AR) and virtual reality technology (VR). This platform has become quite popular in recent years as more and more people have changed their lifestyles and have done more online activities, especially during the COVID-19 pandemic (Damar, 2021). For this reason, metaverse is getting more and more popularity today and it is expected that metaverse can support future learning and digital transformation. It is also regarded as a new dimension in education management without borders since it increases virtual technology's accessibility to learning resources. Besides, learning activities with immersive learning environments can be facilitated in this metaverse. The objective of metaverse is to create a 3D virtual space for use as a community for learning, and learners, in the form of 3D avatars, can access and explore anything in this community.

Figure 7 Metaverse via Spatial.io
(Spatial, 2022 Retrieved from: https://www.auganix.org/wp-content/
uploads/2022/05/Spatial-RPM.mp4?=1)

Virtual technology is an innovation designed to respond to new ways of learning. At present, applications, Internet of Things, and artificial intelligence are incorporated to design virtual learning systems that can make users feel as if they were learning in the physical world. Accordingly, users will be impressed with new experiences and convenience in terms of devices and resources which enable them to interact instantly with virtual learning environments. Today, technology companies claiming to be Metaverse companies have offered great enjoyment in this virtual world, e.g., buying clothes and fittings for online avatars, taking part in a virtual social experience, attending virtual classrooms to practice immersive learning, etc. Or it can be said that metaverse is created to develop or extend the reality, both in virtual world and physical world.

Conclusion

The application of different technologies to support learning in **"New Normal"** style is an alternative for today's instruction and business operation. Many educational institutions have employed virtual technology in their instruction management by making use of existing technologies or platforms to create virtual learning environments, for instance, the creation of learning activities through the Spatial.io platform. This will allow learners, in the form of 3D avatar, to learn, do activities together, or interact with one another within the virtual world. The simulation of real-world environments combined with technologies to create virtual learning communities, or metaverse, is deemed as a new dimension of education without borders. The application of virtual technology in this way shall enhance learners' interest, arouse their intention to learn, and enable them to do activities together. Today, there are a number of case studies that integrate virtual technology in the development of instruction and education. As a consequence, this has finally led to education transformation which places an emphasis on virtual learning environments, e.g., learning through virtual classrooms, learning through virtual laboratories, learning through virtual museums, retrieving information through virtual libraries, etc. The key technologies that play an important role in the implementation of virtual technology include augmented reality, virtual reality, mixed reality, extended reality, artificial intelligence, Internet of Things, and machine learning. These technologies can promote and generate the full potential of learning through media and technologies that can provide an environment similar to the real learning environment, resulting in a learning society without borders.

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