SESSION III: EUROPEAN INTEGRATION, MULTICULTURALITY, AND INTERNATIONAL ECONOMIC RELATIONS

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THE "METAVERSE." THE ARRIVAL OF THE FUTURE OF 3D RESEARCH, LEARNING, LIFE & COMMERCE

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Abstract: *What happens when video games meet Web 2.0? When virtual worlds meet geospatial maps of the planet meet pervasive web video? When simulations get real and life and business go virtual? When you use a virtual Earth to navigate the physical Earth, the internet swallows the television, and your avatar becomes your online agent? The is the METAVERSE.*
Key words*: Metaverse, Internet, simulations, business IT*

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1. Introduction

What happens when video games meet Web 2.0? When virtual worlds meet geospatial maps of the planet meet pervasive web video? When simulations get real and life and business go virtual? When you use a virtual Earth to navigate the physical Earth, the internet swallows the television, and your avatar becomes your online agent?

Virtual worlds increasingly augment the economic and social life of physical world communities. The sharpness of many virtual and physical world distinctions will be eroded going forward. In both spaces, issues of identity, trust and reputation, social roles, rules, and interaction remain at the forefront

Discussion of the Metaverse usually begins with massively multi-user virtual worlds (VWs), a fast-growing space that is already mixing physical and virtual social, economic, and to a limited extent, political systems via both asynchronous single-user and real-time multi-user modes.

The Metaverse is a complex concept, the term is vision of an immersive 3D virtual world, to include aspects of the physical world objects, actors, interfaces, and networks that construct and interact with virtual environments.

2. Definition of Metaverse

The Metaverse is the convergence of 1) virtually enhanced physical reality and 2) physically persistent virtual space. It is a fusion of both, while allowing users to experience it as either. There is no single, unified entity called the Metaverse—rather, there are multiple mutually-reinforcing ways in which virtualization and 3D web tools and objects are being embedded everywhere in our environment and becoming persistent features of our lives.

The emergence of a robust Metaverse will shape the development of many technological delivery realms that presently appear non- Internet-related.

In sum, for the best view of the changes ahead, we suggest thinking of the Metaverse not as virtual space but as the junction or nexus of our physical and virtual worlds.

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The Metaverse is an embodied internet, where instead of just viewing content — one is in it. And one feels present with other people as if in other places, having different experiences that you couldn't necessarily do on a 2D app or webpage, the world of research, education, business, life actions will see phenomenal, changes – not decades away – but now.

3. Disruptive (changing of the status quo) Technology

Technology frequently produces surprises that nobody predicts. However, the biggest developments are often anticipated decades in advance. In 1945 Vannevar Bush described what he-called the "Memex", a single device that would store all books, records and communications, and mechanically link them together by association. This concept was then used to formulate the idea of "hypertext" (a term coined two decades later), which in turn guided the development of the World Wide Web (developed another two decades later). The "Streaming Wars" have only just begun, yet the first streaming video took place more than 25 years ago. What's more, many of the attributes of this so-called war have been hypothesized for decades, such as virtually infinite supplies of content, on-demand playback, interactivity, dynamic and personalized ads, and the value of converging content with distribution.

Since the late 1970s and early 1980s, many of those in the technology community have imagined a future state of, if not quasi-successor to, the Internet – called the "Metaverse". And it would revolutionize not just the infrastructure layer of the digital world, but also much of the physical one, as well as all the services and platforms atop them, how they work, and what they sell. Although the full vision for the Metaverse remains hard to define, seemingly fantastical, and decades away, the pieces have started to feel very real. And as always with this sort of change, its arc is as long and unpredictable as its end state is lucrative.

The Metaverse will require countless new technologies, protocols, companies, innovations, and discoveries to work. And it won't directly come into existence; there will be no clean "Before Metaverse" and "After Metaverse". Instead, it will slowly emerge over time as different products, services, and capabilities integrate and meld together.

One can think about the metaverse as an embodied internet, where instead of just viewing content — you are in it. And you feel present with other people as if you were in other places, having different experiences that you couldn't necessarily do on a 2D app or webpage

Although the Metaverse has the potential to succeed the Internet as a computing platform, its underlying development process is likely to share little in common with its antecedent. The Internet came from public research universities and US government programs. This was in part because few in private business understood the commercial potential of a World Wide Web, but it was also true that these groups were essentially the only entities with the computational talent, resources, and ambitions to build it. None of this is true when it comes to the Metaverse.

Not only is private industry fully aware of the potential of the Metaverse, it probably has the most aggressive conviction in this future, not to mention the most cash (at least when it comes from a willingness to fund Metaverse R&D), the best engineering talent, and greatest desire for conquest. The major tech companies don't just want to lead the Metaverse, they want to own and define it. There will still be a large role for open-source projects with non-corporate ethos — and they will attract some of the most interesting creative talent in the Metaverse — but there are only a few likely leaders in the early Metaverse.

Virtual worlds increasingly augment the economic and social life of physical world communities. The sharpness of many virtual and physical world distinctions will be eroded going forward. In both spaces, issues of identity, trust and reputation, social roles, rules, and interaction remain at the forefront

In time, many of the Internet activities we now associate with the 2D Web will migrate to the 3D spaces of the Metaverse. This does not mean all or even most of our web pages will become 3D, or even that we'll typically read web content in 3D spaces. It means that as new tools develop,

we'll be able to intelligently mesh 2D and 3D to gain the unique advantages of each, in the appropriate context.

4. "Web" = "Online Life"

Although the "Web" technically refers to a particular set of protocols and online applications, the term has become shorthand for *online life*. It's possible that "Metaverse" will come to have this same duality: referring to both a particular set of virtualizing and 3D web technologies, and the standard *way in which we think of life online*. Like the Web, the Metaverse would not be the entirety of the Internet—but like the Web, it would be seen by many as the most important part.

The emergence of a robust Metaverse will shape the development of many technological realms that presently appear non-Internet-related. In manufacturing, 3D environments offer ideal design spaces for rapid-prototyping and customized and decentralized production. In logistics and transportation, spatially-aware tags and real-time world modelling will bring new efficiencies, insights, and markets. In artificial intelligence, virtual worlds offer low-risk, transparent platforms for the development and testing of autonomous machine behaviors, many of which may be also used in the physical world. These are just a sampling of coming developments based on early stage Metaverse technologies.

In sum, for the best view of the changes ahead, we suggest thinking of the Metaverse not as virtual space but as the junction or nexus of our physical and virtual worlds.

5. Metaverse = Augmented Reality (AR)

The Metaverse is, in effect, an augmented reality scenario which offers a world in which every item within view has a potential information shadow, a history and presence accessible via standard interfaces. Most items that can change state (be turned on or off, change appearance, etc.) can be controlled via wireless networking, and many objects that today would be "dumb" matter will, in the augmented reality scenario, be interactive and to a degree, controllable. *To the AR generation, such properties will be like electricity to children of the 20th century: essentially universal, expected, and conspicuous only in their absence.*

Whoever delivers the first useful and scalable AR operating system and standards, perhaps via the cell phone platform, may become a central player in this future. As virtual data proliferate, information overload will be a common problem. The best of these will regulate human use of the system, respecting natural work, rest, and recreation cycles. In the near-term, AR devices may employ today's collaborative filters, which self-organize to advance one's interests and values. This will empower user annotation and the expression of individual opinion: the Participatory Web. Smart tag-based networks will allow individuals to advise friends on which restaurants, shops or services are worth visiting, and which should be avoided. Time-based processes (such as appointments or deliveries) can be followed with a small widget in one's visual interface, unobtrusive but always available.

6. Metaverse = "Lifelogging"

Lifelogging is the capture, storage and distribution of everyday experiences and information for objects and people. This practice can serve as a way of providing useful historical or current status information, sharing unusual moments with others, for art and self-expression, and increasingly, as a kind of "backup memory," guaranteeing that what a person sees and hears will remain available for later examination, as desired.

In lifelogging, Metaverse augmentation technologies record and report the intimate states and life histories of objects and users, in support of object- and self-memory, observation, communication, and behavior modelling. *Object Lifelogs* ("spimes," "blogjects," etc.) maintain a narrative of use, environment and condition for physical objects. *User Lifelogs*, ("life-caching," "documented lives,"

etc.) allow people to make similar recordings of their own lives. Object lifelogs overlap with the AR scenario, and both rely on AR information networks and ubiquitous sensors.

7. Metaverse Disrupts and Revolutionizes Education

The Metaverse will also revolutionize categories which, for the most part, have avoided disruption throughout the internet era. Education is a great example. Technologists have long argued that in-person colleges and trade schools would be fundamentally reconfigured and displaced by remote learning. But if COVID has done anything for this movement, it has proven how truly awful Zoom-based learning and digital quizzes are, and how critical a sense of individual presence and rich socializing is to development.

Whether it's 3D animated characters viewed through a 2D iPad screen or 360° virtual reality, the Metaverse will enable students to attend richly populated educational environments, with full agency and autonomy, as well as rich facial and body animations. This won't replace the in-person experience, but it will close the gap considerably, while also helping those who suffer with social anxiety. It will also enable society to get far greater leverage on one of its most scarce and valuable resources: incredible teachers.

In addition, virtual immersive classes offer the ability to learn in ways that aren't possible in any classroom — especially at underfunded schools. And this means more than just visiting Rome in VR, the Metaverse will enable students to learn about the construction of Roman aqueducts by helping to build them. Rather than just reading about physics, children will build Rube Goldberg machines (on Earth, and on Mars), and construct LED screens the size of buildings. None of this requires education at a distance, but it certainly improves it. What's more, schools will be designed to augment these capabilities *through* a physical classroom. Altogether new companies will be formed to build virtual schools and lessons, with teachers and performers hired to administer them live via motion capture.

Metaverse Immersive Education is a novel learning platform that combines interactive 3D graphics, commercial game and simulation technology, virtual reality, voice chat (Voice over IP/VoIP), Web cameras (webcams) and rich digital media with collaborative online course environments and classrooms. Metaverse Immersive Education gives students a sense of "being there" even when attending class in person isn't possible, practical, or desirable, which in turn provides faculty and remote students with the ability to connect and communicate in a way that greatly enhances the learning experience.

Unlike traditional forms of distance learning and computer-based learning, Metaverse Immersive Education is designed to immerse and engage students in the same way that today's best video games grab and keep the attention of players. Metaverse Immersive Education supports self-directed learning as well as collaborative group-based learning environments that can be delivered over the Internet or using fixed-media such as CD-ROM and DVD. Metaverse Immersive Education gives faculty and remote students with the ability to connect and communicate in a way that greatly enhances the learning experience. Shorter "mini-games" and interactive lessons can be injected into larger bodies of course material to further heighten and enrich the Metaverse Immersive Education experience.

The first generation of Metaverse Immersive Education was built upon the open Virtual Reality Modelling Language (VRML) and Extensible 3D (X3D) standards, whereas the current (2nd generation) platform is based on the commercial and award-winning Unreal 2.0 game engine. The 3rd generation Metaverse Immersive Education platform is now being for which the following are baseline requirements under consideration:

1. Based on open standards (specifications), open implementations, and open-source code
2. Platform-neutral and vendor-neutral client (viewer) and server architectures (no lock-in)
3. Open application programming interfaces (APIs)

4. Support for industry-standard content authoring tools (e.g., Maya, Softimage, SketchUp, Blender, etc.)
5. Scalable network architecture and scalable graphics architecture
6. Interoperable content and asset exchange (reusable content libraries)
7. Voice and text chat with support for recording/playback of in-session chats
8. Privacy controls that enable closed (non-public) virtual classrooms and meetings
9. Option for identity verification (linking avatar and character names to real-world identity)
10. Stable and reliable implementation for all supported platforms (minimal crashing/freezing)
11. Support for recording and playback of user activities and actions
12. Support for instructor-led and self-directed learning
13. Support for "safe mode" controls that shield users from potentially objectionable content
14. Support for game-based learning content and environments (goals, scoring, challenges, etc)
15. Provides a suitable foundation for formal academic curricula and best practices

The objectives are:

1. Immersive Education client-side and server-side platform specification(s) and implementation(s)
2. Best practices for creating, conducting and assessing (measuring and grading) Immersive Education learning experiences
3. Immersive Education conformance test suites
4. Immersive Education use cases
5. Comprehensive review of related open standards and technologies

The key criteria for success is the specification and implementation of Metaverse Immersive Education standards and best practices that will enable organizations to create, conduct, and assess (measure or grade) online learning experiences in a manner consistent with the charter of this working group. The following organizations will participate in the testing of Metaverse Immersive Education technology and best practices:

1. Boston College, USA
2. City of Boston (Mayor Menino's "Create Boston" initiative) and Boston Public School System, USA
3. Columbia University, USA
4. Massachusetts Institute of Technology (MIT) Media Lab, USA
5. New Media Consortium (NMC), USA (200+ college and university members worldwide)
6. University of Aizu, Japan
7. Sun Microsystems (Global Education and Research division), USA
8. Institute of High-Performance Computing (IHPC), Singapore
9. Burke Institute for Innovation in Education, USA
10. Royal Institute of Technology (Kungliga Tekniska Högskolan), Sweden
11. Israeli Association of Grid Technologies (IGT), Israel

8. Metaverse Immersive Education - Examples

8.1 Reusable Content libraries

A teacher who is not skilled in creating or editing digital media content wants to conduct one of his classes using Metaverse Immersive Education technology but doesn't have the time or experience necessary to create or assemble the course materials himself. Rather than create his Metaverse Immersive Education course from scratch the faculty uses a simple Web page interface to browse through libraries of pre-constructed Metaverse Immersive Education courses that have been built by faculty at other universities and colleges. Because the faculty who created these courses have designated them as "shared" they're available for others to use (similar to the MIT OpenCourseWare initiative). After teachers finds a pre-made course environment that suits their

needs they then uses their Web browser to make it available to their own students through their own server instance, meaning they and their students are able to meet online in the course environment within their own private learning space (with no mixing of students or faculty from different organizations). Over time the faculty decides that they would like for their course environment to contain more learning objects (e.g., videos, interactive 3D objects, audio lectures, etc.) which they find by browsing the pre-made libraries. After identifying the custom objects for their course environment, the faculty members have one of their student teaching assistants add the custom learning objects into their course.

8.2 Safe Mode – High School

A high school would like to provide its students with access to certain Metaverse Immersive Education courses created by universities, but is concerned that some of the courses and materials are not suitable for young adults. The high school uses the Metaverse Immersive Education platform's "Safe Mode" controls to identify exactly which courses its students can access, and locks these settings directly into the client software (viewer) so that the viewer itself is incapable of accessing content other than what the high school specifies. In this way the high school is able to distribute a customized version of the Metaverse Immersive Education client software (viewer) to its students without concern that the students will be inadvertently exposed to potentially objectionable content or characters/avatars.

8.3 Seoul Metropolitan Office of Education

The Seoul Metropolitan Office of Education will offer virtual science classes for elementary and middle school students that are grounded due to a COVID-19 pandemic. The online classes will be based on a metaverse platform, a simulated digital world platform. Students can improve learning skills by exploring the interactive virtual world.

The metaverse is a digital world that connects physical reality to virtual spaces. Users can have hands-on experiences through virtual reality (VR) using their own avatars. South Korea's online giant Naver has gained more than 200 million users through its avatar platform Zepetto.

Due to the prolonged coronavirus pandemic, South Korea's educational ministry launched virtual classes in April 2020. Depending on the number of daily infected cases, elementary and middle schools have switched from offline class curriculums to online classes. Various online education platforms have been developed including mobile carrier LG Uplus' U+ Elementary Country, a multilanguage-learning service for children.

Seoul's education office said on August 26 that it will operate metaverse-based science classes that provide a virtual science exhibition hall called "Gather Town," where about 2,100 elementary and middle school students can participate in various science activities with their avatars. Students can freely look around the hall using Google's Chrome browser.

"We will provide virtual reality and artificial intelligence programs through the operation of metaverse-based creative science classrooms and do our best to serve as a hub for convergence science education," Seoul education office director Kim Yeon-bae was quoted as saying. The office said its virtual exhibition hall will provide music classes, observations of astronomical objects and AI-based art classes.

9. Governmental Development of Metaverse

South Korea has created a "metaverse alliance" of local companies to foster the development of a national virtual and augmented reality platform and sort out the ethics of virtual environments.

The alliance will see organizations including carriers, Korea's indigenous web giant Naver, researchers from the university and private sectors, and even industrial giant Hyundai try to figure out how to build a South Korean Metaverse, how to govern it, and how to ensure it is of benefit to South Korea.

The group has been given the job of defining a national metaverse platform that is open to all comers that wish to provide virtual services. It's assumed that 5G will have a big role to play.

Cho Kyung-sik, second vice minister for science and ICT, expressed his hope that the alliance will ensure that the metaverse "is not a space that is monopolized by a single large company" but instead one in which participants collaborate.

Three working groups have been created to move things along. One will convene participants to discuss recent innovation. Another will discuss legal issues. The third will plan collaborations among participants. Regular conferences will move things along too.

The hoped-for outcome is a platform that South Korean companies can use to innovate, preferably with new industries and efficiencies.

10. Facebook – Mark Zuckerberg's Metaverse Vision and Mission

Although Facebook CEO Mark Zuckerberg has not explicitly declared his intent to develop and own the Metaverse, his obsession with it seems fairly clear. And this is smart. More than any other company, Facebook has the most to lose from the Metaverse as it will build an even larger and more capable social graph and represent both a new computing platform and a new engagement platform. At the same time, the Metaverse also allows Facebook to extend its reach up and down the stack. Through the Metaverse, Facebook could become the next Android or iOS/iPhone (hence Oculus), not to mention a virtual goods version of Amazon.

Facebook's Metaverse advantages are immense. It has more users, daily usage and user-generated content created each day than any other platform on earth, as well as the second largest share of digital ad spend, billions in cash, thousands of world-class engineers, and conviction from a founder with majority voting rights. Its Metaverse-oriented assets are also growing rapidly and now include patents for semiconductor and brain-to-machine computing interfaces.

11. Conclusion

Facebook/Zuckerberg power, funds, members and Zuckerberg's obsession to be the leader in the Metaverse realm will all but ensure that the Metaverse will happen sooner than later and that all aspects of life and internet use will be like light bulbs were to candles when gas went to electricity.

There already are numerous companies on the Web offering Metaverse applications, content, programs, etc. The disruptive appearance and future of a Metaverse world needs to be appreciated, understood and implemented. Not to embrace quickly will leave you behind in this ever-changing world.