Contents

Chapter 1

Cyberspace

For other uses, see Cyberspace (disambiguation).

Cyberspace is "the notional environment in which communication over computer networks occurs."[1] The word became popular in the 1990s when the uses of the Internet, networking, and digital communication were all growing dramatically and the term "cyberspace" was able to represent the many new ideas and phenomena that were emerging.[2]

The parent term of cyberspace is "cybernetics", derived from the Ancient Greek κυβερνήτης (*kybernētēs*, steersman, governor, pilot, or rudder), a word introduced by Norbert Wiener for his pioneering work in electronic communication and control science. This word first appeared in the novel Neuromancer by William Gibson (Page 4, Phantasia Press Edition, Bloomfield, MI, 1986), one of the first cyberpunk hardbacks published.

As a social experience, individuals can interact, exchange ideas, share information, provide social support, conduct business, direct actions, create artistic media, play games, engage in political discussion, and so on, using this global network. They are sometimes referred to as *cybernauts*. The term *cyberspace* has become a conventional means to describe anything associated with the Internet and the diverse Internet culture. The United States government recognizes the interconnected information technology and the interdependent network of information technology infrastructures operating across this medium as part of the US national critical infrastructure. Amongst individuals on cyberspace, there is believed to be a code of shared rules and ethics mutually beneficial for all to follow, referred to as cyberethics. Many view the right to privacy as most important to a functional code of cyberethics.[3] Such moral responsibilities go hand in hand when working online with global networks, specifically, when opinions are involved with online social experiences.[4]

According to Chip Morningstar and F. Randall Farmer, cyberspace is defined more by the social interactions involved rather than its technical implementation.[5] In their view, the computational medium in cyberspace is an augmentation of the communication channel between real people; the core characteristic of cyberspace is that it offers an environment that consists of many participants with the ability to affect and influence each other. They derive this concept from the observation that people seek richness, complexity, and depth within a virtual world.

1.1 Origins of the term

The term "cyberspace" first appeared in the visual arts in the late 1960s, when Danish artist Susanne Ussing (1940-1998) and her partner architect Carsten Hoff (b. 1934) constituted themselves as Atelier Cyberspace. Under this name the two made a series of installations and images entitled "sensory spaces" that were based on the principle of open systems adaptable to various influences, such as human movement and the behaviour of new materials.[6]

Atelier Cyberspace worked at a time when the Internet did not exist and computers were more or less off-limit to artists and creative engagement. In a 2015-interview with Scandinavian art magazine Kunstkritikk, Carsten Hoff recollects, that although Atelier Cyberspace did try to implement computers, they had no interest in the virtual space as such:[6]

> To us, 'cyberspace' was simply about managing spaces. There was nothing esoteric about it. Nothing digital, either. It was just a tool. The space was concrete, physical.

And in the same interview Hoff continues:

> Our shared point of departure was that we were working with physical settings, and we were both frustrated and displeased with the architecture from the period, particularly when it came to spaces for living. We felt that there was a need to loosen up the rigid confines of urban planning, giving back the gift of creativity to individual human beings and allowing them to shape and design their houses or dwellings themselves – instead of having some clever architect pop up, telling you how you should live. We were thinking in terms of open-ended systems where things could grow and evolve as required.

For instance, we imagined a kind of mobile production unit, but unfortunately the drawings have been lost. It was a kind of truck with a nozzle at the back. Like a bee building its hive. The nozzle would emit and apply material that grew to form amorphous mushrooms or whatever you might imagine. It was supposed to be computer-controlled, allowing you to create interesting shapes and sequences of spaces. It was a merging of organic and technological systems, a new way of structuring the world. And a response that counteracted industrial uniformity. We had this idea that sophisticated software might enable us to mimic the way in which nature creates products – where things that belong to the same family can take different forms. All oak trees are oak trees, but no two oak trees are exactly alike. And then a whole new material – polystyrene foam – arrived on the scene. It behaved like nature in the sense that it grew when its two component parts were mixed. Almost like a fungal growth. This made it an obvious choice for our work in Atelier Cyberspace.

The works of Atelier Cyberspace were originally shown at a number of Copenhagen venues and have later been exhibited at The National Gallery of Denmark in Copenhagen as part of the exhibition "What's Happening?"[7]

The term "cyberspace" first appeared in fiction in the 1980s in the work of cyberpunk science fiction author William Gibson, first in his 1982 short story "Burning Chrome" and later in his 1984 novel *Neuromancer*.[8] In the next few years, the word became prominently identified with online computer networks. The portion of *Neuromancer* cited in this respect is usually the following:[9]

Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding.

Now widely used, the term has since been criticized by Gibson, who commented on the origin of the term in the 2000 documentary *No Maps for These Territories*:

All I knew about the word "cyberspace" when I coined it, was that it seemed like an effective buzzword. It seemed evocative and essentially meaningless. It was suggestive of something, but had no real semantic meaning, even for me, as I saw it emerge on the page.

1.1.1   Metaphorical

Don Slater uses a metaphor to define cyberspace, describing the "sense of a social setting that exists purely within a space of representation and communication . . . it exists entirely within a computer space, distributed across increasingly complex and fluid networks." The term "Cyberspace" started to become a de facto synonym for the Internet, and later the World Wide Web, during the 1990s, especially in academic circles[10] and activist communities. Author Bruce Sterling, who popularized this meaning,[11] credits John Perry Barlow as the first to use it to refer to "the present-day nexus of computer and telecommunications networks." Barlow describes it thus in his essay to announce the formation of the Electronic Frontier Foundation (note the spatial metaphor) in June, 1990:[12]

In this silent world, all conversation is typed. To enter it, one forsakes both body and place and becomes a thing of words alone. You can see what your neighbors are saying (or recently said), but not what either they or their physical surroundings look like. Town meetings are continuous and discussions rage on everything from sexual kinks to depreciation schedules.

Whether by one telephonic tendril or millions, they are all connected to one another. Collectively, they form what their inhabitants call the Net. It extends across that immense region of electron states, microwaves, magnetic fields, light pulses and thought which sci-fi writer William Gibson named Cyberspace.

— John Perry Barlow, "Crime and Puzzlement," 1990-06-08

As Barlow, and the EFF, continued public education efforts to promote the idea of "digital rights", the term was increasingly used during the Internet boom of the late 1990s.

1.1.2   Virtual environments

Although the present-day, loose use of the term "cyberspace" no longer implies or suggests immersion in a virtual reality, current technology allows the integration of a number of capabilities (sensors, signals, connections, transmissions, processors, and controllers) sufficient to generate a virtual interactive experience that is accessible regardless of a geographic location.

In 1989, Autodesk, an American multinational corporation that focuses on 2D and 3D design software, developed a virtual design system called Cyberspace.[13]

1.1.3 Recent definitions of Cyberspace

Although you can find several definitions of cyberspace both in scientific literature and in official governmental sources, there is no fully agreed official definition yet. According to F. D. Kramer there are 28 different definitions of the term cyberspace. See in particular the following links: "Cyberpower and National Security: Policy Recommendations for a Strategic Framework," in Cyberpower and National Security, FD Kramer, S. Starr, L.K. Wentz (ed.), National Defense University Press, Washington (DC) 2009; see also Mayer, M., Chiarugi, I., De Scalzi, N.,https://www.academia.edu/14336129/International_Politics_in_the_Digital_Age.

The most recent draft definition is the following: Cyberspace is a global and dynamic domain (subject to constant change) characterized by the combined use of electrons and electromagnetic spectrum, whose purpose is to create, store, modify, exchange, share and extract, use, eliminate information and disrupt physical resources. Cyberspace includes: a) physical infrastructures and telecommunications devices that allow for the connection of technological and communication system networks, understood in the broadest sense (SCADA devices, smartphones/tablets, computers, servers, etc.); b) computer systems (see point a) and the related (sometimes embedded) software that guarantee the domain's basic operational functioning and connectivity; c) networks between computer systems; d) networks of networks that connect computer systems (the distinction between networks and networks of networks is mainly organizational); e) the access nodes of users and intermediaries routing nodes; f) constituent data (or resident data). Often, in common parlance (and sometimes in commercial language), networks of networks are called Internet (with a lowercase i), while networks between computers are called intranet. Internet (with a capital I, in journalistic language sometimes called the Net) can be considered a part of the system a). A distinctive and constitutive feature of cyberspace is that no central entity exercises control over all the networks that make up this new domain.[14]

Just as in the real world there is no world government, cyberspace lacks an institutionally predefined hierarchical center. To cyberspace, a domain without a hierarchical ordering principle, we can therefore extend the definition of international politics coined by Kenneth Waltz: as being "with no system of law enforceable." This does not mean that the dimension of power in cyberspace is absent, nor that power is dispersed and scattered into a thousand invisible streams, nor that it is evenly spread across myriad people and organizations, as some scholars had predicted. On the contrary, cyberspace is characterized by a precise structuring of hierarchies of power.[15]

1.2 Cyberspace as an Internet metaphor

See also: Internet metaphors

While cyberspace should not be confused with the Internet, the term is often used to refer to objects and identities that exist largely within the communication network itself, so that a website, for example, might be metaphorically said to "exist in cyberspace".[16] According to this interpretation, events taking place on the Internet are not happening in the locations where participants or servers are physically located, but "in cyberspace".

Firstly, cyberspace describes the flow of digital data through the network of interconnected computers: it is at once not "real", since one could not spatially locate it as a tangible object, and clearly "real" in its effects. Secondly, cyberspace is the site of computer-mediated communication (CMC), in which online relationships and alternative forms of online identity were enacted, raising important questions about the social psychology of Internet use, the relationship between "online" and "offline" forms of life and interaction, and the relationship between the "real" and the virtual. Cyberspace draws attention to remediation of culture through new media technologies: it is not just a communication tool but a social destination, and is culturally significant in its own right. Finally, cyberspace can be seen as providing new opportunities to reshape society and culture through "hidden" identities, or it can be seen as borderless communication and culture.[17]

> Cyberspace is the "place" where a telephone conversation appears to occur. Not inside your actual phone, the plastic device on your desk. Not inside the other person's phone, in some other city. **The place between** the phones. [...] in the past twenty years, this electrical "space," which was once thin and dark and one-dimensional—little more than a narrow speaking-tube, stretching from phone to phone—has flung itself open like a gigantic jack-in-the-box. Light has flooded upon it, the eerie light of the glowing computer screen. This dark electric netherworld has become a vast flowering electronic landscape. Since the 1960s, the world of the telephone has cross-bred itself with computers and television, and though there is still no substance to cyberspace, nothing you can handle, it has a strange kind of physicality now. It makes good sense today to talk of cyberspace as a place all its own.
> — Bruce Sterling, Introduction to **The Hacker Crackdown**

The "space" in cyberspace has more in common with the

abstract, mathematical meanings of the term (see space) than physical space. It does not have the duality of positive and negative volume (while in physical space for example a room has the negative volume of usable space delineated by positive volume of walls, Internet users cannot enter the screen and explore the unknown part of the Internet as an extension of the space they are in), but spatial meaning can be attributed to the relationship between different pages (of books as well as webservers), considering the unturned pages to be somewhere "out there." The concept of cyberspace therefore refers not to the content being presented to the surfer, but rather to the possibility of surfing among different sites, with feedback loops between the user and the rest of the system creating the potential to always encounter something unknown or unexpected.

Videogames differ from text-based communication in that on-screen images are meant to be figures that actually occupy a space and the animation shows the movement of those figures. Images are supposed to form the positive volume that delineates the empty space. A game adopts the cyberspace metaphor by engaging more players in the game, and then figuratively representing them on the screen as avatars. Games do not have to stop at the avatar-player level, but current implementations aiming for more immersive playing space (i.e. Laser tag) take the form of augmented reality rather than cyberspace, fully immersive virtual realities remaining impractical.

Although the more radical consequences of the global communication network predicted by some cyberspace proponents (i.e. the diminishing of state influence envisioned by John Perry Barlow[18]) failed to materialize and the word lost some of its novelty appeal, it remains current as of 2006.[4][19]

Some virtual communities explicitly refer to the concept of cyberspace, for example Linden Lab calling their customers "Residents" of Second Life, while all such communities can be positioned "in cyberspace" for explanatory and comparative purposes (as did Sterling in *The Hacker Crackdown*, followed by many journalists), integrating the metaphor into a wider cyber-culture.

The metaphor has been useful in helping a new generation of thought leaders to reason through new military strategies around the world, led largely by the US Department of Defense (DoD).[20] The use of cyberspace as a metaphor has had its limits, however, especially in areas where the metaphor becomes confused with physical infrastructure. It has also been critiqued as being unhelpful for falsely employing a spatial metaphor to describe what is inherently a network.[21]

1.3   Alternate realities in philosophy and art

1.3.1   Predating computers

A forerunner of the modern ideas of cyberspace is the Cartesian notion that people might be deceived by an evil demon that feeds them a false reality. This argument is the direct predecessor of modern ideas of a brain in a vat and many popular conceptions of cyberspace take Descartes's ideas as their starting point.

Visual arts have a tradition, stretching back to antiquity, of artifacts meant to fool the eye and be mistaken for reality. This questioning of reality occasionally led some philosophers and especially theologians to distrust art as deceiving people into entering a world which was not real (see Aniconism). The artistic challenge was resurrected with increasing ambition as art became more and more realistic with the invention of photography, film (see *Arrival of a Train at La Ciotat*), and immersive computer simulations.

1.3.2   Influenced by computers

Philosophy

American counterculture exponents like William S. Burroughs (whose literary influence on Gibson and cyberpunk in general is widely acknowledged[22][23]) and Timothy Leary[24] were among the first to extoll the potential of computers and computer networks for individual empowerment.[25]

Some contemporary philosophers and scientists (e.g. David Deutsch in *The Fabric of Reality*) employ virtual reality in various thought experiments. For example, Philip Zhai in *Get Real: A Philosophical Adventure in Virtual Reality* connects cyberspace to the platonic tradition:

> Let us imagine a nation in which everyone is hooked up to a network of VR infrastructure. They have been so hooked up since they left their mother's wombs. Immersed in cyberspace and maintaining their life by teleoperation, they have never imagined that life could be any different from that. The first person that thinks of the possibility of an alternative world like ours would be ridiculed by the majority of these citizens, just like the few enlightened ones in Plato's allegory of the cave.

Note that this brain-in-a-vat argument conflates cyberspace with reality, while the more common descriptions of cyberspace contrast it with the "real world".

A New Communication Model

The technological convergence of the mass media is the result of a long adaptation process of their communicative resources to the evolutionary changes of each histor-

ical moment. Thus, the new media became (plurally) an extension of the traditional media on the cyberspace, allowing to the public access information in a wide range of digital devices.[26] In other words, it is a cultural virtualization of human reality as a result of the migration from physical to virtual space (mediated by the ICTs), ruled by codes, signs and particular social relationships. Forwards, arise instant ways of communication, interaction and possible quick access to information, in which we are no longer mere senders, but also producers, reproducers, co-workers and providers. New technologies also help to "connect" people from different cultures outside the virtual space, what was unthinkable fifty years ago. In this giant relationships web, we mutually absorb each other's beliefs, customs, values, laws and habits, cultural legacies perpetuated by a physical-virtual dynamics in constant metamorphosis (ibidem). In this sense, Professor Doctor Marcelo Mendonça Teixeira created, in 2013, a new model of communication to the virtual universe, based in Claude Elwood Shannon (1948) article "A Mathematical Theory of Communication".

Art

Main article: New media art

Having originated among writers, the concept of cyberspace remains most popular in literature and film. Although artists working with other media have expressed interest in the concept, such as Roy Ascott, "cyberspace" in digital art is mostly used as a synonym for immersive virtual reality and remains more discussed than enacted.[27]

Computer crime

Main article: Computer crime

Cyberspace also brings together every service and facility imaginable to expedite money laundering. One can purchase anonymous credit cards, bank accounts, encrypted global mobile telephones, and false passports. From there one can pay professional advisors to set up IBCs (International Business Corporations, or corporations with anonymous ownership) or similar structures in OFCs (Offshore Financial Centers). Such advisors are loath to ask any penetrating questions about the wealth and activities of their clients, since the average fees criminals pay them to launder their money can be as much as 20 percent.[28]

5-level model

In 2010, a 5-level model was designed in France. According to this model, cyberspace is composed of 5 layers based on information discoveries: language, writing, printing, Internet, etc. This original model links the world of information to telecommunication technologies.

1.4 Popular culture examples

- In October 1966, Doctor Who aired *The Tenth Planet,* in which a wandering planet enters the solar system. This planet, Mondas, is the home of the Cybermen.

- The anime *Digimon* is set in a variant of the cyberspace concept called the "Digital World". The Digital World is a parallel universe made up of data from the Internet. Similar to cyberspace, except that people could physically enter this world instead of merely using a computer.

- The anime *Ghost in the Shell* is set in the future where cyberization of humanity is commonplace and the world is connected by a vast electronic network. Explained in the *Philosophy of Ghost in the Shell*.

- The CGI series, *ReBoot*, takes place entirely inside cyberspace, which is composed of two worlds: the Net and the Web.

- In the film *Tron*, a programmer was physically transferred to the program world, where programs were personalities, resembling the forms of their creators.

- In the film *Virtuosity* a program encapsulating a super-criminal within a virtual world simulation escapes into the "real world".

- In the novel *Simulacron-3* the author Daniel F. Galouye explores multiple levels of "reality" represented by the multiple levels of computer simulation involved.

- The idea of "the matrix" in the film *The Matrix* resembles a complex form of cyberspace where people are "jacked in" from birth and do not know that the reality they experience is virtual.

- In the televised remote controlled robot competition series *Robot Wars*, the *Megahurtz* and subsequently *Terrorhurtz* team and their robot were introduced as being 'from Cyberspace', a nod to their online collaborative formation.

- In the 1984 novel *Neuromancer* the author William Gibson introduces the idea of a virtual reality data space called "the Matrix".

1.5 See also

- Augmented browsing

- Artificial intelligence
- Autonomy
- Computer security
- Cyber-HUMINT
- Computer security
- Cyberwarfare
- Cyber security standards
- Framework Programmes for Research and Technological Development
- Wired glove
- Cyberwarfare
- Cybersex
- Online magazine
- Crypto-anarchism
- Digital pet
- eSports
- Global commons
- Infoanarchism
- Information superhighway
- Infosphere
- Internet art
- Legal aspects of computing
- Real life
- Metaverse
- Mixed reality
- Multi-agent system
- Noosphere
- Reality–virtuality continuum
- Simulated reality
- Social software
- Computer program
- Sentience
- Telepresence
- Virtual world
- Virtual reality

1.6 Notes

[1] http://www.oxforddictionaries.com/us/definition/american_english/cyberspace

[2] Strate, Lance (1999). "The varieties of cyberspace: Problems in definition and delimitation". *Western Journal of Communication*. **63** (3): 382–3. doi:10.1080/10570319909374648.

[3] Richard A. Spinello, *"Cyberethics: Morality and Law in Cyberspace"*

[4] White House, *"The National Strategy To Secure Cyberspace"*

[5] Morningstar, Chip and F. Randall Farmer. The Lessons of Lucasfilm's Habitat. *The New Media Reader*. Ed. Wardrip-Fruin and Nick Montfort: The MIT Press, 2003. 664-667. Print

[6] http://www.kunstkritikk.com/kommentar/the-reinvention-of-cyberspace/

[7] http://www.smk.dk/en/visit-the-museum/exhibitions/whats-happening/introduction-to-the-exhibition/

[8] Scott Thil (03.17.09). "March 17, 1948: William Gibson, Father of Cyberspace". *WIRED*. Check date values in: |date= (help)

[9] Gibson, William (1984). *Neuromancer*. New York: Ace Books. p. 69. ISBN 0-441-56956-0.

[10] Vanderbilt University, *"Postmodernism and the Culture of Cyberspace"*, Fall 1996 course syllabus

[11] *Principia Cybernetica* "Cyberspace"

[12] John Perry Barlow, "Crime and Puzzlement," June 8, 1990

[13] Andrew Pollack, New York Times, "For Artificial Reality, Wear A Computer," April 10, 1989

[14] Definition by Marco Mayer, Luigi Martino, Pablo Mazurier and Gergana Tzvetkova, Draft Pisa, 19.05.2014 https://www.academia.edu/7096442/How_would_you_define_Cyberspace

[15] The most recent analysis of the interaction of Cyberspace and International politics has been investigated in the MIT, Harvard and CFR ECIR project (Explorations in cyber International Relations). ECIR Principal Investigator is Nazli Choucri http://ecir.mit.edu/http://web.mit.edu/polisci/people/faculty/nazli-choucri.html

[16] M. Graham "Geography/Internet: Ethereal Alternate Dimensions of Cyberspace or Grounded Augmented Realities?" *The Geographical Journal*, vol. 179, no. 2., pp. 177-188.

[17] New Media, an Introduction: Flew, Terry

[18] John Perry Barlow, *"A Declaration of the Independence of Cyberspace,"* February 8, 1996

[19] *FindLaw Legal News* site, Tech and IP: Cyberspace section, retrieved November 14, 2006.

[20] Cyber Conflict Studies Association, CCSA

[21] M. Graham "Geography/Internet: Ethereal Alternate Dimensions of Cyberspace or Grounded Augmented Realities?" The Geographical Journal, vol. 179, no. 2., pp. 177-188.

[22] Alexander Laurence, An Interview with John Shirley, 1994

[23] "Burroughs/Gysin/Throbbing Gristle", retrieved December 31, 2006

[24] "Internet will be the LSD of the 90s", quoted by an on-line biography

[25] Douglas Rushkoff, "Godfathers of Cyberspace"

[26] Teixeira, Marcelo Mendonca; Ferreira, Tiago Alessandro Espinola (2014-01-28). *The Communication Model of Virtual Universe*. Munich: Grin Verlag. ISBN 9783656569916.

[27] Eduardo Kac, *"Telepresence Art"*

[28] Johanna Granville "Dot.Con: The Dangers of Cyber Crime and a Call for Proactive Solutions," *Australian Journal of Politics and History*, vol. 49, no. 1. (Winter 2003), pp. 102-109.

1.7 References

- Cyberculture, The key Concepts, edited by David Bell, Brian D.Loader, Nicholas Pleace and Douglas Schuler

- Christine Buci-Glucksmann, "L'art à l'époque virtuel", in Frontières esthétiques de l'art, Arts 8, Paris: L'Harmattan, 2004

- William Gibson. *Neuromancer:20th Anniversary Edition*. New York:Ace Books, 2004.

- Oliver Grau: *Virtual Art. From Illusion to Immersion*, MIT-Press, Cambridge 2003. (4 Auflagen).

- David Koepsell, *The Ontology of Cyberspace*, Chicago: Open Court, 2000.

- Ippolito, Jon (December 1998 – January 1999). "Cross Talk: Is Cyberspace Really a Space?". *Artbyte*: 12–24.

- Irvine, Martin. "Postmodern Science Fiction and Cyberpunk", retrieved 2006-07-19.

- Roudavski, Stanislav; Parton, Sonya (2011). "Architectural Creativity in Commercialised Cyberspace". In Christiane M. Herr; Ning Gu; Marc Aurel Schnabel; Stanislav Roudavski. *Circuit Bending, Breaking and Mending: Proceedings of the 16th International Conference on Computer-Aided Architectural Design Research in Asia*. CAADRIA 2011. Newcastle, Australia: CAADRIA. pp. 365–374.

- Slater, Don 2002, 'Social Relationships and Identity Online and Offline', in L.Lievrouw and S.Livingston (eds), The Handbook of New Media, Sage, London, pp533–46.

- Graham, Mark 2011, 'Time machines and virtual portals: The spatialities of the digital divide', in Progress in Development Studies, 11(3), 211-227.

- Sterling, Bruce. *The Hacker Crackdown: Law and Disorder On the Electronic Frontier*. Spectra Books, 1992.

- Daniel Ventre, *Cyberespace et acteurs du cyberconflit*, Hermès-Lavoisier, avril 2011, 288 pages

- Zhai, Philip. *Get Real: A Philosophical Adventure in Virtual Reality*. New York: Rowman & Littlefield Publishers, 1998.

- Teixeira, Marcelo Mendonça (2012). Cyberculture: From Plato To The Virtual Universe. The Architecture of Collective Intelligence. Munich: Grin Verlag.

1.8 External links

- A Declaration of the Independence of Cyberspace by John Perry Barlow

- A Critique of the word "Cyberspace" at ZeroGeography

- Virtual Reality Photos, Austria by Johann Steininger

- Peculiarities of Cyberspace by Albert Benschop

- Sex, Religion and Cyberspace by Richard Thieme

- Get Real: A Philosophical Adventure in Virtual Reality by Philip Zhai

- Brains in a vat philosophical argument against the idea that we could be in cyberspace and not know it by Hilary Putnam

- Cyberspace as a Domain In which the Air Force Flies and Fights, Speech by Secretary of the Air Force Michael Wynne

- DOD - Cyberspace

- DHS - National Cybersecurity Division

Chapter 2

Digital economy

Digital economy refers to an economy that is based on digital computing technologies. The digital economy is also sometimes called the *Internet Economy*, the *New Economy*, or *Web Economy*. Increasingly, the "digital economy" is intertwined with the traditional economy making a clear delineation harder.

2.1 Definition

The term 'Digital Economy' was coined in Don Tapscott's 1995 best-seller *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*.[1] The Digital Economy was among the first books to show how the Internet would change the way we did business. It became an international best-seller within one month of its release, appearing on a number of best-seller lists, including the New York Times Business Book list and a seven-month run on the BusinessWeek best sellers list. BusinessWeek also named The Digital Economy the top selling business book for 1996.[2]

According to Thomas Mesenbourg (2001),[3] three main components of the 'Digital Economy' concept can be identified:

- supporting infrastructure (hardware, software, telecoms, networks, etc.),

- e-business (how business is conducted, any process that an organization conducts over computer-mediated networks),

- e-commerce (transfer of goods, for example when a book is sold online).

But, as Bill Imlah[4] comments, new applications are blurring these boundaries and adding complexity – for example, social media, and Internet search.

In the last decade of the 20th century. Nicholas Negroponte (1995) used a metaphor of shifting from processing atoms to processing bits.[5] He discussed the disadvantages of the former (e.g., mass, materials, transport) and advantages of the latter (e.g., weightlessness, virtual, instant global movement). In this new economy, digital networking and communication infrastructures provide a global platform over which people and organizations devise strategies, interact, communicate, collaborate and search for information. More recently,[6] *Digital Economy* has been defined as the branch of economics studying **zero marginal cost intangible goods** over the Net.

2.2 Impact

It is widely accepted that the growth of the digital economy has widespread impact on the whole economy. Various attempts at categorising the size of the impact on traditional sectors have been made.[7][8] The Boston Consulting Group discussed "four waves of change sweeping over consumer goods and retail", for instance.[9] Deloitte ranked six industry sectors as having a "short fuse" and to experience a "big bang" as a result of the digital economy.[10] Telstra, a leading Australian telecommunications provider, describes how competition will become more global and more intense as a result of the digital economy.[8]

2.3 Response

Given its expected broad impact, traditional firms are actively assessing how to respond to the changes brought about by the digital economy.[11][12][13] For corporations, timing of their response is of the essence.[14] Banks are trying to innovate and use digital tools to improve their traditional business.[15] Governments are investing in infrastructure. In 2013, the Australian National Broadband Network, for instance, aimed to provide a 1 GB/sec download speed fibre based broadband to 93% of the population over ten years.[16]

2.4 See also

- National Broadband Network

- Canada 3.0

- Electronic business

- Electronic commerce

- Information economy

- information society

- Knowledge economy

- Knowledge management

- Knowledge market

- Network economy

- Virtual economy

- Digitization economics

2.5   References

[1] Tapscott, Don (1997). *The digital economy : promise and peril in the age of networked intelligence*. New York: McGraw-Hill. ISBN 0-07-063342-8.

[2] "Don Tapscott Biography". Retrieved 24 October 2013.

[3] Mesenbourg, T.L. (2001). *Measuring the Digital Economy*. U.S. Bureau of the Census.

[4] "The Concept of a "Digital Economy"". Retrieved 30 March 2015.

[5] Nicholas Negroponte - Bits & Atoms - University of Phoenix. Phoenix.edu. Retrieved on 2013-07-23.

[6] Fournier, Laurent (2014). "Merchant Sharing". arXiv:1405.2051 [q-fin.EC].

[7] The New Digital Economy - How it will transform business, Oxford Economics

[8] Taking leadership in a digital economy, Deloitte Digital

[9] Digital's Disruption of Consumer Goods and Retail. bcg.perspectives (2012-11-15). Retrieved on 2013-07-23.

[10] Deloitte Australia: Digital disruption - Short fuse, big bang?. Econsultancy (2012-10-22). Retrieved on 2013-07-23.

[11] Internet matters: Essays in digital transformation | McKinsey & Company. Mckinsey.com (2013-03-13). Retrieved on 2013-07-23.

[12] Welcome to Telefónica Digital. Blog.digital.telefonica.com (2013-07-15). Retrieved on 2013-07-23.

[13] Economy is better off with digital disruption. Smh.com.au (2012-07-23). Retrieved on 2013-07-23.

[14] Being too late in digital more costly than being too early: Deloitte Telstra joint report. Computerworld (2012-11-30). Retrieved on 2013-07-23.

[15] Retail banks to tackle "digital disruption" in 2013. CCR Magazine (2012-11-21). Retrieved on 2013-07-23.

[16] What is the NBN? | NBN - National Broadband Network - Australia. NBN. Retrieved on 2013-07-23.

2.6   Further reading

- Huws, Ursula. iCapitalism and the Cybertariat - Contradictions of the Digital Economy, in *Monthly Review,* Volume 66, Issue 08 (January 2015)

Chapter 3

Critical infrastructure

Critical infrastructure is a term used by governments to describe assets that are essential for the functioning of a society and economy - the infrastructure. Most commonly associated with the term are facilities for:

- electricity generation, transmission and distribution;

- gas production, transport and distribution;

- oil and oil products production, transport and distribution;

- telecommunication;

- water supply (drinking water, waste water/sewage, stemming of surface water (e.g. dikes and sluices));

- agriculture, food production and distribution;

- heating (e.g. natural gas, fuel oil, district heating);

- public health (hospitals, ambulances);

- transportation systems (fuel supply, railway network, airports, harbours, inland shipping);

- financial services (banking, clearing);

- security services (police, military).

3.1 Regional critical-infrastructure protection programmes

3.1.1 European Union

The European Programme for Critical Infrastructure Protection (EPCIP) has been laid out in EU Directives by the Commission (EU COM(2006) 786 final). It has proposed a list of European critical infrastructures based upon inputs by its Member States.

Each designated European Critical Infrastructures (ECI) will have to have an Operator Security Plan (OSP) covering the identification of important assets, a risk analysis based on major threat scenarios and the vulnerability of each asset, and the identification, selection and prioritisation of counter-measures and procedures.

3.1.2 Germany

The German critical-infrastructure protection programme is coordinated by the Federal Ministry of the Interior. Some of its special agencies like the German Federal Office for Information Security or the Federal Office of Civil Protection and Disaster Assistance BBK deliver the respective content, e.g., about IT systems.[1]

3.1.3 United Kingdom

In the UK, the Centre for the Protection of National Infrastructure provides information, personnel and physical security advice to the businesses and organisations which make up the UK's national infrastructure, helping to reduce its vulnerability to terrorism and other threats.

It can call on resources from other government departments and agencies, including MI5, the Communications-Electronics Security Group and other Government departments responsible for national infrastructure sectors.

3.1.4 United States

The USA has had a wide-reaching Critical Infrastructure Protection Program in place since 1996. Its Patriot Act of 2001 defined critical infrastructure as those "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters."

In 2014 the NIST Cybersecurity Framework was published, and quickly became a popular set of guidelines, despite the imposing costs of full compliance.[2]

These have identified a number of critical infrastructures and responsible agencies:

1. Agriculture and food – Departments of Agriculture and Health and Human Services

2. Water – Environmental Protection Agency

3. Public Health – Department of Health and Human Services

4. Emergency Services – Department of Homeland Security

5. Government – Department of Homeland Security

6. Defense Industrial Base – Department of Defense

7. Information and Telecommunications – Department of Commerce

8. Energy – Department of Energy

9. Transportation and Shipping – Department of Transportation

10. Banking and Finance – Department of the Treasury

11. Chemical Industry and Hazardous Materials – Department of Homeland Security

12. Post – Department of Homeland Security

13. National Monuments and icons - Department of the Interior

14. Critical Manufacturing - Department of Homeland Security (14th sector announced 03-Mar-2008; recorded 30-Apr-2008)

The National Infrastructure Protection Plan (NIPP)[3] defines critical infrastructure sector in the US. Presidential Policy Directive 21 (PPD-21),[4] issued in February, 2013 entitled Critical Infrastructure Security and Resilience mandated an update to the NIPP. This revision of the plan established the following 16 critical infrastructure sectors:

1. Chemical

2. Commercial Facilities

3. Communications

4. Critical Manufacturing

5. Dams

6. Defense Industrial Base

7. Emergency Services

8. Energy

9. Financial Services

10. Food and Agriculture

11. Government Facilities

12. Healthcare and Public Health

13. Information Technology

14. Nuclear Reactors, Materials, and Waste

15. Transportation Systems

16. Water and Wastewater Systems

National Monuments and Icons along with the Postal and Shipping sector were removed in 2013 update to the NIPP. The 2013 version of the NIPP has faced criticism for lacking viable risk measures.[5][6] The plan assigns the following agencies sector-specific coordination responsibilities:

1. Chemical -Department of Homeland Security

2. Commercial Facilities -Department of Homeland Security

3. Communications - Department of Homeland Security

4. Critical Manufacturing -Department of Homeland Security

5. Dams -Department of Homeland Security

6. Defense Industrial Base -Department of Defense

7. Emergency Services - Department of Homeland Security

8. Energy - Department of Energy

9. Financial Services - Department of the Treasury

10. Food and Agriculture -Department of Agriculture

11. Government Facilities - Department of Homeland Security and General Services Administration

12. Healthcare and Public Health - Department of Health and Human Services

13. Information Technology -Department of Homeland Security

14. Nuclear Reactors, Materials, and Waste - Department of Homeland Security

15. Transportation Systems -Department of Homeland Security and Department of Transportation

16. Water and Wastewater Systems - Environmental Protection Agency

3.2   See also

- Infrastructure

- Infrastructure security

3.3   References

[1] *Nationale Strategie zum Schutz Kritischer Infrastrukturen (KRITIS-Strategie)*

[2] "NIST Cybersecurity Framework Adoption Hampered By Costs, Survey Finds". Retrieved 2016-08-02.

[3] National Infrastructure Protection Plan

[4] http://www.whitehouse.gov/ the-press-office/2013/02/12/ presidential-policy-directive-critical-infrastructure-security-and-resil

[5] White, R. "Toward a Unified Homeland Security Strategy"], "Homeland Security Affairs", February 2014. Retrieved on 26 February 2015.

[6] Kahan, J.   "Resilience Redux: Buzzword or Basis for Homeland Security"], "Homeland Security Affairs", February 2015. Retrieved on 28 February 2015.

3.4   External links

- Infracritical: comparison of US and international definitions of infrastructure

3.5 Text and image sources, contributors, and licenses

3.5.1 Text

- **Cyberspace** *Source:* https://en.wikipedia.org/wiki/Cyberspace?oldid=732014885 *Contributors:* AxelBoldt, The Anome, Ed Poor, Little guru, Heron, Wichitalineman, Edward, Patrick, Infrogmation, Menchi, Geoffrey~enwiki, Minesweeper, Haakon, Mac, Docu, Novum, David Latapie, Saltine, Sabbut, Bevo, Carbuncle, Phil Boswell, Robbot, Dale Arnett, Verbose~enwiki, Lowellian, Chris Roy, Stewartadcock, Meelar, Centrx, The Cave Troll, Alison, Niteowlneils, JRR Trollkien, Mackeriv, Beland, MarkSweep, Loremaster, Piotrus, Oneiros, GeoGreg, Sayeth, Asbestos, Mschlindwein, Gerrit, Chmod007, M1ss1ontomars2k4, Amxitsa, Discospinster, Rich Farmbrough, Pmsyyz, MeltBanana, Bender235, Kbh3rd, Wmuf6j49et, Guiltyspark, Helix84, Mdd, Jumbuck, Drat, H2g2bob, Thryduulf, Kelly Martin, Woohookitty, Mindmatrix, Skyraider, GregorB, Graham87, Deltabeignet, Kbdank71, JIP, Rjwilmsi, Wikibofh, Quiddity, Vegaswikian, Pmc, Doc glasgow, Mayfly~enwiki, Kerowyn, Chobot, YurikBot, Alpha Prime, MGodwin, Bhny, Epolk, Bergsten, Chensiyuan, Gaius Cornelius, BlackAndy, Multichill, Retired username, Caiyu, Signpostmarv, Tertulia, Supten, Deku-shrub, Mysid, Bota47, Emijrp, Digit LeBoid, Ninly, Donald Albury, SMcCandlish, Tevildo, GraemeL, LeonardoRob0t, Garion96, That Guy, From That Show!, Nijyo, A bit iffy, SmackBot, Classicfilms, Reedy, DXBari, Gilliam, Ohnoitsjamie, Chris the speller, Trampikey, Ned Scott, Can't sleep, clown will eat me, Sommers, November05, PieRRoMaN, TechPurism, BullRangifer, Metamagician3000, Bdiscoe, Acdx, Ligulembot, Rodeosmurf, Cast, Lambiam, Nick Green, J 1982, Wickethewok, NongBot~enwiki, Filippowiki, Spydercanopus, Hu12, HisSpaceResearch, Idiotbastard, Joseph Solis in Australia, CapitalR, Achoo5000, Davidbspalding, Kotepho, Switchercat, Jeff Alexander, Warrenfish, Fordmadoxfraud, AnthonyCheng, Cydebot, Peterdjones, Tawkerbot4, Cyberguru, After Midnight, Reverting, Thijs!bot, Bot-maru, Oliver202, Roninbk, Bob.gourley@comcast.net, Dawnseeker2000, Escarbot, Psyonic, AntiVandalBot, Adasmithie99, Cruentus, Alphachimpbot, Emerald Melios, Wiki0709, Skomorokh, Suryadas, PhilKnight, Magioladitis, Kevinmon, Pan Dan, Rickard Vogelberg, Artemis-Arethusa, J.delanoy, Maurice Carbonaro, Ginsengbomb, KMQ0729, Thaurisil, Octopus-Hands, Jailbreaker22, SharkD, Drkoepsell, FrummerThanThou, Crakkpot, STBotD, VolkovBot, Vrossi1, Leafyplant, Mezzaluna, Akerbeltz, Jean-Frédéric, Rjakew, Equilibrioception, Malcolmxl5, Bot-Multichill, Almccon, Stephendcole, Yintan, Lillemose, Flyer22 Reborn, Masgatotkaca, Yerpo, Oxymoron83, Lightmouse, KritonK, Dravecky, StaticGull, Martarius, ClueBot, Kai-Hendrik, JustUniversal, Mild Bill Hiccup, Mhjackson, Blanchardb, The phantom mooer, CrazyChemGuy, Eeekster, Estirabot, Rhododendrites, DumZiBoT, BodhisattvaBot, NellieBly, RP459, Svea Kollavainen, SpellingBot, TutterMouse, Fieldday-sunday, MrOllie, Aceedwin, Tide rolls, דניאל ב., Zorrobot, Legobot, Luckas-bot, Yobot, Ptbotgourou, Fraggle81, Cyanoa Crylate, Grammaton, Taxisfolder, Kybexar, Eric-Wester, AnomieBOT, Jcoules, JackieBot, GrombularDiscourse, Bree ellen 1, Murdochs, Citation bot, TheAMmollusc, Capricorn42, Matteo004, Coretheapple, GrouchoBot, Solphusion~enwiki, MerlLinkBot, Smallman12q, FrescoBot, Tiramisoo, Sidna, Wnewbold, HeiRenXuesheng, Dejan33, Citation bot 1, Mimzy1990, Pinethicket, PrincessofLlyr, Kylin.Ma, MeUser42, DixonDBot, Gunther91, Adi4094, Minimac, Difu Wu, Mean as custard, RjwilmsiBot, WikitanvirBot, Timtempleton, Niwi3, Dcirovic, Cybexar, SporkBot, Donner60, Mentibot, ChuispastonBot, ClueBot NG, Gaioa, This lousy T-shirt, LamaHippoOtter, Portinfinite, Usageunit, Helpful Pixie Bot, Titodutta, BG19bot, AvocatoBot, MeanMotherJr, Codename Lisa, Avwezel, Jodosma, Ginsuloft, FredManBlueberry, Manul, Max.werner20, Vexatron, Hlbgle, Monkbot, Marcomayer, Luigimartino.unifi, Daniela C DeMaria, Nday56, Trewser, Celestialghost, WillSelwood, Harryjames666, Marceloufrpebr, Eugene Wallo and Anonymous: 218

- **Digital economy** *Source:* https://en.wikipedia.org/wiki/Digital_economy?oldid=729379929 *Contributors:* Michael Hardy, 6birc, Rich Farmbrough, CanisRufus, BD2412, Vegaswikian, Wavelength, Teloss, Dfa881, Sardanaphalus, SmackBot, Rigadoun, Twas Now, Headbomb, Shuetrim, RedCoat10, Magioladitis, Linkerules, Manticore, OohBunnies!, Perohanych, Albert Simard, Alexius08, MystBot, Addbot, AndersBot, OlEnglish, SasiSasi, Luckas-bot, Yobot, Citation bot, Erud, Alexandru Stanoi, Erik9bot, Rmarsden, Vrenator, Lucius Winslow, Rollins83, EmausBot, Dewritech, RA0808, ChuispastonBot, ClueBot NG, Jaobar, BG19bot, Deepak2510, MusikAnimal, Compfreak7, Meatsgains, Dalek2point3, Anandkadia, Pelinquin, ChrisGualtieri, IjonTichyIjonTichy, Dexbot, Makecat-bot, Schrauwers, Pedarkwa, Fixuture, Cwilliamson16, WorldInhabitant and Anonymous: 30

- **Critical infrastructure** *Source:* https://en.wikipedia.org/wiki/Critical_infrastructure?oldid=738732404 *Contributors:* Edward, Nealmcb, Kku, Schneelocke, Topbanana, Markus Kuhn, ChicXulub, YUL89YYZ, Danthemankhan, Jguk, Rjwilmsi, Ddawson, Bhadani, RussBot, Arado, Epolk, CSWarren, Nixeagle, P199, Levineps, CWY2190, Fayenatic london, JamesBWatson, Jalittle, DGG, Chervitz, Tuduser, Bogey97, Zhongxin, Ephebi, Nauka, Idioma-bot, EH101, Caseyrc, Thehubnub, Regregex, LeadSongDog, Spartaninternet, Twinsday, Canis Lupus, Engi08, Macaulat, Galzigler, Addbot, Jpmonroe, Socipoet, Andrea.rigoni, Yobot, Ptbotgourou, AnomieBOT, Infracritical, AlexPlante, FrescoBot, Brett R. Stone, Gerda Arendt, Rcsprinter123, ClueBot NG, PhnomPencil, Compfreak7, Lesser Cartographies, Palacios.rafael, Mjb638, KasparBot and Anonymous: 18

3.5.2 Images

- **File:Emblem-money.svg** *Source:* https://upload.wikimedia.org/wikipedia/commons/f/f3/Emblem-money.svg *License:* GPL *Contributors:* http://www.gnome-look.org/content/show.php/GNOME-colors?content=82562 *Original artist:* perfectska04
- **File:Free-to-read_lock_75.svg** *Source:* https://upload.wikimedia.org/wikipedia/commons/8/80/Free-to-read_lock_75.svg *License:* CC0 *Contributors:* Adapted from 9px|Open_Access_logo_PLoS_white_green.svg *Original artist:* This version:Trappist_the_monk (talk) (Uploads)
- **File:Grand_Coulee_Dam_spillway.jpg** *Source:* https://upload.wikimedia.org/wikipedia/commons/d/d8/Grand_Coulee_Dam_spillway.jpg *License:* CC BY 2.0 *Contributors:* Grand Coulee Dam spillway *Original artist:* David Brodbeck from Seattle, WA, USA
- **File:Unknown_engraver_-_Humani_Victus_Instrumenta_-_Ars_Coquinaria_-_WGA23954.jpg** *Source:* https://upload.wikimedia.org/wikipedia/commons/d/d5/Unknown_engraver_-_Humani_Victus_Instrumenta_-_Ars_Coquinaria_-_WGA23954.jpg *License:* Public domain *Contributors:* Web Gallery of Art: Image Info about artwork *Original artist:* Unknown Master, Italian (active 1570s)

3.5.3 Content license