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DELIVERABLE D3.2

Draft of Philosophy of the Internet and web hermeneutics book

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Workpackage:	**D3.2 Draft of Philosophy of the Internet and web hermeneutics book**
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1. Summary of Progress

The goal of the handbook is to build a transdisciplinary field of *data ethics* combining work in philosophy, sociology, computer science, and critical theory. The term 'transdisciplinary' is used rather than 'interdisciplinary' insofar as the goal is to achieve not just multiple perspectives on the same subject matter, but create a unified understanding that builds on, but 'transends' the limitations of existing fields. This approach was pioneered by the philosopher Bernard Stiegler, who supports the use of the term '*digital studies'* over *'digital humanities'* insofar as the disciplines are defined by methods, and a complete understanding of the digital will require techniques from the social sciences and computer science as well as traditional humanities-based exegesis of texts or the philosophical understanding of concepts. This handbook proposal is under discussion with Rebecca Shillabeer of Routledge Philosophy. The book proposal was also sent to MIT Press via Gita Manaktala, however, MIT Press refuses to publish collected editions at this time and would prefer a single-volume edition by Bernard Stielger or Harry Halpin on the topics of NEXTLEAP, which they do agree are of importance. Since NEXTLEAP is viewed as a collective project, the attempt to do an edited collection based on the outline below will be tried first. If during the course of the second period of the project it does not appear (by M24) that there are enough authors that will contribute to the edited volume, another single-author proposal will be sent to MIT Press. Below is the proposal that was sent to Routledge and MIT Press originally, with a series of edits in response to Routledge's response.

2. Book Rationale

Within the last two decades, the Internet has become the inescapable nexus of social interaction and now holds an essential place in the diffusion of knowledge and political economy, leading to not only to rapid technological change, but also revolutionary social change. Yet no single book exists that can offer a broad and critical overview of current debates central to Internet Science encompassing ethical, political, and social aspects while being grounded in the technical foundations.

The infrastructure of the Internet remain obscure to almost everyone, whether at work or in their most intimate communications, despite the fact that through these interactions personal data is harvested: Personal data is now viewed as “a new asset class” and even the “new oil” of the information age. The impact of this data in aggregate as “big data” cannot be underestimated, as it currently fuels the machine-learning algorithms – otherwise known as “artificial intelligence” that is leading to both revolutions in automation as well as unemployment. Today, more than ever, we need a critical understanding of the new data-driven economy that can form the foundation for a new data ethics that allows the handling of data in way that strengthens human capabilities rather than exploits them.

This book should have a wide readership. Understanding the architecture of the Internet and its implications for the rest of society’s activities is of strategic importance for everyone from private companies, to public institutions as well as the next generation of “digital natives” who take this infrastructure for granted. While whistleblowers such as Edward Snowden have contributed to raise the level of social consciousness over the potential and actual dangers of digital technologies, there is still much work to do in formulating problems, conceptualizing the issues and proposing new orientations in technological development and social practices. It is the task of philosophy to reveal new problems and to produce new concepts in order to help society face its techno-social history. This will be done via both the exploration of the epistemological and ontological problematizations brought about the net, as well as new forms of political philosophy that take as central notions of power, democracy, security, decentralization, and privacy on the Net. Since the topic is fundamentally both technical and crosses disciplinary boundaries, the book will not only gather philosophers but also engineers, legal and political scholars, sociologists, and computer scientists.

The originality of the book consists in the fact that it features:

- An overview of the basic concepts and controversies of ethics involving big data and the internet
- A philosophical approach that unifies previously disjoint technical and sociological works in “internet science”
- Offers a critical analysis of data architectures and infrastructures
- Pioneers a proposition of fundamental rights and autonomy that demonstrates the importance of protocols, crytography, and decentralization in the digital age.

3. Structure of Contents

3.1 Section 1: Politics in the Digital Era

The first section of the edited collection will be devoted to presenting the main concepts and controversies regarding data ethics based on the governance of data and the internet itself (i.e. 'internet governance'). This section will range over technical norms, rules and decision making processes for the administration of data and internet governance, including an analysis of the roles of governments, private enterprise, and civil society. Since the relatively recent rise of big data across nearly all aspects of life, researchers and experts have worked at analyzing and revealing the ethical issues raised by those new technical systems, and at producing concepts in

order to orientate the technical, political and geopolitical developments to come in terms of new forms of governance. These problems are founded in classical pre-Internet political philosophy insofar as these issues relate to previous understandings of power, justice, the commons, and the production of law itself. Philosophical analysis is not separable from the history of the development of technologies and the institutions around them, including existing laws such as the European Data Protection Regulation. If knowing *who* governs the Internet, and *how*, is indeed a matter of political philosophy, a thorough investigation requires a strong technical knowledge of the architecture and the functioning of technical infrastructures. Each author will contribute to reminding the reader a number of necessary conceptual distinctions: First, a historical reminder will be done about the evolution of Internet and the controversies it produced, including the danger of its current centralization. Then, authors will focus on more specific contemporary issues ranging from the governance of AI to the capitalist abuses involved in the material production of digital technologies.

3.2 Section 2: Data and Surveillance

The second section will address the problem both of privacy and of the public in the digital age, a central concern of data ethics. Following the conceptual distinctions established in the previous chapter, it will be possible to envision a critical (or as put by Stiegler, “pharmacological”) approach to some of the key philosophical notions at heart of the debate. The dual notions of *transparency* and *opacity* will be analyzed first in terms of data, when information should or should not be public. In detail, we'll go through how the ideology of open data, originally applied to government data via Berners-Lee's concept of a Semantic Web is now being applied to individual data, allowing the harvesting of an individual's data for uses beyond an individual's control, leading the philosopher Eduard Glissant has bring up the “right to opacity” to counter-act this increased transparency. Yet much transparency is self-inflicted increased individual self-monitoring, including the 'quantified self' movement, and whether or not this is a new form of 'bio-fascist' control. Encryption can be analyzed as a method for creating opacity in terms of data, as well as a method of therefore upholding rights in the digital age. Then we will continue to explore opacity and transparency in terms of not only of data but in terms of cognition and interpretation, that data-driven algorithms are ultimately cognitive opaque while capable of transforming data into knowledge. The framing of traditional studies of privacy focus on the notion of the individual, and so we will also explore how privacy works in terms of groups, capable of producing knowledge in its very own way, beyond the individual. The work of the philosopher Gilbert Simondon can be used to conceptualize privacy via an ontological approach built on relations as opposed to classical 'individual-based' ontology of substances. The philosophical and technical problems brought by privacy lead us to consider the problem of trust. Trust is needed to constitute a public space, and given the collapse of trust in traditional nation-states and private enterprises such as Google and Apple, one issue is whether or not this be done using decentralization and encryption in the form of blockchains.

3.3 Section 3: The Philosophy of Digital Studies

The third section will aim at presenting a unified philosophical groundwork in order to re-envision and reformulate the various controversies around data and ethics exposed in the previous articles in order to formulate new forms of political strategy and tactics. This will form a new philosophy of the internet based on a perspective that transcends traditional disciplinary boundaries, the concept of *digital studies* of Stiegler that attempts to combine the multiple levels of ethical impact (psychological, social, and philosophical) of the digital revolution into a single framework. The foundation of this chapter will be Stiegler's re-conceptualization of data, entropy, and complexity as foundational philosophical concepts, for example with encryption being able to hide complexity in data as entropy from adversaries. However, the fight against entropy and for complexity can also be thought of as central to the political and even ecological debates of the time, including climate change and the “Anthropocene.” This also leads to a new analysis of “proletarianization” as being stripped of cognitive and technical capacities in dealing with data. In face of these dangerous political times caused by the 'disruption' of the internet in both our everyday lives and political structures, one path forward can be found in combining the 'incalculable' power of human interpretation and the computational power of technology to amplify human intelligence, create new forms of extended cognition (as put in the “Extended Mind” hypothesis by Clark), and

create collective intelligence in groups. If the “breakdown” of the modern industrial era in the digital age can be thought of an ontological breakdown - going away classical “top-down” ontology (Aristotle’s or Kant’s theories of categories) and towards “bottom-up” processes of categorization made possible by digital annotation technologies in the form of a “hermeneutic Web” provides a tactic for rebuilding “digital capacities” in education. The philosophy explicated in this section end with a call for 'taking care' of data, and for the application of data ethics in all realms of life.

3 Sections and Invited Chapters

For each contribution, the minimum length will be 700 words and there will be expected 35 final contributions. We expect some of the authors not to be able to complete their texts according to deadline, and thus will ask for substitute authors and new subjects as necessary in order to give a comprehensive view of the subject matter.

Section 1: Politics in the Digital Era

1. The Ethics of the Internet
Charles Nesson (Harvard University): https://cyber.harvard.edu/people/cnesson

2. Internet Governance
Bernard Benhamou (Sorbonne): http://www.netgouvernance.org/NG2/Accueil_Netgouvernance.org.html

3. Governance by Infrastructure
Francesca Musiani (CNRS): http://www.csi.mines-paristech.fr/People/musiani/

4. Peer to Peer Ethics
Michel Bauwens (P2P Foundation): http://wiki.p2pfoundation.net/Michel_Bauwens

5. Blockchain: Internet governance redistributed?
Primavera de Filippi (CNRS): https://cyber.harvard.edu/people/pdefilippi

6. Exploitation and the Manufacture of Digital Devices
Jack Qui (Chinese University of Hong Kong): http://www.com.cuhk.edu.hk/en-GB/people/teaching-staff/qiu-jack-l-c

7. Labour in the Digital Age
Antonio Casilli (ParisTech) *http://www.iiac.cnrs.fr/spip.php?page=article-annuaire2&id_article=12*

8. Data and Society:
Zeynep Tufeki (UNC): http://www technosociology.org

9. Data and Politics:
Geoff Mulgan (Nesta) http://www.nesta.org.uk/users/geoff-mulgan

10. Data and Ethics:
Terrell Ward Bynum (S. Connecticut) http://rccs.southernct.edu/471/

11. The Political Origins of Social Media:
Blaine Cook and Evan-Henshaw Plath: https://en.wikipedia.org/wiki/Blaine_Cook_%28programmer%29

12. Tahrir Square and Digital Revolutions
Amr Gharbeia (Egyptian Initiative for Personal Rights): https://eipr.org/en/tags/amr-gharbeia

13. Internet Censorship in Iran and Beyond:
Mahsa Alimardi (Oxford Internet Institute): https://www.mahsalimardani.com/

14. On Russian Cyberwarfare and the Idea of "Digital Self Defence"
Ksenia Ermoshina (CNRS): http://www.csi.mines-paristech.fr/en/people/phd-candidates/ksenia-ermoshina/

15. Human Rights and Protocol Standards
Niels Ten Oever (Article 19): http://nielstenoever.net/

Section 2: Data and Surveillance

16. The Political Economy of Mass Surveillance
Elijah Sparrow (Riseup Labs): http://riseuplabs.org/

18. Big Data and Transparency
Alex "Sandy" Pentland (MIT): http://web.media.mit.edu/~sandy/

19. Ethics and Cryptography:
Phil Rogaway (UC Davis): http://web.cs.ucdavis.edu/~rogaway/

20. Ethics and Hacking
Ahmed Ghappour (Boston University): http://www.bu.edu/law/tag/ahmed-ghappour/

22. Anonymous Communications
Ian Goldberg (University of Waterloo): http://www.cypherpunks.ca/~iang/

23. Leaking and Anonymity
Gabriella Coleman (McGill University): http://www.gabriellacoleman.org/

24. Transparency as a Political Concept
Mikkel Flyverbom (Stockholm University)
http://www.socant.su.se/english/global-foresight/participating-researchers/mikkel-flyverbom

25. Debunking Algorithms and Enlightening the Black Box
Dominique Cardon (Sciences Po): http://www.medialab.sciences-po.fr/people/dominique-cardon/

26. The Notion of Group in Digital Environments
Yuk Hui: (Luneberg University) http://www.digitalmilieu.net/yuk/

27. Empowerment and Data Protection
Valérie Peugeot (CNIL): *https://www.cnil.fr/fr/commissaire/valerie-peugeot*

28. Privacy-Enhancing Technologies
George Danezis (UCL): http://www0.cs.ucl.ac.uk/staff/G.Danezis/

29. The Politics of Cryptography
Seda Guerses (KUL): http://homes.esat.kuleuven.be/~sguerses/

30. The Web We Want and the "Magna Carta" of the Web
Renata Avila (Web Foundation): https://webfoundation.org/about/executive-team/renata-avila/

Section 3: The Philosophy of Digital Studies

31. Digital Studies and De-proletarianisation
Bernard Stiegler (IRI): http://www.iri.centrepompidou.fr

32. Software Studies
Matthew Fuller (Goldsmiths): http://www.gold.ac.uk/cultural-studies/staff/m-fuller/

33. The Metaphysics of Computation
Brian Cantwell Smith (University of Toronto): http://www.ageofsignificance.org/people/bcsmith/

34. Automation and the Amplification of Intelligence
David Bates (UC Berkeley): http://rhetoric.berkeley.edu/faculty-profile/david-bates

35. The History and Philosophy of the Web
Harry Halpin (Inria) http://www.ibiblio.org/hhalpin

36. A Critical History of Data
Orit Halpern (Concordia University) http://orithalpern.net/

37. Data and Algorithmic Control
Antoinette Rouvroy (University Namur) http://unamur.academia.edu/AntoinetteRouvroy

38. Socially Extended Knowledge
Spyridon Palermos (University Cardiff): https://sites.google.com/site/sopalermos/

39. Towards a Hermeneutical Model in Social Networking or the Virtues of Controversy
Franck Cormerais (University Bordeaux):
http://mica.ubordeaux3.fr/index.php/fr/component/content/article/19-chercheurs-axe2/752-cormerais-franck

40. The Philosophy of Democratic Technology
Andrew Feenberg (University of British Columbia): http://www.sfu.ca/~andrewf/

5. Intended Audience

The purpose of the book is to constitute a reference resource on the key topics and debates in the emerging fields of internet science and data ethics, with a focus on issues of much current interest such as decentralization, cryptography, and big data. This book should guide new students as well as experienced practitioners through the essential conceptual distinctions while developing new conceptual propositions that link these current issues to longer-standing philosophical questions (ontology, hermeneutics, political philosophy).

There are no current comprehensive critical analysis of data. Although there exists texts on surveillance studies in general and analytic “the philosophy of information” via the work of Floridi, none of the existing works bridges the gap between “continental” and “analytic” philosophy while remaining both rigorously technical and political. The closest work is the work of Christian Fuchs, but he proposes a narrow Marxist reading of technology rather than a more broad philosophical inquiry that can develop new and suitable concepts. The aimed readership mainly consists in students and researchers in philosophy, media studies, computer science and communication studies.

6. Short Biographies of Editors

Bernard Stiegler

Current positions: Director of the Institute of Research and Innovation (Centre Pompidou, Paris), professor at the Technological University of Compiègne - France, visiting professor at Brown University - USA (2017), visiting professor at Nanjing University - China (2016-2017). Considered one of the leading philosophers of technology in the world, his books now exert a large influence on critical media studies.

Current research areas:

- Relation between technology and philosophy, not only in a theoretical sense, but also situating them in industry and society as practices
- Exploring the possibilities of developing technologies of spirit
- Individuation in consumer capitalism

  New possibilities of an economy of contribution base on a new architecture of Internet

Publications: (Over 30 books)

- *La Technique et Le Temps* (Three volumes, English translation: *Technics and Time)*
- *La société automatique* (English translation: The Automatic Society)
- *Constituer l'Europe* (Two volumes)

Harry Halpin

Current position: Research Scientist, INRIA. Visiting Researcher at Sociotechnical Systems Research Center at MIT. Receiving his Ph.D. from the University of Edinburgh and a Marie Curie Scholar, as well as a participant in the D-CENT project, he now is project co-ordinator of the NEXTLEAP project.

Current research areas include privacy, security, social media, AI, Semantic Web and philosophy of language and mind

Publications:

Books:

- Halpin, H. and Monnin, A: (2014) P*hilosophical Engineering: Towards a Philosophy of the Web.* Wiley Blackwell.
- Halpin, Harry: (2013) *Social Semantics: The Search for Meaning on the Web. Springer.*

Representative Journal Articles and Peer-reviewed Conference Proceedings (over 30+ publications)

1) Harry Halpin, Kelsey Cairns. and Graham Steel. (2016). Security Analysis of the W3C Web Cryptography API. In *Proceedings of Security Standardization Research*, Gaithersberg (USA), December 5-6 th 2016.
2) Elijah Sparrow, Harry Halpin, Kali Kaneko, and Ruben Pollan. LEAP: A Next-Generation Client VPN and Encrypted Email Provider. In P*roceedings of International Conference on Cryptology and Network Security (CANS)*. Milan (Italy), November 14-16, 2016.
3) Harry Halpin. Does the web extend the mind? *Proceedings of Web Science Conference*. pp. 139-147 (2013).
4) Tim Berners-Lee and Harry Halpin (2012). Defend the Web. *Digital Enlightenment Yearbook*
5) Halpin, H., Robu, V., Shepard, H., (2007) The complex dynamics of collaborative tagging. *Proceedings of World Wide Web Conference*, pp. 211-220.

7. Sample Chapter

7.1 Outline of Preface by Bernard Stiegler

The book will be introduced by a paper in which Bernard Stiegler will show how data-driven technologies can be viewed as a *pharmakon*. This concept is used to describe the fact that any technological instrument is always both a poison and a remedy: it helps fixing a problem but at the same time it creates another. In this regard, encryption is indeed a remedy to generalized surveillance and through personal data exploitation. Yet at the same time, instead of allowing autonomy, those tools can deprive their users of their knowledge if they consist in “black box” solutions that cannot be inspected and understood by their users. According to Stiegler, the pharmacological nature of technics must lead us to develop a certain vigilance and a constant attention to the inevitable toxic effects of each particular technology, and to elaborate what he calls “therapeutics” through law, education and culture. Stiegler will show that data-driven systems, including machine-learning, crytpographic systems, and decentralized architectures follow the same pharmacological pattern. By facilitating communication and allowing the possibility of privacy in social exchange, encryption systems and decentralized architectures do constitute a remedy. On the other hand, it is necessary to interrogate the toxicity that can be produced with such technologies. For instance, adding new layers of communication systems means more data and thus more energy spent in communicating and in controlling those communications.

7.2 Sample Chapter on History of the Web

This draft text by Harry Halpin attempts to frame the history of the Web in a larger philosophical framework of decentralization.

In order to situate the Web both historically and philosophically as a decentralized system, it is useful to take into account the wider context of distributed cognition (Hutchins, 1995). Decentralized systems are not only technical but social. As defined by Hutchins, human social institutions and representations are a form of distributed cognition, where humans share knowledge about the world and themselves “via the propagation of representations through various media” (Hutchins, 1995). One hallmark of human understanding can then be defined as the use of these representations to guide behavior, including decision-making. For that reason, the enlightenment is defined by Kant as the “use [of] one’s own understanding without another’s guidance” (Kant, 1963). In a centralized system, an authority is in control of another entity, resulting in a loss of autonomy for the controlled entity. Autonomy can then be defined as the use of one’s own cognitive resources to create and share one’s own representations based on an independent judgment in terms of trust. In some distributed systems, the loss of autonomy may be a reasonable design choice, necessary in order to gain increased powers of co-ordination. Yet as regards humans and their social institutions, centralized control over fellow human beings was seen as biologically natural within the institution of slavery, when bodies were reduced to mere tools in a larger process. However, if one assumes that humans are at least *epistemically equal*, *i.e.*, that all humans have at least the potential to be a member of a community of self-directed knowing subjects (Lynch, 2016), then one can state as the goal of knowledge representation that it should enable humans to strive to be autonomous. If human intelligence is dependent on representations, the ability to navigate and create these representations becomes not just a matter of engineering and education, but of utmost political importance.

A number of justifications of central control have historically been put forward, but until the Enlightenment these were typically based on a claim to some kind of hidden knowledge. To summarize Rushkoff (2010), within Europe this knowledge was generally controlled by the clergy, who monopolized the ability to read and write. With the advent of the Reformation and then the Enlightenment, reading and writing skills spread into the population at large, producing the ability to independently publish and argue over truth and meaning. However, knowledge was still effectively centralized by publishers, who controlled the production of knowledge in the form of books, and the university system (which was one of the few institutions to survive the transition from feudalism into capitalism post-Enlightenment), who controlled knowledge in the form of explicit

training and certification. Knowledge itself is a prime reason for control: If someone doesn't know how to do something or how something works, it seems intuitively obvious that they should be put under the control of someone who possesses the knowledge that is proper to the task at hand. Thus, the advent of the Enlightenment led not to a massive decentralization of knowledge but to a re-centralization of knowledge in the hands of a bureaucratic elite, who maintain their power at least in part through their control over knowledge (Rushkoff, 2010). Yet this control could be naturalized, as the time and effort that could be put into the reading and training required to join the "knowledge class" did not seem to scale. To put it crudely, if one wanted access to specific knowledge up until even the 1980s, one would have had to go to Oxford to gain access to the Bodleian library — a task that was simply impossible for the knowledge-starved masses of the earth, who were thus stuck in the proletarian positions of taking orders from the knowledge elite.

After the invention of digital computers in the mid-twentieth century, for the first few decades of their existence these general purpose machines were hidden away like sacred idols by a priesthood of computer operators, with the huddled masses forced to write their programs on punch cards whose answers, in the fashion of a Sibylline oracle, would be given days later. The access to computers by a few was of course aggravating to scientists and a new class of "hackers" who wanted to be able to directly interact with the computer. The breakthrough of time-sharing shattered this monopoly of knowledge (McCarthy, 1962). Time-sharing took advantage of the fact that the computer, despite its centralized single processor, could run multiple programs at once in a nonlinear fashion, making computation much more efficient and accessible. So, instead of idling while waiting for the next program or human interaction, in moments nearly imperceptible to the human eye, it would share its time among multiple humans. Inspired by the spread of time-sharing, the question facing computer scientists was how could computational resources be shared not only throughout time, but throughout space?
The answer, under the auspices of Licklider's tenure at ARPA, was the Internet, and the scientific project to create a "Galactic Network" of researchers that could share computing resources began in earnest (Hafner and Lyon, 1996). After considerable toil, the invention by Cerf and Kahn of a general-purpose protocol for distributed communication, TCP/IP (Transmission Control Protocol/Internet Protocol), led to a plethora of applications that are generally taken for granted today, from e-mail to file sharing. With the military Internet splitting off, the use of the Internet remained from its advent in the late sixties until the late eighties effectively the domain of academic computer science researchers, with little impact on the spread of knowledge outside these rarefied circles.

As the invention of personal computing in the late seventies led to more widespread adoption of computers by the general population, various attempts to turn the Internet into a platform for sharing knowledge began to take shape, with the two most notable being WAIS (Wide Area Information Servers) and Gopher. WAIS was specialized for accessing and searching library indexes, but could be used as a general purpose search engine for searching text on a remote server over TCP/IP. Initially developed by Brewster Kahle, Harry Morris and other programmers at Thinking Machines Inc., WAIS soon became one of the more popular and effective ways to find information on the Internet despite lacking a graphical user interface. Nearly simultaneously, another team of researchers at the University of Minnesota developed another protocol, Gopher, which allowed the organization of information on the Internet through a series of menus that an ordinary person could easily navigate. Gopher could even be combined with WAIS for effective searching of full text, and it appeared that the Internet was finally poised to create a decentralized digital library of Alexandria. With numbers of users of Gopher and WAIS rising rapidly, the siren song of financial success beckoned. Thinking Machines Inc. stopped allowing WAIS to be used for free, and Brewster Kahle and Harry Morris set up WAIS Inc. to sell the software, which was promptly bought by the commercial Internet service AOL. Likewise, the University of Minnesota decided to start charging licensing fees for the Gopher codebase created by its developers. At the very moment when there was rising interest in the Internet as a potential platform for discovering knowledge by the general public, it seemed as if the first generation of software would put this knowledge behind a paywall.

Luckily, although his paper describing the "World Wide Web" was rejected for the ACM Hypertext conference in December, 1991 in San Antonio, Texas, Tim Berners-Lee decided to go the conference regardless and give a demonstration. On his way, he stopped at universities and gave demonstrations of how to set up a

Web site and “link” using hypertext from one Web site to another. As Gopher and WAIS fell into decline due to the uncertainty around licensing and commercialization, the World Wide Web started to take-off. Both taking key ideas from the concept of hypertext invented by Ted Nelson’s Xanadu and earlier systems such as Engelbart’s NLS (oNLine System) as well as departing from them, the Web at first seemed rather underwhelming. However, it succeeded because it was both easy-to-use and decentralized.

The first virtue of the Web was a radical simplification of the overly complex academic hypertext systems, allowing broken links and easy-to-use markup in the form of HTML (HyperText Markup Language). Broken links are a fundamental ingredient of the Web which, unlike other existing hypertext systems, does not guarantee access to content. A dreaded 404 error is always possible since no central authority preemptively checks URIs, payloads, continuity of service or even deliver authorization to “mint” them (provided one is in control of a domain name). The second breakthrough was the layering of HTML hypertext on top of TCP/IP and the domain name system, allowing hypertext “pages” (or rather “resources”) to be identified by URIs (Uniform Resource Identifiers) such as the now familiar *http://example.org*. Berners-Lee viewed this as even more critical to the Web than the use of HTML, since any Web page could link to any other Web page in a decentralized manner and URIs provided a universal space of names so that anyone could buy (or rent) a domain name and create a Web page.

With the easy-to-use language of HTML, the ubiquity of TCP/IP that connected computers all over the globe and the well-understood domain name system for buying names, anyone could easily set-up their own Web site to share knowledge about any subject of their choosing, and thus the Web soon took off as the first truly decentralized system for global knowledge sharing. The Web’s decentralized nature, which allowed anyone to contribute and link to anyone else, made it a “permission-less” platform for knowledge. The decentralized innovation also applied to the core functionality of the Web as developers added new tags, such as the image tag by Netscape, and a constant stream of innovation has characterized the Web ever since its inception. Of course, it helped that CERN was committed to providing the core technology for free and the permission-less innovation was managed by a consensus-run global standards process for HTML, HTTP and URIs at the Internet Engineering Task Force (IETF) and Berners-Lee’s own World Wide Web Consortium (W3C). Still, the Web was not completely decentralized, as the domain name system itself, on which URIs depend, was centralized and requires the licensing of domain names — although once one has bought a single domain name one may host many different Web sites. As regards the decentralization of knowledge, the Web was viewed not as the end, but the beginning: Berners-Lee and others began hoping that eventually it would evolve into a truly universal information space for the sharing of knowledge that went beyond hypertext.

8. References

This section presents a sample of of previously published books and journal issues concerning the various topics addressed by the book.

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Lovink, G., Rasch, M. (eds.) (2013). *Unlike Us Reader: Social Media Monopolies and Their Alternatives*, Institute of Network Cultures.

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Preneel, B., Rogaway, P., Ryan, M.D., Ryan, P.Y.A. (2015). *Privacy and security in an age of surveillance* (Dagstuhl perspectives workshop 14401). Dagstuhl Manifestos, 5(1), pp. 25-37, 2015.

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Berry, D.M. (2015), *Critical Theory and the Digital*, Bloomsbury.

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