ECOSYSTEMS AND ARTISTIC RESEARCH IN FORMING DIGITAL CURATORIAL INFRASTRUCTURES

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DILEMMAS OF DIGITAL CURATION

Digitization and digitalization have become fundamental means of transformation of memory institutions and their role in the information society. Not only the collections of artworks, literature, and documents, but also majority of social representations have turned to data formats. Digital media and institutional critique have transformed knowledge processes and organizational ecologies. Archives and galleries have become content providers for digital distribution channels. While they became primarily providers of digital content, the indicators according to which their performance is evaluated are quantity of digital content they produce, its reach, and consumer engagement on digital platforms.

Nevertheless, the flip side of this picture has revealed many ongoing and even enlarging gaps and problems calling for critical analysis. At the very heart of these issues are general questions of democracy and equal rights to social representation. The architecture of corporate digital infrastructures limits the discourse and our ability to represent non-majority societies, and more than human actors. Moreover, there are unresolved concerns about environmental and climate issues affecting the sustainability of digital transformation. Facing these circumstances, the humanities and digital curation of media art are in the process of embracing new approaches.

The first stage of the digitalization of cultural heritage and the accompanying discourse within the digital humanities began in the 1990's. Scholars participating in projects of building research repositories and editing metadata were engaged in a wide range of discussions, from technical to philosophical, and they were getting acquainted with markup languages and creating model content types. Within that convergence of humanities and information engineering, the power of rhetorical arguments had been slowly embodied and tamed by information structures. (Drucker, 2012)

At the same time, the digital archiving strategies, influenced by post-structuralism and deconstruction, were reshaped by the urge to reconsider categories of identity, gender, race, nations, authorship, power relations, bodies, and subjectivity. Questions that are part of decision making at the memory institutions, like what and why something is included in and excluded from digital archives and represented in research, turns out to be political, or at least a matter of collection policies.

Despite all of the novel approaches in curation and seemingly unlimited possibilities of displaying the archival material, it is always limited by the underlying information infrastructures, which carry a variety of biases and presumptions. For example, communication channels, data modes, and visual rhetoric are borrowed from areas like commerce and business applications. In the words of Miriam Posner:

> *"We can do what we know how to do: visualize datasets that we inherit from governments, corporations, and cultural institutions, using tools that we have borrowed from corporations. Or we can scrutinize data, rip it apart, rebuild it, reimagine it, and perhaps build something entirely different and weirder and more ambitious."* (Posner, 2016)

Jonathan Gray and his colleagues draw attention to how data infrastructures carry normative forces by producing data formats prioritising certain ways of knowing over others and thus can be also mal-aligned with publics interests. (Gray et al., 2018) They emphasize our need for 'data infrastructure literacy', which provides more than just knowledge of data as a resource of static and finished information to be utilised, but embraces how data infrastructures organize and materialize relations between people, things, disciplines and technologies. The data literacy should not just accessorize people with data processing skills, but its goal is to cultivate sensibilities for data culture and data politics. These new sensitivities include our awareness of whereas infrastructures *"make space for collective inquiry, experimentation, imagination and intervention around data in educational programmes and beyond, including how data infrastructures can be challenged, contested, reshaped and repurposed."* (Gray et al., 2018)

Figure 1: Zavala, K. & Odendaal, A. (2020). *Algorithms of Late Capitalism zine #3*. The project reflects socio-cultural critique of tech, surveillance or AI. Retrieved from https://algorithmsoflatecapitalism.tumblr.com/zines

Increasing volumes of digital data and the gradual centralization of information services, which is marketed as the 'cloud', negatively impacts ecosystems and has limited benefits for many organizations. The outsourcing of information technologies to cloud companies was accompanied by unrealistic expectations. Cloud was ideal for speculative investment into 'startups' without their own infrastructure to achieve fast development and quickly assess their market value. The situation of memory institutions like archives and museums is quite different as they are setting their goals in long time periods. Unfortunately, the digitalization of state and public institutions often leads to large-scale repositories with generic features and corporate design. Digital archives could easily fall under the rubric of 'research infrastructures', aimed at providing services for industrial development and competitive economy.

The immateriality of cloud was a carefully crafted illusion. Expanding digital infrastructures and the growing amount of data are not without ecological consequences that the metaphor of cloud obscures. According to the data of IDC (International Data Corporation)[1], there were 500 thousand data centres worldwide in 2012. In 2019 it was already 8 million, which counts for a 16-fold increase. By energy consumption 3% globally, digital media has surpassed the airlines' industry, and the prediction for 2025 is a growth to 5-6% of worldwide energy consumption.[2] The area of server farms goes from an average of 1000 square meters to 12 hectares, with energy consumption up to 100 megawatts. The building of server housing facilities, equipped with cooling systems and power generators, consumes large quantities of construction material even when using renewable energy. Over the course of its lifetime the average smartphone generates 33 times more energy consumption in operations in datacenters than in its own use. The energy mix in the power grids still contains a significant part coming from coal and gas. The underlying infrastructure, as well as transport and parking, severely damages agricultural soil and natural landscapes, producing extraordinary material and energy demands that have never existed before. We should visualise the reality of smoking factories behind our websites and mobile applications.

1   IDC's Worldwide Quarterly Server and Network infrastructure trackers. IDC 2008–2019. Retrieved from https://www.idc.com/prodserv/subservices.jsp

2   The Shift Project. (2018). Lean ICT – Towards digital sobriety. Retrieved from https://theshiftproject.org/en/article/lean-ict-our-new-report/

BABYLON OF EXPERTS

When we think of sustainable approaches, some deeper questions about our society arise. Natural resources are depleted by the extractive consumption economy, but there is undeniably a cultural dimension of unsustainability relating to behaviors, social conventions, institutions, values, worldviews, and epistemological bases. (Kagan, 2013, p. 24) In our society, vertical, spiritual, substantive rationality that fostered critical reflection was supplanted by sensoric, hyper-consumerist rationality and technologist effectivity. Historical developments of science has constituted a worldview that is atomistic and individualistic. Things are distinct and measurable material entities, people are separated from each other and from their environment. Industrial and postindustrial western societies are the paradigms of economic progress and development. However, not only philosophers suggest that there might be something wrong with the modernist scientific thought and its application. Erwin Laszlo points out that this atomistic view, inherited from the modern scientific method, has its roots in the fragmentation of our understanding. (Laszlo, 1996, p. 33) An advocate of transdisciplinary thinking, Basarab Nicolescu , refers to it as a 'paradigm of simplicity', and contends that it is based on the binary thinking produced by classical logic and the rigid norms of truth in science, thanks to which *"discipline can pretend to contain all knowledge within its own field entirely"*. (Nicolescu, 2002, p. 33)

During the pandemic of Covid-19 disease we could observe how the impervious boundaries of specializations limited any expert discussion. Journalists were often met with evasive answers from experts like: "I am a clinician, you have to ask epidemiologist", "I am an epidemiologist, you have to ask immunologist", "I am an immunologist you have to ask vaccinologist" and so on. Even the scholars of environmental subdisciplines, that just operate on varied scales, e.g., population biology and ecosystem ecology, were often not able to communicate with each other. (Kuneš, 2020, p. 215)

Nicolescu describes this situation of narrow specialization of human knowledge as Babelisation:

> *"The decision-maker becomes increasingly more incompetent regardless of his or her intention […] even a group comprised of the best specialists from all the various disciplines would only be able to develop a generalized incompetence, for the simple reason that the sum total of competencies is not competence: on technical level, the intersection between different domains of knowledge is an empty ensemble."* (Nicolescu, 2002, p. 42)

He also sees the technology as a main driver force of the atomization of science and claims that the awaited benefits of specializations of disciplines turned to opposite consequences: *"a multischizoid, complex reality has replaced what should have been the simple one-dimensional reality of classical thought"*. (Nicolescu, 2002, p. 37)

Despite all the scientific discoveries and knowledge, we've seen the growth of anti-scientific worldview. The number of Flat Earthers, rejecting any fact or rational argument, the Q-anon and other conspiracy theories that accumulated followers by offering easy answers to complex problems. What science cannot explain is replaced by magical thinking and slippery logic that home on affective concerns and behaviors. Q-anon snowballed this way other social groups, being interested in holistic thinking, yoga, or wellness. Undermoderated social platforms provided by global corporations just took advantage of situation they created themselves, and amplify affect and fear to monetize on, while slipping out of any social responsibility.

We should learn from this situation on social media while searching for transdisciplinary solutions for science suffering from 'Babelisation' and to work for a more consistent, socially interconnected communication networks set up to ensure that exclusive specialized knowledge has to be followed by additional levels of inclusive public discourse. The same goal is necessary when the interfaces of public cultural repositories are designed.

In *Art and Sustainability*, Sacha Kagan (Kagan, 2013, p. 37) describes how 'Technological System', e.g., efficient and rational implementation of technology and technocratic decisions throughout the whole society, is deeply rooted in positivism of Enlightenment accepts only one common logic that is based on representation by numbers, while anything escaping this reasoning is seen as a mere illusion. The pure reason of positivists science is driving the technical progress, and thus it is required to be free of any mythical thought and to become an universal instrument in all-encompassing economical apparatus. Universal robots in Karel Čapek's dystopic play *R. U. R.*, *Rossum's Universal Robots* (1921) illustrated this idea by being designed to produce anything 'ad infinitum', without rising any ethical or moral questions. Niklas Luhman, system sociologist, remarks:

> *"Technological progress leads to ecological disasters, which cannot be avoided however only through more advance technological progress and thus at the price of an even greater dependency of society to technology."* (Luhmann, 1999, p. 47)

On the contrary, Kagan explains, the art does not fit into this system of the 'most efficient method' and artists as dreamers are part of quite opposite invention of 19th century – subjectivity and individualism of Romanticism. 'Romantic Order' is where all intuition, imagination, attention to feelings and admiration of nature reside. Artists in Romantic Order are gifted to create works of exceptional beauty by their hands, they are independent and free from influences from the others. This dichotomy, as

a result, creates an artist, isolated outside of the Technological System, locked in their romantic realm of individual genius as in an escapist ghetto, and freed from the structural hold of formal rationality. (Kagan, 2013, p. 70) In the 20th century, a number of art movements addressed the difficulties of this profound division of the social from the technological, and artists refused to remain silent in the face of technocratic authority in their purported capacity as producers of aesthetic objects.

Before going into greater detail about how systems art and media art contribute to interdisciplinary dialogues between science, technology, and society, it is important to note how artistic research, in general, underlies inventive data practices and how it can question the default lines of inquiry that are built into data infrastructures, including reassembling them in accordance with public interests.

Artistic research is grounded in practice led research as a distinctive feature of the research activities conducted by arts and humanities researchers. It involves the identification of research questions, contexts and problems, while the research methods and outputs incorporate a significant focus on creative practice. At that interdisciplinarity in artistic research involves not only multiple disciplines (informatics, biology, ...), but also multiple base domains of inquiry. Graeme Sullivan (Sullivan, 2009) defines those domains as

Interpretivist: constructivist creation of meaning, network, dialogue, interdiscipline
Empiricist: exploratory, conceptual, reflective, discipline-based
Critical: positionality-change, contextual, perspective, question, transdiscipline

Art practice is meta-theoretical, practical, reflexive, post-discipline and makes use of visual systems accordingly. It also comes in coupled with abovementioned interpretivist, empiricist and critical domains forming theory dimensions: Meaning-making, Enact-explain, Create-critique.

ENTANGLEMENT OF VIDEO ART AND SYSTEMS ART

In the September issue of Artforum in 1968, Jack Burnham published an article Systemic Aesthetics, where he wrote :

"Increasingly, products – either in art or life – become irrelevant and different set of needs arise: these revolve around such concerns as maintaining the biological livability of the earth, producing more accurate models of social interaction, understanding the growing symbiosis in man-machine relations, establishing priorities for the usage and conservation of natural resources, and defining alternative patterns of education, productivity and leisure." (Burnham, 1968, p. 30)

Burnham, art theorist, critic and curator, who established the field of systems art, continued:

"In the emergent 'superscientific culture' long-range decision making and its implementation become more difficult and more necessary. [...] A systems viewpoint is focused on the creation of stable, on-going relationships between organic and non-organic systems be these neighborhoods, industrial complexes, farms, transportation systems, information centers, recreation centers, or any of the other matrixes of human activity." (Burnham, 1968, p. 30)

The editorial of the first issue of Radical Software in 1970, pointed to an obsession with hardware, be it in the form of land, labor, or capital, in contrary to software as an access to information and its dissemination. In the argument, the 'techno-sphere' and cybernetics were placed on the same level as natural and organic systems, and the software was introduced as a realm of the real power, and thus as a place where the battle must be fought over information structures:

"Unless we design and build alternative information structures that go beyond and reconfigure existing ones, then alternative systems and lifestyles will be nothing more than products of the existing process." (Radical Software, 1970, p. 1)

It is significant that the magazine dedicated to independent video practices, had three equal sections, Hardware, Software, and Environment, which differs its approach to the issues connected with media from McLuhan's technological determinism.

In a similar vein Michael Shamberg, author of **Guerilla Television**, (Shamberg, 1971) the major Radical Software publication, describes the word radical not in the sense of political revolution and physical disruption of the system, but as a post-political discontinuity with the past,

the transition from the old consciousness to the new consciousness through open information tools. He suggests to replace corporate broadcast TV influence on American mind at the time by using low-cost video-tape cameras, video cassettes, and cable television and designing alternative television networks that favor portability and decentralization.

There were key Raindance Corporation members among the contributors of the magazine – Frank Gillette and Paul Ryan, as well as Gene Youngblood, Nam June Paik and Buckminster Fuller. The Radical Software as a communication platform developed the idea of media ecology as the study of communication media and their effect on other media and society. It played a crucial conceptual role in this regard. In conjunction with the then new cheap video technology, artists and activist groups formed local loops of community media. In opposition to the central control of one-way broadcasting of mainstream media, collectives such as Ant Farm, Videofreex, The Kitchen and dozens of others experimented with possibilities of the social integration of video and cybernetic systems and in doing so they have built grassroot systems of self-representation. The same pattern applies to the feminist video movement, of which we may mention Martha Rosler and her **Vital Statistics of a Citizen**, simply obtained (1977), marking the era when feminist and women collectives were using the video camera to interrogate the politics of representation in maintaining hegemonic power structures. Martha Rosler poses as an object to be 'objectively' measured and represented by data from the outside, by male-dominated science. Feminist video art practices from the 1970s and 1980s play an important role in reconfiguring norms and social conventions in cultural systems. (Long, 2016, p. 19)

In addition to the explicitly political urban New Left of the 1970's, there was also the New Communality movement, which tended to return to the countryside and to a model of transformative revolution focused on interpersonal relationships and consciousness. On the remark of media and ecology, Gyorgy Kepes, the founder of the Center for Advanced Visual Studies at the Massachusetts Institute of Technology in Boston, USA, in the Arts of the Environment (1972), wrote:

> *"Environmental homeostasis at the global level is now necessary for survival. Creative imagination and artistic sensitivity can be seen as one of our basic, collective, self-regulating devices that help us all register and reject what is toxic and find what is useful and meaningful."* (Kepes, 1972, p. 6)

Regarding examples, the Ant Farm collective, in addition to their media performances, researched alternative architecture practices and environmental design. Pulsa Group, an interdisciplinary collective, dealing with the differences between sociotechnological and biopolitical systems, also contributed to emergence of systems art. Its members, who referred to themselves as 'Researchers in programmed environments', proposed to correct systemic breakdowns by imaginatively expanding the interactive

awareness of local media populations, which include feedback principles: environments, program events, cable television, tapes, and movies. In one of their projects – **Harmony Ranch** (1966 – 1973) – they experimented with self-organized collective organic farming to find out about long-term growth rhythms and regenerative changes. Agriculture and the dynamics of group life were part of their ecology of cybernetic systems, whether focused on soil quality and vegetable production, or cooperative social forms and music production with acoustic and computerized instruments. (O'Brien, 2016) Their connection with the media art scene of the time was maintained by visits of Nam June Paik, Karlheinz Stockhausen or Steve Reich.

We can draw the conclusion that since the emergence of media art, media ecology is both a condition and accompanying phenomenon of the natural ecology. Electronic media arts as socio-cybernetic systems were created with intrinsic sensitivity to environmental sustainability in their very heart. We have also seen that software was at the center of attention. It was not only the computer software as we know it today, but software understood as a discourse and the whole body of social practice.

CURATING ECOSYSTEMS

In 1990's, new media as emerging 'digital utopia' fit well into the narrative of innovation, where specialized knowledge is generated through experimentation, which can be applied in the industrial society. The curatorial policy of the new media was suitable for art centers, subsidized by technology companies. The specialization in recognizable industrial domains went well along with the government's policies of funding art laboratories under the roof of centers of excellence. However, nowadays we see a growing shift towards critical approaches.

In a significant text on the curation of new media, Steve Dietz identified more than twenty labels being used as equivalents to new media, including computer art, electronic art, multimedia, digital art, software art, cybernetic art, next media, or variable media. (Dietz, 2000) He noted that new media after 2000 lost the charge of novelty and curators, instead of exhibiting the most technologically advanced media, began to work also with artists using obsolete media, low-tech and DIY tactics. The term new media was replaced with the term media art, that subtly marks the shift from high-tech art, with a starting point in technological progress, to contextually aware and critical exploration of digital and networked media. Many of the media art projects articulating the systemic and ecological ways of thinking and aesthetic preferences that Jack Burnham elaborated in his essay or which subsequently emerged, are of renewed interest to art critics and curators today while media art seems to be able to embrace a theory of systems along with ecosystem research. Ecologically charged and systemic aesthetics embodying art provide arguments as to why it is necessary to consider the wider context when discussing media art conservation. It shifts our thinking from artworks as visual artefacts, like

moving images, towards artworks as open cybernetic systems, involving social actors or living ecosystems.

We can compare one of the original works of Hans Haacke with a contemporary example to underline analogies between the systems art of 1970s and the present. Hans Haacke's **Rhine-Water Purification Plant (1972)** at the Krefeld Museum, included a device for purifying water from the Rhine with functional chemical treatment and water filtration using activated carbon and sand. The purified water was pumped into a large transparent acrylic tank with swimming goldfish to demonstrate how it is possible to construct a life-supporting system technologically. However, the project also intervened behind the cosmetic patch of restorative eco-aesthetics. Haacke documented the extent of the pollution of the wastewater discharged into the Rhine in Krefeld, which amounted to 42 million cubic meters each year, and quantified the volume and types of industrial and domestic waste, listing the main polluters. The project addressed the need to restore the degraded ecosystem and pointed out the city's role in pollution, which attracted attention from the local media He called the political effect of this work *"a real-time social system"*. (Demos, 2016, p. 47)

Figure 2: Brain, T. (2011, 2021). *Coin-Operated Wetland*. Retrieved from http://tegabrain.com/Coin-Operated-Wetland. Recreates natural water purification circuit in a gallery. Image by Alex Davies.

Among Tega Brain's earliest artworks, based in environmental engineering and examination of issues of ecology, data systems and infrastructure is **Coin-Operated Wetland** (2011, 2021). A people operated laundromat with closed water circuit built in a gallery consists of a soil and plant purification system for wastewater to return clean water back to washing machine.

"We could only do one load per day because that's the pace at which the plants could consume the water. But if we're going to shift away from seeing ecosystems strictly as service providers and towards a more negotiated, reciprocal relationship with them, our systems are going to need a little more give." (Brain, 2019)

Preservation and conservation projects should not be limited to technological structures and formal features of the artwork. At the symposium **Contemporary Art Conservation Revisited: 20 years later**, held in 2022 at the Bern Academy of the Arts (Haidvogl et al., 2022), Coline Ardouin presented paper on the topic of managing and caring for living plants that are part of an art installation in a museum setting, which requires cooperation with experts from different fields, such as biology or botany. Example of such curatorial practice can be the **Beuys' Acorns** (2007–2025). Re-enacting project of Heather Ackroyd and Dan Harvey involved trees grown from acorns collected from Joseph Beuys' **7000 Oaks** (7000 Eichen, 1982–1986) social sculpture. In this landmark artwork, by putting oak trees and other tree species in public locations, Beuys hoped to transform Kassel from the "city of administration" to the "city of trees". A basalt column was to be buried in the earth adjacent to each tree. Organizationally and financially ambitious project was launched in 1982 as part of the Documenta 7 exhibition by transporting all the columns to the park, where they were assembled into an enormous sculpture. The basalt mass and consequent planting was met with disfavors and obstacles. Planting carried on by number of people and groups for several years, until finally the material sculpture disappeared, turning into the invisible 'social sculpture'. While Beuys' artistic vision was to transform consciousness so that the biosphere, as a healthy, biological and essential atmosphere, would be consistent with human and multi-species needs, the reiteration of this ecological project, The **Beuys' Acorns** took form of a tour with discussions of these topics through French cities in advance of the United Nations Conference on Climate Change in Paris in 2016, and continued through various institutions across United Kingdom. The saplings have acted as both artwork and catalyst for a public discussion on climate change carried out in galleries and exhibitions. In 2021, artists Ackroyd & Harvey have installed **Beuys' Acorns**, a group of 100 oak trees, on Tate Modern's South Terrace. The trees were exhibited at Tate Modern in London and as part of Beuys' legacy, seven of the oak saplings were permanently planted in the local area. The artists aim to plant the remaining trees by 2025. (Tate Modern, 2021)

ART OF DIGITAL COMMUNITIES AND OPEN PUBLIC INFRASTRUCTURES

In 2010, in a lecture Freedom in the Cloud, held for the Internet Society New York, Eben Moglen recapitulated the development of networks, from the original ideas of all peers on the same level, changing gradually to omnipotent servers in the cloud and surveilled 'users' under the secretive economy of data mining. He called it the architecture of disaster. An increasing concentration of power has emerged without any discussion of the long-term social consequences. The asymmetry between thin clients against strengthening servers also means the increasing impotency of people who own the client devices. Only the music that the monopoly music publisher permits can be played on a phone. It's not what one wants to listen to, but what is in the majority economic interest of the publishers to be listened to. It is no longer the case of software companies, but management of platform business models. (Moglen, 2010) The lecture happened to be the starting point leading to the development of public social networks, critique of using the word 'user' for humans and Moglen's idea of small internet device, a personal mobile server, having all the apps to facilitate the communication among people, called Freedom Box, became a reality ten years later.[3]

Moglen's lecture inspired four students of New York University to start a crowdfunding campaign. At the end of 2010, they released the first version of diaspora*[4], which was to replace Facebook with a decentralized network, sponsored by a public institution and not owned by anyone. Diaspora was a media sensation before a line of code was written. The youth, inexperience, high expectations, and bugs of the first version left an indelible mark on the project and later would sink further huge difficulties. As a 'startup', it failed, but the community prevailed and today it is second largest open social network.

In decentralized social networks, there is no one central website. There is many of them, with different names, with different individual or organizational providers. These nodes create a connected network by using a common protocol, based on standardized message types, understandable to all nodes. If it sounds faintly familiar, that's exactly how internet was designed to work.

Based on the StatusNet software and the OStatus protocol, **identi.ca** (2008-) was maybe the first node of the independent social network. It was mostly concerned with the free software community. As an extension of the RSS/Atom web publishing protocol, which is still widely used for podcasts, Evan Podromou standardized Ostatus in 2010. With a reader app for RSS or a podcast, anyone can collect interesting news from various internet places by subscribing without needing to visit each site

3   Freedom Box. Retrieved from https://www.freedombox.org/

4   Diaspora* Retrieved from https://diasporafoundation.org/

Figure 3: Klodner, M. et al. (2020-). *Leaf node9*. Retrieved from https://webs.node9.org/channel/leaf. Solar-power designed field server for forest livinglab exhibited with Livinglabs zine in Entrance Gallery in Prague. Ecosystems and biodiversity are computationally supported with sensitivity to local resources, measured by environmental sensors. Leaf's open social network node and camera intermediate environmental art experiments from the field research or gallery space. Source: author

again and again. However, RSS does not allow for comments, sharing, or interaction, which is why events and their actors were included as an extension. Evan Podromou continued his work on various social projects and is a co-author of ActivityStreams,[5] a major open format specification for activity protocols, which are used to syndicate activities taken in social web applications and services, already widely used by websites, and decentralized social media hubs, creating a network known as the Fediverse. (Monoskop, 2022)

By the time Diaspora* was in its infancy, Mike MacGirvin wrote the DFRN (Distributed Friends and Relations Network) protocol. Connections to Status.Net via their OStatus protocol, as well as Twitter and Facebook, were functional. He later studied the source code and packets of Diaspora*, and thanks to Ilya Zhitomyrsky, succeeded in creating a functional federation module for the Diaspora. Mike MacGirvin has been dealing with decentralized protocols for decades. In the 1980s, he wrote federated software for bulletin boards that provided several services, file downloads, email, games, and news. It was able to send federated messages to FidoNet, Bitnet and ARPAnet. Farming in rural Australia, Mike manages the development of projects for decentralized social networks. He has abandoned all project branding and roadmaps in favor of developing an ethical solution for harmful online communities. When not battling wildfires, he goes to feed his horses, listens to what they have to say, and then addresses the concerns of the online community in the support forum.

The power and money dominated culture of 'tech-bros' of Silicon Valley is rejected also by feminist and cyberfeminist collectives. **The systerserver** (2005-) is a physically situated server run by women to be their own space and medium of expression. They intentionally avoid proclaimed 'ease-of-use' of commercial services for the similar reasons as (Drucker, 2012) and (Posner, 2016) in digital humanities. Communities of techno-feminist practice are informed by Donna Haraway's 'situated knowledges'. (Haraway, 1988) The idea concerns how concrete practices of particular people virtually make truth. Cyberfeminists from KRYSS Network explain how to understand the notion of feminist server:

> *"An informal group of feminists have been imagining a more autonomous infrastructure that puts human well-being at the core of technology and governance, to ensure that the data, work and memory of feminists are better accessible, preserved, managed and controlled in ways that allow for the promotion of human rights and the exercise of online freedoms of opinion and expression, and of assembly and of association, of rights to information and privacy, and of how the concept of consent is clearly defined."*
> (Lim, Serene & Kuga Thas, M. Angela, 2021)

5   ActivityStreams 2.0 W3C Reccomendation (2017). Retrieved from https://www.w3.org/TR/activitystreams-core/

Figure 4: Varia collective. (2016-). *Bibliotecha Varia*. Retrieved from https://network-sofonesown.varia.zone/Bibliotecha/. In Rotterdam, artists, media students and theorists formed around the Varia space placed an unusual electronic book into their bookshelve. Bibliotecha proposes an alternative model of distribution for digital texts. It allows specific communities to form and share their collections, through a single-board computer running free software to share books over a local WIFI hotspot. No server farm required. Source: varia.zone

In response to the dystopia of global corporate surveillance megastructure and geopolitical architecture, which Benjamin Bratton entitled The Stack (Bratton, 2016), **Waag | technology & society** formulated a mission for digital public spaces called the Public Stack in 2019.[6] The difference between the Stack and the Public Stack lies in the core values embodied in the principles the latter rests upon, and the design process it encourages. The Public Stack departs from the private and state-centric conception of The Stack described by Bratton. While The Stack is built upon closed design processes resulting in proprietary technology, the base layer of the Public Stack orbits around common values of fundamental rights and socioeconomic considerations, which are embodied in the open design processes involving all stakeholders to provide democratic governance of digitalisation. The resulting tech layer is open-source and ethical. There are no users, but digital citizens. A broad coalition of media and academic institutions was also formed in the Netherlands under the name Public Spaces,[7] supporting public transition to an open software, whose operations are based on civic values.

Waag Society for old and new media (lately renamed as Waag Futurelab) in Amsterdam was founded in 1994. It is informed by the ethos of the feminist hacker movement, as Marleen Stikker, its director, is one of the founders of **The Digital City** (**De Digitale Stad,** 1994), the first virtual community introducing free public access to the internet in Amsterdam. In the 1994, **The Digital City** was one of the first free internet providers and also the site where political parties and newspapers made their first digital steps. The municipality of Amsterdam opened its entire administrative information system, becoming the first open government. (Baumgärtel, n.d.) With The Digital City, as well as other online communities, the line between public infrastructure and art project is unclear. In 2011, archival work was started under the name of **re:DDS** project to make the heritage part of the Amsterdam Museum. (de Haan, 2011) Trying to retrieve as much as possible of the early days, being hardware, code and files, and media headlines as 'web archaeologists excavate a digital city' the gathered material became part of the permanent collection of the museum. (Teffer, 2014) In 2016, under the name **The Digital City Revives**, the search for old material and the preservation of digital heritage continued and the case study was honored with a Digital Preservation Award. (The Digital City revives)

Examples of online digital communities that merge art, activism, cultural infrastructures, and community care, such as **The Digital City, The systerserver, Node9**, and many others, have existed on the internet for more than 20 years, long before the corporate services we use today. Memory institutions can learn considerably more from their modes of

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6   Waag | technology & society (2019). *Public stack.* Retrieved from https://publicstack.net/

7   Public Spaces. Retrieved from https://publicspaces.net/

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operation and resilience for their digital cultural infrastructures and preservation initiatives than from corporate models. Given the fluid nature of networked art, Annet Dekker speaks of *"authentic alliances".* (Dekker, 2018, p. 14) The net creates an environment in which communities are formed of real people, constituted through technical, social and cultural matter. From the perspective of the conservator and other professions involved in the preservation process, it is necessary to work with speculative and procedural approaches and *"becoming part of a 'network of care' in which a collaborative approach is important to comprehend the complexities of net art".* (Dekker, 2018, p. 164)

NEAR FUTURE TRANSITIONS IN DIGITAL CURATION

Private big-tech platforms' responsibilities and rights to moderate content, as well as the trade-off between censorship and free speech, have been the subject of a contentious political debate in recent years. We are in the situation of internet, still as emerging medium without regulation, brings back an example from history of the telecommunication industry during its maturing days in the 1970's. At some point, only phones devices manufactured by the telecom operators themselves could connect to their network. The same way users of YouTube cannot talk to users of Facebook because it does not fit the interest of corporations. Imagine if broadcasters utilized proprietary signals to compete, requiring different TVs for each TV station. Consider a situation where we were unable to dial a phone number from one network provider to another. Public institutions and their policies should be more concerned about the situation of the open internet turning in large part into a proprietary domain.

This should be taken into account when designing and choosing exhibition spaces for digital archives of cultural heritage. Corporate content platforms failed to provide a place for cultural discourse or education. Instead, they were strengthened and reinforced as attention-driven tabloid advertising services. As private walled gardens, they deliberately lack transparency and interoperability based on technical standards. Even if history is showing us that the walled gardens are disappearing and in the long term are replaced by open ecosystems that eventually bring more value, they are often the way to the most profitable business in the early days of any industry.

Although information infrastructures had undergone a long development from monolithic and isolated systems to modular and interoperable, the general use of prefabricated and presumptive tools still inevitably interferes and inhibits critical, independent, thinking. As Johanna Drucker puts it:

> *"The cultural authority of digital technology is still claimed by the fields that design the platforms and protocols on which we work. These are largely fields in which quantitative, engineering, and computational sensibilities prevail. Tools for humanities work have evolved considerably in the last decade, but during that same period a host of protocols for information visualization, data mining, geospatial representation, and other research instruments have been absorbed from disciplines whose epistemological foundations and fundamental values are at odds with, or even hostile to, the humanities. Positivistic, strictly quantitative, mechanistic, reductive and literal, these visualization and processing techniques preclude humanistic methods from their operations because of the very assumptions on which they are designed: that objects of knowledge can be understood as self-identical, self-evident, ahistorical, and autonomous."* (Drucker, 2012)

The process of critically making media architectures at the level of computing, design, technology, information modeling, data structures, interface, and protocols should transform the theory and practice in digital curation. As fundamental tenets of cultural platforms, inclusive social tools of digital curating and preservation should permit critical reading, qualitative methods, support paratextual apparatus, invite widespread performative involvement, and promote conversation.

Media artists and free software developers, previously the first inhabitants and thinkers of the empty internet space, continue to create and shape ethical networks. There are already several open social protocols being used by websites to talk to each other, which could connect archive repositories and collection systems. Open public standards in federated social networking already provide solutions without controversies of deplatforming or dividing corporations and digital curators are starting to incorporate them into digital art infrastructures. In thousands of repositories spread out across memory institutions and present in their cultural preservation strategies, social networking can offer infrastructure for equitable and environmentally conscious communication and activities. Aware of the fact that what determines art is often found in relation to broader social alliances, Annet Dekker pointed out, that it is not uncommon for networks to form around artworks that are collected by museums, large institutes, or private collectors:

> *"I suggest that such a network could evolve into a network of care that maintains or conserves (parts of) an artwork, consists of a combination of experts and non-specialists, and introduces knowledge from a variety of fields and backgrounds."* Conservation thus *"is less about conserving materials and more about the preservation of social information and relations."* (Dekker, 2018, p. 14)

However, carbon imbalance measures the time to rethink long-term preservation strategies. Because the only possible digitization and long-term preservation projects are those that are within the limits of sustainability. The trustworthy repositories and curatorial practice should be seen from the perspective of their ability to maintain art together with the biological livability of the interconnected environment.

One of the strategies of datacenter operators is increasing efficiency and optimization. That is not difficult to accomplish, it saves money, and it does not change too much the existing system. It is promoted that hyperscale or AI utilization control make datacenters more environmentally friendly. However, that is nothing new and will not seriously tackle greenhouse gas emissions. Efficiency is a factor that is already present in alarming future scenarios. Despite ongoing efficiency gains, worrying energy consumption growth persists. With growing number of devices, we need several stages of ten-fold decrease steps in consumption and extensive downgrades also in terms of raw material requirements to make the exponential curve of carbon emission go flat. Datacentre buildings have embedded environmental impacts which cannot be offset by planting trees somewhere else at large scale.

Apparently, the datacenter transformation will follow the transformation of the electricity grid. Centralized power distribution is being replaced with renewables in the decentralized grid of many local sources. In the near-future grid residential houses not only produce energy, but also contain virtualized computing infrastructure, where waste heat is used for heating rooms and warm water. Distribution of computing workloads, household or transportation needs will be coordinated by smart control protocols balancing energy and computation resources availability with immediate demands. Some workloads will need to shift to more appropriate time slots, so that they do not collide with responsive workloads or priority energy flows. The 'cloud' marketing wave passed, and the 'edge' is already here. Microdatacenters are now the trend, along with edge servers and making use of network routers and endpoint devices. IDC states that carbon-neutral datacenters need 'holistic community planning' and their operators will engage in long-term urban development. Within the long-range vision the datacenters should even become the platforms for more sustainable ecosystems. (IDC, 2020) That would require urban development not only include microdatacenters in places where needed, but also their integration to blue-green city infrastructure of water and plants. In Sweden, Triple Green certification of datacenters[8] was introduced by Bahnhof AB. Certification requires not only renewable energy, but also waste heat use for nearby households and this heating must replace other energy sources, while everyone profits in the process. Common heat pumps require warm air to function, therefore a residential datacenter seems to be the perfect fit here. Industry has historically always used energy responsibly. Heating was standard byproduct of many infrastructures and was included in the urban design from beginning. It is only surprising that this is not yet the case with big-tech, where heat is released into the air in the pursuit of rapid growth.

8   Triple Green (2015). *Bahnhof AB*. Retrieved from http://triplegreen.net

The publishers of **Low-Tech Magazine** have launched a solar version of their website in 2018 on a 2.5W microcomputer board powered by a solar panel and a small battery. They spent a lot of time redesigning the pages to keep the code as small as possible, and the images in monochrome. The site has an indicator of whether the sun is shining and how much energy is available. If the weather is bad for a few days, the website will shut down. You can come another day. Small single-board computers with minimal resource requirements and low consumption are appropriate for a sustainable model.

The sustainability mindset is about to be extended to large institutional systems requiring robustness and high availability. Even that is being achieved with embedded devices. Free software is increasingly easy to manage and self-host, and recently a major shift happened in small-tech clustering technologies, that made it possible to join many computing, storage, sensor, and other IoT (Internet of Things) devices together. A little supercomputer is still consuming a fraction of electric power and materials compared to an old generation server, which can compel us to consider choosing small-tech infrastructures for public sphere projects. The potential of small-tech solutions rests upon the abundance of interconnected publishing and curatorial nodes, contributing to the building of an organizational model of cooperation between small independent galleries and major cultural and memory institutions which can mutually support and temporarily or permanently represent each other. In *Organization After Social Media*, Geert Lovink and Ned Rositter describe how organized networks have changed the practices of many types of small institutional forms as they progress from casual friendship and instant 'networking' to stronger decision-making ability with social technologies based on enduring time. (Lovink & Rossiter, 2018) In so doing, your library server can live in symbiosis next to your room plants in your office.

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