

SUSTAINABILITY AND THE IMMATERIAL RETHINKING KNOWLEDGE AND ITS PRODUCTION BEYOND THE LINEAR ECONOMY

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ABSTRACT: The article speculates on the applicability of existing discourses on material sustainability to a shift in behaviours concerning the management of immaterial resources such as education, skills, and the production and dissemination of knowledge. While information products constitute a central aspect of contemporary cultural environments, our mainstream vision of sustainability seems to be enclosed in the material world. This disconnection, which defines our present production model, causes an important chasm: while we increasingly produce discourses *about* the importance of shifting towards circular models of consumption and production, our approach to concepts and ideas remains grounded in a linear, extractivist logic. As such, our understanding and management of the immaterial remains grounded in an eschatological paradigm which is bound to the concept of *future*, which, in contemporary European languages, is entangled with ideas of growth and acceleration. Developing from Guattari's (1989) proposition of an Ecosophy, I propose an understanding of sustainability of immaterial resources, which will be narrowed down to the problem of production of knowledge and its dissemination through Higher Education. The reflection combines the idea of circular and linear temporalities, explored through the works of Bakhtin (1981), Heidegger (1985), and Koselleck (2004), alongside Zeman's (1975) Systemic Semiotic Theory and postulates from Greimasian Generative Semiotics (Cf. Greimas 1983), interrogating how principles of material sustainability can be reoperated as tools to mitigate the imminent immaterial ecological disaster.

KEYWORDS: Sustainability, Ecology of Knowledge, Education, Temporality, Circular Economy.

As the climate crisis gains the forefront of mainstream discourses, our interest in the “slow” movements — in fashion, food, and living —

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has shed light on the problem of time as central to the future of our existence. Yet, awareness of the urgency of deliberate deceleration is enclosed in the discussion around the material world — particularly energy extraction and consumption, transport, sartorial fashion, and the food industry. On the one hand, we are beginning to understand the impact of acceleration in the tangible terms of exhaustion of finite resources and the saturation of by-products the processes of fast extraction, production, and obsolescence create: a mark of our industrial model and the economic system fostering and informing it. However, we don't seem to consider how the same issues may affect the immaterial realm — particularly the production of knowledge and its dissemination through education (Higher Education degrees in special) and their assimilation by a paradigm of consumer commodity. This phenomenon results in an inversion: education and research cease to be a point of disruption from where new paradigms can emerge, becoming instead pressured to cater for “the market”, transforming researchers, students, and knowledge itself into commodities.

Transposed to the immaterial, accelerated linear economies see ways of knowing and human competencies as isolated resources to be exploited and exhausted or extinguished when they are not deemed “useful”: a set of dynamics starting to cause irreparable damage to the environment of human subjectivity, which can be understood in terms of cultural and epistemological diversity. If (environmental) sustainability is a problem of resource management, it is imperative to extend this discussion to include the literal *human* and cultural resources that are being traded in this system.

Building on theoretical reflections that announce this problem — Félix Guattari's (1989) essay *Les Trois Écologies*, Jiří Zeman's (1975) Systemic Semiotic Theory, and the reflections on temporality presented by Mikhail Bakhtin (1981) and Martin Heidegger (1985) — this article aims to discuss the urgency of identifying and addressing the question of sustainability in the immaterial realm, with emphasis on education and the production of knowledge, which offer an emblematic case for other information products. As environmental sustainability is a problem of flexibility — our ability to adapt our ways of being and doing, to replace and transform — to reimagine knowledge and education in a sustainable paradigm requires the same principles to be applied to our theoretical tools. Thus, rather than a traditional semiotics of texts, my

exercise draws from contemporary theories announcing paradigmatic changes enabling Semiotics to expand its limits — the Semiotics of “life practices”, as well as Semiotics of Culture and Biosemiotics¹; in this piece, their *ethos* is re-transposed to a speculation of what lies beyond the material dimension of interactions, cultural phenomena, and the *umwelt*. I will attempt a reflection on how sustainable principles disseminated in contemporary mainstream discourses and practices can support more ecological practices of the immaterial, enabling the possibility of a paradigm change aligned with the urgency raised by Byung-Chul Han (2021) of a “temporal revolution” that will shape a new kind of time framework.

1. The Meaning of Future

Our approach to the concept of time often takes for granted that, rather than a fact or an event, *future* is a linguistic construct that can only be accessed through the intricacies of verbal representation. Although many contemporary languages possess future tenses, not all permit one to speak about the future, as is the case in the Māori language studied by Linda Tuhiwai Smith (1999): without forms that express what is yet to come, the only possible understanding of time is grounded in the present. While our future-driven mentality might equate the ability to imagine and communicate futures with a higher level of “development”, to envision and utter futures also unleashes the equivalent “accidents”, to reference Paul Virilio’s (2005) theory. If we accept Martin Heidegger’s (1985, p. 272) conception of discourse as a temporalisation of Dasein, to project oneself in a different time from *now* through linguistic constructs also alters the temporalisation of being itself. To speak outside of the present causes a temporal split that goes beyond the discourse being uttered: it collapses the aspects of inchoateness and terminativeness, causing subjects to project their existence outside the temporal aspectuality they inhabit. By enabling the utterance of hypotheses, speculation, and prophecies, those discursive modalities

¹ It is not possible to provide a thorough revision of these traditions in the space of this article, but I refer mainly to Eric Landowski’s works *Passions sans nom* (2004) and *Les interactions risquées* (2005); Jacques Fontanille’s *Formes de Vie* (2015); Juri Lotman’s seminal work “On the Semiosphere” (2005), and *Culture and Explosion* (1992); and Jakob von Uexküll *A Foray into the Worlds of Animals and Humans* (2010) and *Theoretical Biology* (1926).

cause subjects to shift towards potential realities, which can be utopian or catastrophic, creating tensions between slowing down dysphoric outcomes while attempting to bring about euphoric futures faster.

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In Western contemporary languages, the concept of future as what will come is split into two forms: *futur* (*future*, *futuro/a*) and *avenir* (*avvenire*, *porvenir*). While *futur* shares the Latin root *futurus* — to grow, to become² — *avenir*, the contraction of *à venir*, translates as [what is] “to come”. Adopting Jean-Pierre Dupuy’s argument, Slavoj Žižek (2024) approximates the *futur* with the continuation of the present as a “dystopian fixed point”, the full actualisation of tendencies already in place; while *avenir* indicates the possibility of a radical discontinuity with the present. An akin distinction is presented by Denis Bertrand (2021), referencing Bruno Latour’s understanding of *futur* as what human subjects can build, while the *avenir* is that which cannot not come — what belongs to the Addresser, to “Providence”. Although deceptively dissimilar, those two distinctions share that, while *futur* is a predictable future that can be shaped, *avenir* belongs to the order of the unpredictable — which, for Latour, seems to have a fatalistic undertone while, for Žižek, it brings the euphoric possibility of revolution.

An *expansionist* concept of future as growth — *becoming more* — is fully actualised in the idea of *futur* as continuity. The split between the realised present and the “better times to come” births the distinction of past and future in terms of *experience* and *expectation* debated by Reinhardt Koselleck (2004), in which both values constitute distinct modes of presence: expectation exists in the *horizon*, an imaginary line that recedes as one approaches it, as a form of “future made present” — an amalgamation of the triggering of a process, or inchoateness, and the complete action, or terminativeness (Cf. Greimas & Courtés 1993). In that sense, the idea of “progress”, which is another iteration of an expansionist idea of increase, aims to reduce the temporal difference between experience and expectation, accelerating the temporal gap between the (unwelcome) now and a (yearned for) later. Although this

² Despite not sharing the linguistic root or phonetic affinity with the Latin-derived forms, the German word *Zukunft* is defined similarly as time yet to come, one’s life path that is still in the future, and the verbal tenses that express this time.

view wishes for an enlargement of the durative aspect in the long run — a possible definition of “sustainability” — it actually erodes the possibility of duration when it aims at accelerating abrupt starts into fast completions.

Our obsession with the future denounces a partiality to an eschatological worldview, whose emergence is attributed to Judeo-Christian liturgy. As much as Koselleck (2004, p. 13) remarks that the unknown Eschaton was one of the Church’s integrating factors, a “secular eschatology” remains an integrating factor of our ways of imagining futures: our operativity of this concept reiterates the linear journey from an imaginary beginning towards an *end* and the hopeful expectation of better times — whether that means a utopian future or the “Hereafter”. Nonetheless, Bakhtin’s (1981) analyses present us with the problem that eschatological time disseminates a “future emptied out”, the end of all signs in its past and present forms, which must be opposed to the idea of a *creative* and *generative* time which would be measured by acts of creation rather than destruction: a time that *conceives again*.

The opposition of eschatological linearity marking the accelerated time of modernity to a mythical pregnant time of cycles is at the foundation of the contrast between “linear” and “circular” production systems that inform contemporary discourses about sustainability. In this argument, cyclicity and renewal approximate the logic of “natural time”, while the blind sprint from beginning to end contains in itself the possibility of acceleration (which, in a cyclical logic, would be pointless). In that sense, notions such as novelty and progress only make sense if we hope the future will be *different*. Yet, the eschatological model is, by definition, destructive. In his Systemic Semiotic Theory, Zeman (1975) postulates the process of degradation of information through a reading of the Third Law of Thermodynamics as a principle governing communication: in the cosmic flow and in the flow of time, *entropy* is an irreversible gradient plus direction, in which states of time and information degrade towards chaos — a form of “no-return” (linear) motion that results in a degeneration of systems. By approximating his reasoning and the understanding of linearity as a *modus operandi*, we can conclude that the acceleration of a linear trajectory from present to future is, *ipso facto*, the acceleration of a pathway towards chaos. Thus, the pursuit of futures can only lead to an *end*.

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When understood alongside the problem of knowledge and education and their commodification, various futures are entangled in a complex dynamic. Focusing on environmental sustainability — as part of course contents, research priorities, and in the mission statements of institutions — the desire to advocate for practices ensuring a later for the planet clashes with the possibility of continuity of human socio-economic life: the pressures to secure “employability” for those acquiring education products, and the continuity of businesses themselves (both universities as institutions and “the market”). More than the unfortunate beneficiaries of centuries of environmental abuse, today’s learners are immersed in a *zeitgeist* marked by the unknown Eschaton of late capitalism and its Horsemen: the climate crisis, disintegration of democracies, financial crisis and social unrest, angst about the potential consequences of AI, global pandemics, and war. Young learners today find themselves at a crossroads: the trailblazers demanding sustainable products and business practices, their awareness (and rightful indignation) is aimed at the (mis)use of energy, raw materials, environmental pollution, the suffering of animals, and umbrella issues such as carbon, emissions, and plastic.

The reduction of ecology to a problem of the natural environment denounces the paradigm generating this awareness. While Gen Y and Gen Z are the most educated cohorts in known human history, they also received the most specialising education. The most qualified professionals to ever exist are also the ones whose qualifications have the most shrivelling effect, narrowing down skills, competencies and, consequently, knowledge itself, to a highly utilitarian role — a mechanistic view of subjects in line with the prevalent socio-cultural systems, and mirroring the specificity and disposability of other commodified products and services. Equally, this model responds to the commoditised context of the neoliberal university, where education is bent to conform to narratives and systems of value that are typical of what I would like to call an *extractivist paradigm*. In *Les Trois Écologies*, Guattari (1989) outlines this logic in the flattening out of all modes of valorisation; the reiteration of existing “pathological” models; and the fragmentation of subjectivity, which, for him, are a result of the forced separation of the natural environment from the *socius* and the mind.

In essence, although young professionals have been taught *about* sustainability, the framework of the education model remains aligned with a linear paradigm. Such contrariety between knowledge (our awareness of an ecological crisis and the necessary actions to mitigate it) and the dominant cultural, social, and economic paradigms (growth-oriented extractivist economic models) prevents any knowledge from enacting a meaningful social, as well as environmental impact. For as long as this contrariety is sustained, environmentalism will be condemned to become a “style”: a superficial “dress” of discourses that, at their significant core, continue to operate as linear economies giving themselves as simulacra of green businesses.

In this clash between two sustainabilities — the word as synonymous with environmental ecology and its wider meaning as the possibility of “sustaining something” — we must interrogate what it is that we wish to sustain: our natural environment or systems and practices we have in place? At this moment, our desire to “educate for the future” constitutes a contradictory formula combining information on sustainable processes and the reiteration of a model of *economic sustainability*. The desire to prepare students for literal survival in the existing market logic means, in essence, the production of viable “cogs” for existing businesses. Nonetheless, because market landscapes are fast-evolving, to cater to market sustainability means to subject forms of knowledge, professions and, consequently, the human resources carrying these, to the same destructive forces of the *fashionable* governing every commodity system. This logic creates a confrontation of two futures: the future of the *system* can only be secured through the death of the *process* — the individual parts forming the whole. Thus, accepting to surrender education and knowledge to an extractivist logic is the victory of one future over the other.

2. A Circular Economy of Knowledge

The issues presented in the above section can be encapsulated in the present market-led Anglo-Saxon university model and the narrow focus on *specialist education*. A modality of labour associated with social prestige and the promise of higher earnings, this model carries the risks

of exposure to *programmed obsolescence* embedded in any commodity system. Such, in turn, mirrors the time pressures to produce new qualified workers to replace the obsolete ones at an increasingly faster rate, collapsing learning time for the sake of “faster completions”. That demand also contributes to growth — in terms of how much capital is spent — to universities, which can welcome more students faster but, inevitably, subject knowledge and qualifications to the same life cycle of other consumer products. In Emmanuel Levinas’ (1972) illuminating statement, whenever cultural significations allow themselves to be interpreted through the superstructures of economy, economy imparts its forms onto culture — an ambivalence in signification that evidences a certain disorientation.

To align with significations derived from economic models imprints the same quantitative and mechanistic approaches to human relations: in the image of the operator from Generative Semiotics (Cf. Greimas 1983), education in this model replaces human potential with an inventory of thematic roles, becoming an intermediary that allocates competentialised subjects to other addressers. In Guattari’s terms, such can only produce reiterations of existing pathological models incompatible with an environmentally (and socially, subjectively) sustainable future, reproducing practices resulting in the waste of human and epistemic potential. Whether that means a shrinking of “permitted” narratives a subject can embody or the limitation of disciplines’ potential, radical specialisation and the radical utilitarianism it supports result in a phenomenon similar to the reduction of biodiversity in the natural environment.

Diversity combined with a synergy between the parts appears as a pivotal element of sustainability: an image invoked by the Portuguese sociologist Boaventura de Sousa Santos (2009) as an “ecology of knowledge”, the coexistence of epistemologies and forms of subjectivity appears as a mirror to the same phenomenon in the natural world, which the anthropologist Anna Tsing (2015) presents in the idea of *assemblages*: forms of open-ended gatherings allowing life forms to gather while creating new forms of life. A model she approximates to the concept of polyphony in music, assemblages are conglomerates of intertwined autonomous melodies — thus lacking a single or dominant perspective — which include living and non-living ways of being, as well forms that are not “part of progress”. Essential to multispecies

ecojjustice, the entanglement of temporalities, spatialities, and intra-active assemblages is invoked by Donna Haraway's (2015) image of the *Chtulucene*, named after the mythological feminine tentacular powers from various cultures (Terra, Gaia, Pachamama, etc.): a representation of a total connection between things that "compose and decompose".

Such perspectives around ecology describe the radical opposite of the current logic of fashionable commodified specialisms and ways of knowing, which, if continued, can cause entire disciplines to disappear and an irreversible deformation of the remaining knowledge into forms exalting only their market value, defined by their (actualised) potential as a (realisable) resource — and profit-oriented *use* — a logic consistent with the model of extraction, production, consumption, and waste typical of the linear economy. The contemporary concept of a "circular economy", on the other hand, preaches for cycles of production-consumption in which waste is minimised in the process through optimisation of resources (natural and human) across the production chain and through consumer attitudes encapsulated in the "Rs" for refuse, reduce, reuse, repair, recycle and so forth. This vision approximates Guattari's, Tsing's, and Haraway's holistic understanding, which can be summed up in the idea of *longevity of forms*: products and the environment, but, equally, the extension of human and non-human life.

On the other hand, "becoming waste" in the emerging phenomenon of career obsolescence carries important subjective consequences reaching beyond the financial impacts—on society as well as individuals. When entire fields of knowledge are allowed to disappear, there is also an irreparable loss for human culture. In his book *The Art of Fermentation* (2012), Sandor Ellix Katz equates diversity with the possibility of continuity, using the humble example of yoghourts to illustrate this point. The product's commercial version, made from isolated strains of bacteria (scientifically deemed as "essential" for the process), cannot be recultured: it is a sterile product with a "single-use" life and can only be reproduced through the introduction of artificial ferments. Natural heirloom yoghourts, on the other hand, carry an entire ecosystem of microorganisms: while scientists don't fully understand the function of single organisms, it is the synergy — the assemblage — between those organisms that allows for it to be indefinitely replicated spontaneously. Similarly, a mechanistic view of disciplines focusing on the parts and their degree of utility while discarding what is not understood results

in cultural and epistemological contexts that can only be replicated artificially, mirroring the same crisis in agriculture and animal preservation, where the lost ability of plants and animals to reproduce has to be mitigated through artificial human intervention.

As much as we accept that practices of preservation — and repairing, reusing, and recycling — are paramount to natural resources, to apply the same tools to “endangered” ways of knowing and disciplines is an urgent concrete action we must take in the face of the threats of a market-led, algorithmic logic that confuses “data” and “knowledge”. However, preservation without reforming our knowledge production systems is the same as trying to clean our oceans without stopping to pollute them first. Thus, education for the future must shift from the focus on short-lived market needs to produce credentials and competencies that are *designed* and *optimised* for maximum longevity — a process of total deceleration aiming to recover the durative aspect of processes while allowing knowledge to “compose and decompose”, restoring the possibility that epistemologies and culture will “conceive again”.

Beyond the protection and creation of diversity, our education practices must recover holistic perspectives from Ancient wisdom, reconnecting ourselves with the meaning of assemblages and the interconnection of various “species” in a complex system. When such awareness is in place, we can understand that, in the image of natural systems, every unnecessary extraction generates destruction and waste: the extraction of immaterial resources operates by the same logic, even if the waste is invisible, intangible, unquantifiable. As much as material waste, pollution, and climate change threaten to make our natural environment unliveable, we must interrogate the extent to which the forms of immaterial destruction — affecting both our subjectivity and as a “landfill of knowledge” — are making existence itself uninhabitable.

Even if imperfect, practices for mitigating material sustainability contain the potential of enacting change and can be reshaped into viable solutions to shifting our ways of thinking and doing, so long as they are followed by a genuine change of paradigm. Such tools permit us to imagine education and the production of knowledge inscribed in a circular logic, where the allocation and use of resources (such as time, attention, potential and — why not? — happiness and purpose) are

planned for duration and renewal, rather than consumption and obsolescence; where products (such as credentials and knowledge itself) can be repaired for maximum longevity; where a project of *degrowth* supports a cultural shift towards practices of consuming and producing less; and, finally, where necessary production prioritises practices and processes that do not aggravate existing problems and, ideally, help to mitigate these.

Mirroring the practice of remake³ and the optimisation for longevity, we must imagine education and credentials whose components can be repaired and replaced, decreasing the need for re-consumption and the waste of time and financial resources implied. That would include the possibility of a “second-hand skills” market, in which obsolete and out-of-fashion knowledge can be repurposed or valued precisely for its “patina” as a surplus of value. Instead of making new knowledge, we must learn, through *bricolage*, how to make use of the vastness of what has already been extracted, which, I dare to speculate, can serve us for generations.

However, the emerging understanding of *regenerative practices*, led by holistic agricultural and animal husbandry systems, is potentially the most relevant case for a complete reimagining of systems. In this modality of farming, the restoration of soil fertility is attempted through a recovery of plant biodiversity and the symbiotic relation with animals — an artificial yet meta-regenerative effort that aims to make a U-turn towards obsolete pre-industrial practices as a solution to ensure an ecologically viable future for plants, animals, and humans. To ensure our cultural survival, our knowledge systems need a similar set of processes in which diversity and synergy sustain assemblages of disciplines with the aim of restoring the *natural fertility* of our cognisance. As a theory of meaning, Semiotics must move from reductionist, fragmented,

³ Remake is a practice mostly found in sartorial fashion, and consists of undoing garments (or shoes) to reuse viable materials in the making of new garments. There is ample historical evidence of this practice across social classes, not only as “good house keeping”—such as recycling adult’s clothes into clothes for children, or repurposing damaged bedding and tableware into smaller or pieced textiles—but also in the reutilisation of precious fabrics in aristocratic dress, which used to be passed on as inheritance but needed to be modified to keep abreast of new fashions. Today, the practice is being revived by fashion houses as a way to mitigate dead stock, textile waste, and the refreshing of vintage cloth and, once more, can be found across the spectrum, from high-end brands to fast fashion giants, such as H&M and Urban Outfitters.

monocultural ways of knowing — perhaps beginning by interrogating what the fundamentals of a (re)generative semiotics would look like.

3. Conclusion: dismantling the future?

Research, the production of knowledge, and its transmission have been, throughout history, one of the only points of resistance against oppressive systems — social, political, economic, religious. As Tsing (2015) draws the line between the Holocene and the Anthropocene in the destruction of refugia, removing knowledge's ability to dissent also appears as the dismantling of solace for culture. As a theory of meaning, Semiotics can play a pivotal role in restoring refuge, starting with the regeneration of *value* by recovering its sense beyond “market value”. Recovering cultural signification as independent from economic meaning is one of the most urgent immaterial sustainability actions we must take, reconstituting creative knowledge carrying the possibility of refuge for the mind and the *socius*.

Sustainability and the theme of *renewal* are entangled — which marks its incompatibility with linearity and the temporalities it imposes. Thus, time itself, alongside its perception and the meaning we derive and construct from it, must become a central element of ecology. For Heidegger (1985), the modality of being in which Dasein surrenders the possibilities by running forward towards the possibility is essentially suicide: to accelerate *completion* can only mean to accelerate *death*. Our obsession with growth — which Han (2021) defines as a random, cancerous proliferation — can be framed as an obsession with death, in which we are collectively headed to a form of symbolic (and, perhaps, even literal) suicide as the culmination of a directionless, meaningless acceleration that creates a continuous linearity of extinctions without renewal — a hostile system existing only through the death of the processes constituting it. We must understand that the disintegration of our *socius* through polarisation, the crisis of democracies and war, and of our mental ecosystems are manifestations of a “total ecological collapse”. In a cultural reading, the diseases of acceleration endemic of our society — anxiety, depression, burnout — are a physical (from Physics...) consequence of this interconnected destruction: the accelerated entropy leading to the degradation of all systems, the prevalence

of hopelessness, fear, and an “...abandonment of the order of things...” (Guattari 1989, p. 61)

Yet, *future* only has a meaning within a linear logic. Thus, in place of preparing for futures and their promise of an end, we must perhaps consider Han’s (2021, p. 78) claim for a temporal revolution inaugurating a different time — a creative circular temporality capable of accommodating renewal. As observed by Mihhail Lotman (2002), concepts such as *umwelt* and the *semiosphere* are more than new words: they are a reclamation of a shift in paradigm and new ways of thinking theory. *Sustainability* is no different: the necessary shift in our understanding and interaction with the concepts related to it — such as future and time — is, in essence, a semiotic doing.

Thus, the role of a Semiotic Theory of generative orientation carries the potential for the reparation of knowledge landscapes: in reconnecting with Semiotics’ ethos of *generating sense* — rather than *extracting* it — dialogues between disconnected subjects and disciplines can be (re)woven, decomposing to compose again, recovering holism through generative interdisciplinary thinking. By reflecting on the entanglement of the temporalities and spatialities of each discipline, Semiotics can support assemblages of knowledge, repurposing the waste of knowledge to maximise our immaterial resources beyond the utilitarianism of a linear economy. Informed by circularity, we can expand our cognisance through a theory measured by acts of creation: a possibility carried by Semiotics not in its discourses, concepts, and postulates but in the paradigm at its core.

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