**Organizational memory as technology**

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***Abstract***

How does organizational memory function in the context of digital computing? Research on organizational memory has its roots in information systems approaches that emphasize data storage and retrieval. For some time, however, such technical approaches have been replaced by studies of the human processes involved in remembering. In particular explorations of social influences that affect the reframing of memories and furnish remembering with collective influences. However, this analytical emphasis on human (individual and social) aspects stands in contrast with the growth of the use of information technology in organizations, as well as in life as such. Computers and networked devices not only send, receive, process and store massive amounts of communication, they also automatically generate data through sensors, cameras and algorithms at speeds and in volumes that far exceed human cognitive capacities. Moreover, and in contrast with earlier technologies for prosthetic memory (such as films, books, archives, etc.), 21st century media are focussed on feeding information back to the user (including organizational agents) to influence their choices, decisions and behaviour in real time. In this chapter contemplate how organizational memory works in such contemporary technical contexts. Drawing specifically on the media theorists Bernard Stiegler and Mark Hansen we contrast analogue and mechanical forms of memory from digital, computing based ones, and end with a series of challenges for of organizational memory studies.

***Introduction***

Conceptions of organizational memory in management studies have evolved from early discussions of technical models, including how information systems designs function like databases in which information is stored, retrieved or deleted (Brandon & Hollingshead, 2004; Lewis & Herndon, 2011) or, alternatively, how they function like storage-bin-type containers (Walsh & Ungson, 1991) which are navigated through maps that point to the location of distributed bits of knowledge. More recent work, however, has eschewed technological models in favour of the consideration of the human and social aspects involved in remembering. In this, organizational memory studies (Foroughi, Coraiola, Rintamäki, Mena, & Foster, 2020; Rowlinson, Booth, Clark, Delahaye, & Procter, 2010) follow sociological approaches, in particular Halbwachs’s (1992) conception of collective memory which, *inter alia*, shines a light on the distortive processes that accompany the reconstruction of memory.

Individual (Connerton, 1989) and organizational (Anteby & Molnar, 2012) processes of recollection are influenced by the collective processes that keep particular memories alive *within* groups, families, and social classes, whilst also being coupled with the dialectically oppositional need and drive for unity and cohesion *across* such fractions. Halbwachs, who had produced his work against the backdrop of two world wars and the Holocaust, and having so experienced propaganda, lying and demagogy, understood that the past is not a fixed or closed domain. Memory is selected and reconstructed actively, so that even the most intimate and personal recollections are mediated by ongoing and dynamic social processes, inscribed in physical and cultural-historical environments and brought to life through exchanges with others and with groups – each providing and developing frames of reference and interpretation.

Organizational memory studies have similarly begun to study processes of reinterpretation and reframing involved in remembering, and the social mediation and historico-cultural milieu indicated by myths (Sapir, 2020), symbols (Foster, Suddaby, Minkus, & Wiebe, 2011), and other collectively shared elements (Zundel, Holt, & Popp, 2016), or in terms of the influence of organizations, institutions and ideologies. In this paper we seek to extend the inquiry into organizational memory by asking about the role of technology, in particular what Mark Hansen (2014) calls ‘21st century media’, which comprises a wide range of sensors, cameras, microphones which automatically capture data to guide (or replace) human decision making. Put differently, 21st century media operate at scales and sensory thresholds that are beyond the narrow bandwidth of human conscious grasp – and, yet, they have come to fundamentally shape our sensory experiences.

These technologies unsettle the idea of the predominance of human and social elements involved in memory and remembering as they indicate a growing ‘tendency’ towards operations that occur at a microtemporal scale without requiring or involving human perception and conscious awareness (Hansen, 2014: 37). For example, Hayles (2017: 42) compares the near instantaneousness of computational operations with the ‘cost’ of consciousness, which lags several hundred milliseconds behind perception, followed by processes of reasoning or negotiating, which take seconds, minutes or even longer. In comparison, digital machines operate in their own intrinsic instantaneous temprorality, which Ernst (2013: 54) calls *Eigenzeit*. Digital media not only outpace human forms of noticing and contemplating, they also play havoc with the all too human idea of the sequencing of time which, *inter alia*, underpins the possibility of a historical or mnemonic discourse made up of narrative accounts conneting the progression of things and events in more or less linear terms, indicated by the ubiquitous arrow of time. Digital media require neither arrows nor narratives; they do not have a history, nor do they store or preserve information in ways in which they then can be arranged or sequenced – they merely compute, send and receive, instantaneously and infinitely, at least for as long as the apparatuses are switched on and programmes are not idling or, as Vaujany and Mitev (2017: 382) have it, they generate “a constant [informational] flow that is simultaneously and recursively materialised through media, most of which now global”*.* In so doing, technical media do not just operate alongside human practices, but actively intervene in them by intersecting cognitive processes. For example, technical media can guide human action through recommender systems through which nonconscious cognitive processes generate outputs that are fed-forward to the ‘screen’ of consociousness for processing; can supplant human involvement by automatically and often pre-emptively taking action, such as in automatic trading or driving contexts; or can interact with human sense directly when we thumb ‘mindlessly’ through gamified interfaces.

These changes are profound because human communication is now mediated. It is simultaneously mediated technologically, exeternally, and through (or rather ‘as’) computable, networkable, disembodied and infinitely transferrable screen imagery no longer requires or is capbale of ‘representing’ anything (Vaujany and Mitev (2017). Digital technologies are, therefore, implicated in the growing distribution of human cognition and it no longer seems viable to configure technologies as mere supplements to mnemonic processes that are animated by conscious, deliberative social action.

These changes have significant implications for the possibility of memory in the context of organizations, which are by now deeply enmeshed with their technologized environments. Because 21st century media are no longer concerned with the storage of human knowledge and experience as it was still the case with more traditional archives, libraries, or even films, their mode is characterized by recycling and refreshing rather than the preservation of artefacts for the future (Ernst, in Hansen, 2014: 41; Kallinikos & Mariategui, 2011). The result is an organizational focus on data processing and the generation of immediate feedback loops. This means that alternative conceptions of organizational memory are required. In this paper we attempt to contribute to such a direction by outlining a technologized account of organizational memory first in terms of the influence of analogue and mechanical systems, and then with a view on identifying how these change with the onset of sensor and feedback-driven 21st century media.

***Technological memory***

To set the scene for an investigation of computing and network-based conditions of organizational memory, we begin by outlining a technology-focussed account of memory involving pre-21st century technologies. The philosopher Bernard Stiegler (1998, 2009, 2011) offers a theorization of the interplay of technology (he speaks of *technics* to refer to what he calls “organized inorganic matter”) and organized human development in which memory takes a central role. Particularly important for our purposes is that in this account memory is no longer purely something inside a person, such as *genetic* memory, which is stored and inherited through DNA, nor is it epigenetic memory, which comprises individually acquired experience stored in the central nervous system (and which cannot be inherited genetically). Stiegler identifies a third kind of memory involved in this human-technology nexus: knowledge inscribed in tools; an *epiphylogenetic* or *tertiary* kind of memory, which is exteriorized into instruments and so can be passed on to the next generation outside, as it were, of the human body. Tertiary memory is not a mere extension of the human body by technical means, and while it bears resemblance to Landsberg’s (2004) idea of prosthetic mnemotechniques by which ‘societies, cultures and even individual persons systematically attempt to remember, as well as cultural strategies for passing on memories to future generations’, it reverses the emphasis from the purposive or systematic attempts of humans and societies to remember but by stressing the ontologically prior nature of technology: first giving rise to the possibility of the creation, perseverance, and development of humanity itself.

Stiegler discusses the importance of technics for human memory in some very dense sections towards the end of his book *Technics and Time*, Vol 1 (Stiegler, 1998). From Husserl (1991) he takes the emphasis of the role of a ‘big’ or ‘large’ *now* of perception. The temporal object, such as a conscious or mental process such as memory that is extended through time is, for Husserl, constituted in its duration as a flux which is coincident with the flux of consciousness of which it is the object. An example is a melody, which is constituted only in its duration, hanging together with notes preceding and following it (Stiegler, 2009: 5). Husserl identifies with every present moment (with each originary impression), an additional element that extends that now; its ‘just past’ which is constitutive of the present. In the case of the melody, the ‘just past’ are the already disappeared notes that conjoin the present ones. Immediate perception therefore drags with it a ‘comet’s tail’ of this immediate past, and the ensuing conjoing ‘*present+immediate past’* construct is what Husserl calls ‘*primary memory’* – memory that constitutes an original impression. Husserl invokes the fading sound of a violin:

When a tone dies away, it itself is sensed at first with particular fullness (intensity); and then follows a rapid weakening in intensity. The tone is still there, still sensed, but in mere reverberation (Husserl, 1991: 33).

The reverberation is therefore different from the perception itself, but as a memory it is neither ‘really’ present in retentional consciousness (*retentionales Bewußtsein*); nor is it a different tone in addition to the original one. Instead, the intuition of time, at any point, involves not just what appears to be enduring right now, but also what has just been. ‘Primary memory or primary retention’ names this immediate form of retention-coupled-with-perception, which differs from what Husserl calls ‘secondary memory or secondary retention’, which is detached from primary retention, existing only as a memory in the sense of a recollection of a past as a total temporal phenomenon that can come back into presence (*Wiedererinnerung*). Where primary retention names the tail of a reverberating note, secondary retention is like remembering a melody one has heard at a recent concert – it is therefore a selection – as everyone in the audience will retain something different from all the music played in the concert. Secondary memory is somehow *like* the ‘*perception+primary retention*’ couplet, but it differs as it is merely a *represented* past, not a *perceived* past.

Stiegler then directs us to a later passage where Husserl asserts that both primary and secondary retention are also different from a third kind of memory, which is not lived or subject to an individual’s own experience, but retained through paintings or sculptures (which he refers to as image-consciousness -*Bildbewusstsein*). Primary and secondary retentions share a character of ‘re-presentation of something itself’ – primary retention re-presents perception, while secondary retention re-presents a total temporal phenomenon. Images and sculptures, on the other hand, retain memory in an external (or exteriorized) way and it is precisely this third form of retention – through non-living things – that preoccupies Stiegler’s own work.

Husserl directly opposes primary and secondary memory as separate forms of retention – but Stiegler instead argues that primary memory can be influenced by secondary memory. Here we witness a profound shift in memory with the invention of, first, the analogue phonograph which has transformed the play of memory, imagination and consciousness as, for the first time in human history, the identical repetition of a temporal object became possible (Stiegler, 2011: 40). Perception can change, for example when listening to the same recording of a song over and over again, always hearing new things in the same object (and also changing our anticipation of the next moments); and as this is only possible through media (the recording as tertiary memory), both secondary and tertiary memories can influence perception in the now.

To understand the far-reaching implications of technical memory and, in particular (following Stiegler), their working as and through temporal objects, we need to follow Stiegler from Husserl to Heidegger – and so from the phenomenological concern for the living present in the former – to the consideration of the role of heritage in the latter.

*Dasein* (Heidegger’s term roughly equating to the human being) comes into a world that is always already there (*ready-to-hand*); a world that it inherits without having experienced it directly (Stiegler, 1998: 140). Heidegger’s *always-already-there*, what he calls world-historiality (*Weltgeschichtlichkeit*), names this ghostly presence of the dead who have not entirely vanished because their traces remain for future generations. Rather than beginning afresh with each new generation – that is beginning just with the genetic predispositions that is germane to the particular evolutionary stage of humanity’s development – the *always-already-there* bestows individual humans their identity, their customs and manners, their speech and gestures. Dasein is being-thrown into a world and so inherits its past; it inherits experience in addition to genetic information, which allows it to become a ‘who’ - a child or grandchild, a member of a family, culture, city and so on, and even though this past is not anything the new earthling has lived, it is still *its* past. Having a past is a facticity, a sense of self and belonging, from out of which the self can project itself forth into its future; to become this or that person, and so to glance possibilities that are rooted in their heritage: ways of being that arise out of the thrownness into a world that is already brimming with cultural life, recipes, traditions, labels and much more, even if none of these have been experienced by that individual herself. As heritage (past) and possibility (future) hang together so closely, it is therefore possible to say that ‘…the past is not something which *follows along after* Dasein, but [it is] something which already goes ahead of it (Heidegger, 1967a: 20, in Stiegler, 1998: 207).

***Exteriorized memory***

Stiegler follows Heidegger in this analysis of heritage but accuses him of shying away from the most radical implication of the *always-already-there,* namely, that at the very ground of human being lie *material elements*, media, that convey traces of the dead:

“It is a memory that is neither primary nor secondary; it is completely ignored in Heidegger's analyses, as it was in those of Husserl, and yet it is immediately there in a tool; indeed it is the very meaning of a tool” (Stiegler, 1998: 254)

Like Husserl’s pictures and sculptures which, he excludes as mere image-consciousness from the conception of retention, Stiegler argues that Heidegger excludes the realm of the technical from the analysis of world-historiality. Instead, Heidegger retreats into a quite human concern of a totality (or finality), in which authentic beings run against the sway of what is already there. Put differently, an authentic life needs to be lived in view of the possibility of the end of that life (its own most mortality), rather than in projecting one’s future in terms of what has already been there; it is therefore precisely the ‘being-having-been’ that needs to be forgotten in order to regain a temporally authentic relation to one’s own being.

In addition to the comings and goings of humans there is therefore an experiential (*epigenetic*) layer of life that is not lost with the living when they die; this layer conserves *itself* and passes *itself* down to future generations (Stiegler, 1998: 140). Stiegler attributes to this layer an active and ontologically prior character; not a biological programme (and not a process attributable to ‘pure life’, as experience cannot be inherited genetically) but instead:

“…a cipher in which the whole of Dasein is caught; this epigenetic sedimentation, a memorization of what has come to pass, is what is called the past, what we shall name the *epiphilogenesis* of man, meaning the conservation, accumulation and sedimentation of successive epigenesis, mutually articulated”

In identifying the importance of technics as a medium that allows for heritage, Stiegler follows the Heideggerian idea of Dasein being reliant upon a past, and that this past is not just what has been individually experienced. However, unlike Heidegger, Stiegler does not allow for Dasein to have its having-been on its own accord. In being more than its own past, Dasein is always-already technological; being happens amidst and as a result of tools. Any engagement with tools, even in their most basic form such as chipping a flint stone to develop sharp edges that can then be used in the collective organization of work (hunting, preparing food or carpeting), as well as conflict and exchange, involves remembering how the tool was made, how it was deployed and modified, so creating a form of memory that is inscribed in the activity of social life (Stiegler, 1998: 150–154).

We can now also see how Stiegler’s account differs from Halbwachs’s (1992) which identifies human interchanges as the basis for the development of self and culture (subject to the dialectic struggle between individual and collective forms of memory) and with much of the recent organizational memory literature similarly lacking engagement with the technological foundation of human (organized) memory. Stiegler, instead, locates a much earlier event - earlier even than the development of articulation and language - in the capacity to fashion and use tools. He goes as far as to suggest that it is not the human that invents the tool, but the tool that makes the human (or rather that the development of tools makes it possible for humans to emerge):

“Tertiary retention is in the most general sense the prosthesis of consciousness without which there could be no mind, no recall, no memory of a past that one has not personally lived, no culture” (Stiegler, 2011: 39)

It is therefore subsequent technological regimes that simultaneously open up new forms of cognition and linguistic expression. *Hominization* is, for Stiegler, inseparable from *technicization*; man is a technical animal. Humans depend on technical objects that preserve *epigenetic* experience outside of the body and so make *experience* available for future generations which is something genetic evolution is unable to do. The task, therefore, is to:

“…to see in the instrument what truly sets in play the temporality of being, what regarding access to the past and, therefore, to the future, is constituted through the instrument techno-logically, what through it constitutes the historical as such” (Stiegler, 1998: 245)

Put in terms of our inquiry into organizational memory, the task is to begin to analyze technology no longer in terms of retention bins (i.e., Walsh & Ungson, 1991) or transactive memory systems that function akin to Husserl’s secondary retentional systems, storing selective sequences from otherwise continually flowing primary perception. Instead, we are to accord technology a much more fundamental, foundational and transformative role in the organization of human activity – and of human consciousness as such. Put differently: something happens memorially from within the technological elements themselves: a mode of existence that is itself technological. The question of memory is therefore a question of technics.

***The pharmacological function of exteriorized memory***

To elaborate the role of exteriorized memory for our understanding of memory in organizations, we need to turn from simple tools (technical elements) to more complex machines, such as integrated information systems (technical ensembles) (see D’Adderio, 2003). A book retains speech in the same way in which the tool retains the gesture of the worker. As simple tools give way to machines and industrial complexes, the knowledge of generations of labourers passes into the machines, so that it is no longer possible to suggest that workers bear tools or operate machines, but rather that workers are now reduced to operating (Stiegler speaks of ‘serving’) technical ensembles (Stiegler, 2010a: 37). As machines and machine complexes get upgraded continually (a process Simondon, a philosopher of technology, calls ‘concretization), the worker does not. What resides in machines is ‘human reality, the human gesture set and crystallized into functioning structures (Simondon, 1958: 12, cited in Stiegler, 1998: 67).

Günther Anders (2016) even sees the human adopting a shameful position, finding itself falling further and further behind the capacities of technology which are updated continually while the worker is merely reborn, naked and wrinkly, from generation to generation with the same limited set of skills. Put in Stiegler’s conceptual framing, the stock of tertiary knowledge, retained in massively growing knowledge and productive facilities comes at the expense of a loss of knowledge in the worker, (which Stiegler calls proletarianization), now left merely to operate buttons and computer interfaces so becoming unable to penetrate these surface level inputs into otherwise incomprehensible machine operations. Even the engineers and other experts who design, maintain, repair and upgrade technological systems mostly do so drawing on defined processes, manuals and by installing modular, black box systems (Stiegler, 2010a: 47).

All this points to a profound reorientation of memory systems in particular in the context of organizations which are replete with such technological ensembles which mimic and, therefore, retain human knowledge and action. Unlike individual machines which merely repeat the gesture of a worker tirelessly, ensembles are able to be continually upgraded and adjusted. This means that industrial technical objects have a consistency that goes beyond being utensils owing to their capacity to operate at their own accord, habouring a self-determining logic that belongs to them alone: their own mode of existence (Stiegler, 1998: 68). Organizational memory is therefore no longer merely a retainer for selective human memory (such as the secondary kind of memory identified by Husserl, which retains certain elements of a wider flow of primary perceptions). Technical objects are a form of social memory – and they are part and parcel of a transformation from a version of humanness characterized by their bearing of tools towards machines (which are organized inorganic matter) taking the role of tool bearers. Conceptualizing organizational memory in terms of human and social processes or remembering alone therefore misses that humans are increasingly squeezed out of the processes involved in organizing technical knowledge. This is particularly so with digital media which are not only elements of control and surveillance (as for instance elaborated by Zuboff, 2018), but also, argues Stiegler (2016b: 80), effect the rise of stupidity and madness; a process of proletarianization that indicates the degradation of the reflective and expressive potential in societies.

At this point it is helpful to turn to Stiegler’s analysis of the effects of this industrialization of memory in terms of both its beneficial and negative effects. For this, Stiegler invokes the Greek term *pharmakon*, earlier invoked by Derrida, naming both a poison and its remedy, to indicate the relation between technology and humans whose duplicity is indicated both by a gain and a loss. Just as the growth of pharmaceutical chemistry brings both relief while turning health into a market, the act of writing exemplifies this pharmacological pattern as it involves a loss as it no longer makes necessary the practice of internal memorization, and a gain because it allows for the storage of information on paper: “Tertiary retention is …what compensates for the default of retention – which is also to say, the loss of both memory and knowledge. But it is also what accentuates this loss (this default): it is a pharmakon” (Stiegler, 2016a: 17).

Writing is pharmacological in the sense that it takes away something (the need for, and eventually capacity of short term memory) while giving back something similar but different (long term memory, exteriorized into a technical support); technics allow for the development and transmission of culture, science, and so for humans to become human; they provide a supplement for a lack (*de-fault*) and so give to humans the capacity to evolve by means other than life. Memory is key in Stiegler’s account: ‘content’ that *could have been* *lived*, even if it was in fact not experienced (or lived) by consciousness - but which still informs consciousness as it is exteriorized into tools, machines and retentional devices (see Hansen 2017: 170). But the deficit amasses as humans can no longer encompass these exteriorized memories,[[1]](#footnote-1) instead relying on maps, index systems, tables and, increasingly, automated recommender systems; as technical developments are unpredictable; and by a rise of mental illness, disillusion (owing to the standardization and marketization of belonging and desire) and what Stiegler (2016b: 26) calls ‘algorithmic ill-being’ as a product of large-scale automatization. Each new technology has the potential to bring about a new pharmakon, but what distinguishes the digital era from the book press, the gramophone or even the cinema is, for Stiegler, that the digital harbours a particularly destructive toxicity for social systems and democracy – and so they make it impossible (unlike in earlier technological developments) to find therapies that mitigate against their effects, that is to rewire the short-circuiting. Where the industrial revolution, for example, spawned debate about the tempering of profit, environmental deprivation and exploitation through tax systems, laws and social welfare programmes, an epoch of real-time adaptation and light-speed feed-forward processes – that is of full automation - obviates the deliberative and reflective processes required to develop and cultivate such slow human remedies. Knowledge, he says, takes time: time to think, to sleep, and to dream (Stiegler, 2016a: 50ff; 84).

***Temporal objects***

To understand why Stiegler attributes such destructive power (or rather pharmacological toxicity) to digital media, it is necessary to briefly return to the question of memory as primary, secondary retentions as in Husserl’s experience and recollection of a concert, and Stiegler’s tertiary extension through a phonographic repetition of the *same* temporal object. Perception, we recall, can change when exteriorized memory is presented again (even over and over). Stiegler calls the work of the phonograph a prosthesis of a ‘singular type’, one ‘making it obvious’ that it produces the recording of a track on a material object (Stiegler, 2011: 39). However, the matter gets more complicated when we turn from the simple and analogue phonograph to the cinema. Unlike the exteriorization of memory in music, the cinema brings a shift in the relationship between the three types of memory, as it connects disparate elements together into a single temporal flux (Stiegler, 2011: 15). It does so by working with all three elements of memory whereby tertiary memory first roots secondary and primary memory in one another. The cinematic is so profoundly influential because it works precisely at the level of tertiary memory: a temporal object that coincides with consciousness which, in turn, is ‘intimately penetrated and controlled by cinematic sequences’ (Stiegler, 2011: 38). Put differently, for Stiegler, the temporal flux of cinema coincides with the spectator’s consciousness – not, however, because cinema has adapted human memory, but because the work of consciousness ‘is already somehow cinemato-graphic’ (Stiegler, 2011: 87). This is so because any sense of ‘*We’*, that is of a social body, of belonging, culture, history and scientific progress (but also Halbwachs’s collective memory) is only possible because *epiphilogenetic*, technical memory provides access to a past that was never lived:

The process requires access to a false past, but one whose very falsity is the basis of an “already-there” out of which the phantasmagorical inheritor can desire a common future with those who share this (false) past by adoption, phantasmagorically. (Stiegler, 2011:90)

The trick performed by the cinema is to replace the source of the past that was not lived. Unlike earlier technologies like the phonogram, which for Stiegler, still worked as a prosthesis of a ‘singular type’ by ‘making it obvious’ that it produces the recording of a track on a material object (Stiegler, 2011: 39), the cinema does no such thing as the technology of the moving image now *coincides with consciousness* (with primary retention) which is equally, at its base, fundamentally artificial, that is it is always already modified and constituted through secondary and tertiary memory (that is, it is always already ‘somehow’ cinematographic).

The effects of this change are far-reaching. The formation of a self is, as we have seen, subject to engagement with tertiary memory – with the continually growing masses of things that are made available for experience through mnemonic devices – Heidegger’s *always already there*. Libraries, rituals, cultural practices, songs and stories preserve the collective memory of a ‘*We’* as a shared, common past which allow for the development of a shared desire of a common future (Stiegler, 2011: 88). Any self (the ‘*I*’) is continually formed in relation to this *We* – through processes of synchronization (Stiegler, 2011: 102) by which a self experiences these rituals, reads books or engages in social practices, but never totally fusing with the remnants of the old. And just like the *I* must remain partially undetermined to be able to be part of a group, so the collective *We* also retains an open and developing character (Stiegler, 2011: 97). The collective *We* relates to a conforming *I* that is never fully formed and so capable of both continuation and novelty in a process of co-individuation – something Halbwachs had well recognized and precisely this is what Stiegler now sees endangered with the cinema and the culture industries *writ large*, and with more recent digital media. The cinema (and as we will see, more recent digital developments) destroys these processes of self and society making (Simondon’s ‘co-individuation’), as the cinema provides scripted and standardized versions of non-lived pasts – and of desired futures without requiring the deliberative, reflective and self-forming processes of synchronizing self and other. Retentions (tertiary memories) but also protentions (desires for futures) become standardized and, in Stiegler’s analysis, fall under control of marketing (Stiegler: 2020: 172). The cinema begins a process of confusion of primary and secondary retentions with tertiary ones – it is as if one has lived through the film; as if these memories are not just those of a collective *We* – from which every developing self has to choose elements, modify what does not fit, and so engage in a process of synchronization, but precisely this process is now short-circuited:

“…just as the worker has been deprived of individual technical potential by machine tools, the subject-conscious-of-objects has become a consumer of products deprived of all possibilities of participating in the process of defining, constructing, and implementing the retentional criteria for a life of the mind.” (Stiegler, 2011: 103).

***Digital memory technologies***

The structural workings of the cinema are now exacerbated by digital technologies and in particular social media which equally bypass the individuation processes that allow for the synchronized development of self and community (*I* and *We*) and instead short-circuit a pathway from commercial and political interests to the very process that produces the self. In addition to its implication on the formation of selves, digital media also impact the formation of democratic social bodies which, in mandating decision-making powers to elected representatives, require the possibility for participation through debate and reflection, which can only happen in the slow processes that mark political and social institutions and organizations (Stiegler, 2010b). Precisely this ‘time delayed’ mode, however, is now destroyed by the real-time workings of digital media, both in terms of the direct effects of memory systems that no longer merely store information but actively feed forward and so affect decisions through recommender systems (e.g. Tripadvisor, see Orlikowski & Scott, 2015), or directly (e.g. in automated trading, see Beverungen & Lange, 2018) and the real-time adaptation of politics to public opinion (e.g. whipped up on Facebook or Twitter).

Even darker than Stiegler’s identification of the workings of digital media on consciousness are Mark Hansen’s (2014) elaborations of the effects of what he calls 21st century media, a term comprising a vast array of digital developments from social media to the internet of things, sensors, platform ecologies and so on, on pre-, sub-, or non-conscious processes. 21st century media, for Hansen, represent a form of retention that is radically different from previous technologies. Not only due to their miniaturisation, portability and the ubiquity of sensors that automatically gather, process and propagate data – making human behaviour itself a kind of archive (Hui, 2016: 316), but because - for the first time in human history - such processes unfold largely without humans having direct experience, awareness or even potential access to what is processed and computed. Galloway and Thacker (2007: 155) speak of the ‘unhuman’ qualities of networks which nevertheless do not exclude human decision and commonality:

Networks are elemental, in the sense that their dynamics operate at levels “above” and “below” that of the human subject. The elemental is this ambient aspect of networks, this environmental aspect - all the things that we as individuated human subjects or groups do not directly control or manipulate. (Galloway and Thacker (2007: 157).

However, this unhuman element of networks does not mean that there is no connection to humans on the very elemental level. N. Katherine Hayles (2017: 10ff) – following the work of Andy Clark (2008) - argues that large parts of human awareness happen not on the conscious level, but as non-conscious operations at a level of neuronal processing which recognize patterns to complex, subtle and fast for consciousness to discern. These operations are crucial for the functioning of consciousness as such but not accessible to awareness. It is precisely here that Hansen diverges from Stiegler, suggesting that 21st century media directly mediate mediation itself. (Hansen, 2014: 43). Put differently: while higher level human processes associated with cognition, awareness or sensemaking are still involved, they are now intricately linked with immensely fast, distributed, parallel and so become decentred processes:

…today’s ubiquitous computational environments and bionic bodily supplementations operate more by fundamentally reconfiguring the very sensory field within which our experience occurs than by offering new contents for our consciousness to process or new sensory affordances for us to enframe through our embodiment. (Hansen, 2014: 45)

Only frequently so far does organizaitonal research probe into the material aspecsts involved in relaying infomarion (Vaujany and Mitev, 2017: 385), and yet the ubiquity of computational environments, particularly in organizational contexts which are replete with technological structures, as already given rise to a form of *experiential* computing, whereby embodied experiences are digitally mediated by everyday artefacts with embedded computing capabilities (Yoo 2010, p. 215). More specifically, the ubiquity of everyday objects with embedded computing capabilities gives rise to a condition in which embodied human experience, manifest in relations between the body and ‘the world’ (e.g relations between the body, time, space, others , and things) is fully or partially mediated by digital technologies (Yoo 2010). ‘Computers’ lurk in cars, TVs, watches, phones, doorways, and traffic lights, and the process of computation is implicated, (although often concealed) as we chose where to go, what to do, how to do it and when to do it (Hayles 2017; Yoo 2010). Therefore, in this mode of computing, technology is no longer an object of interpretation (Blagoev et al. 2018; Humphries and Smith 2014), nor is the experience of technology an end in and of itself, rather technology intervenes in, configures and shapes conscious experience (Yoo 2010, p. 218).

Organizational scholars, echoing Stiegler’s assertion that technics lie at the core of being, have suggested that the emergence of experiential computing constitutes an ‘ontological reversal’, insofar as information systems no longer function to represent preceding physical realities, but instead function to construct the physical environs in which humans act and experience (Baskerville et al. 2020). For example, new buildings or structures are typically rendered digitally through computer-aided design, their integrity and behaviour under different environmental conditions are tested through in-silico modelling, physical models which inform the discussions of designers and architects are produced by 3D printers, the building or structure is ‘digital first’. Similarly, airline tickets are continually modified after they are ‘issued’ in connection with airlines’ booking systems to reflect changes or cancellations, and despite their on-material and flexible nature, translated into images on smarphone screens they open barriers at gates or transfer vaccination information (Baskerville et al. 2020; Boland et al. 2007). All this happens outside of and in excess of human perception and noticing, involving networks, data processing and a multitude of devices.

Despite this apparent ontological reversal, 21st century media equally offer a supplementation. These media have become unavoidable in many sensory engagements with the world – from finding one’s way through maps on smartphones, trackers eliciting biometric data, media feeds purveying news or communication; to the many invisible assistants that keep cars on track, and recommender systems calculating ideal places to eat, sleep or live. These media therefore provide massively enlarged and microtemporally sped up access to the world but the pharmacological recompense is that these newly expanded sensory data can no longer be experienced directly and slowly through the human senses and so we require devices and interfaces to translate the sensory expansion so it can once again be experienced (retrospectively) by human senses.

21st century media therefore appear to offer a similar supplementary (exosomatizating) function to that of writing - by providing access to the very experiences that have been removed from human control and relegated to technology. But Hansen (2014: 50ff) identifies a crucial change in the supplementary pattern: while writing directly gives back what it takes away (a source of memory, first natural and short term become artificial and long term), 21st century media constitute an indirect recompense: the waning powers of perception and the loss of control over one’s nonconscious processes is not restored artificially but rather develops a *different* capability in its stead, one that is neither entirely human nor purely machinic. There simply is no perceptual access to these enlarged sensibilities – only their ‘presentification’ in humanly accessible form (heartbeats shown retrospectively as graphs or numbers; recommendations as rankings, and so on), but that is not even their point or purpose. 21st century media no longer merely store memory, they are geared towards gathering microsensory data directly (bypassing consciousness) and then processing these to influence action and emotion (the reengineered sensibility again bypassing consciousness) in real time:

… the technical sensors now ubiquitous in our lived environments are able to capture experiential events directly at the microtemporal level of heir operationality and -independently of consciousness’s mediations – “feed them forward” into (future or “just-to-come”) consciousness in ways that can influence consciousness’s own future agency in the world. (Hansen, 2014: 52).

In distinction to Stiegler (and Heidegger’s) notion of the ‘already there’, which forms one’s tertiarily retained past but which the individual need not have been experienced itself, Hansen (2014: 53) argues that it is now ‘contemporary data of sensibility [which] can be defined as data that *cannot be directly lived* by consciousness’ – nor *can* they ever be experienced or lived directly by consciousness. They simply fall outside of the realm of human consciousness. ~~sensibility~~.

**Challenges for the study of organizational memory**

In the above sections we have elaborated a technical conception of memory. Stiegler’s outline of tertiary retention has allowed us to shift the focus from primary streams of perception (experiencing a piece of music) and secondary retentive selections (remembering some elements from the experience) as the key aspects of human memory towards tertiary forms of retention. Tertiary memory is retained in elements other than life, be that tools or machines, or more direct technologies that memorize experience, such as the phonograph. Via Heidegger, we have elaborated the importance of the *always already there* – that is the entirety of memories that allow for the formation of selves and societies (the co-individuation that synchronizes the *I* and the *We*). Stiegler’s correction of Heidegger connects the *always already there* with tertiary memory: only what is retained outside of the human body can be conveyed from generation to generation, and this *epiphylogenetic* pattern of inheritance first affords the rise of the human as a bearer of tools. The onset of machines, however, adds a further twist, and via Simondon’s ‘concretization’ we have seen how knowledge passes into machines which, as bearers of tools, engender their own modes of existence, leaving the human being to merely operate on the surface of complex technical ensembles, pressing buttons, turning levers or typing commands without, however, being able to penetrate, oversee or control the complexities of these new complexes. For Stiegler, a bleak picture emerges of humans bereft of control and sense of self, lagging behind autonomously improving technological apparatuses; idiocy growing from generation to generation. Finally, we turned to the influence of computing and digital media on memory. Via Stiegler’s outline of the workings of the cinema, populating the *always already there* of a non-lived past with scripted and standardized memories, we arrived at Hansen’s outline of 21st century media which are no longer geared towards storage of memory, but to collect, process and feed back sensory data below and above conscious awareness.

The above sections no doubt represent a wild ride through a complex territory, but at the centre of all concerns is the question of memory – exteriorized as consciousness or as raw sensations into technical media. To return to our concern with organizational memory, we therefore suggest that while the (re)current focus on human and social elements which we indicated via Halbwachs is interesting, it nonetheless merely covers a small aspect of what happens with and to memory in and through organizations, leaving the question of technology unanswered. In closing, we therefore want to outline a series of challenges for organizational memory studies, if this field is to attend seriously to *mnemotechincs.*

*Reconfiguring Mnemonic Processes*

The most significant implication for the concept of memory advanced here is that technics can no longer be configured as supplementary to mnemonic processes that are fundamentally social, but rather these social mnemonic processes are conditional upon technics. This claim requires a theoretical recalibration in the relation between the technological and the social in organizational memory studies. For example, the retention bin analogy that lies at the core of functionalist memory studies (D’Adderio 2003; Fiedler and Welpe 2010; Walsh and Ungson 1991) attends to the notion that memory may be exteriorized. However mnemonic processes (e.g acquisition and retrieval) are configured as conscious, deliberative processes undertaken exclusively by individuals or groups of individuals (Walsh and Ungson 1999: 70). Similarly, interpretive organizational memory studies highlight the exteriorized aspects of memory through the notion of *mnemonic traces*, which may be “maintained in objects of the world” such as archival documents, monuments and museums (Mena et al. 2016: 723). Within interpretive approaches, these material or objectivized mnemonic traces feature in the strategic and rhetorical work of managers, who might corral, or discard these objects in the creation of social memory assets (Foster et al., 2011, 2017), or in the development of collective memory (Mena et al. 2016). More recently, organizational memory studies have sought to elucidate the active functions of technology in mnemonic processes, highlighting how technological affordances facilitate and constrain the process of organizational remembering (Humphries and Smith 2014). Whilst these developments move organizational memory studies towards a more symmetrical configuration of the social and the technical in mnemonic processes, the human and the organization remain the authors of memory, responsible for and capable of reconstructing the past *with* material rather than *from* material (Blagoev et al. 2018: 1761).

Here we propose that materialist treatments of technology in organizational memory studies are challenged by 21st century media, which are computationally-contingent and non-material, and therefore increasingly inaccessible to conscious perception (Faulkner and Runde 2019). The ubiquity of these imperceptible, open, flexible, editable and communicative objects, present a condition in which human (and thus organizational) experience is always technologically mediated (Yoo, 2010; Baskerville et al, 2020). The Stieglerian notion of tertiary retention, in light of the features of digital objects, suggests that mnemonic processes are not accomplished *with* technology, but rather *through* technology. This configuration of memory as technologically contingent has implications for future research in organizational memory studies, across functionalist, interpretive, critical and performative traditions (Coraiola and Murcia 2019; Foroughi et al. 2020) at the cognitive, organizational and environmental levels of analysis.

*Future Research*

First, at the cognitive level, organizational memory studies might take up a concern for the co-relation of humans and non-human media in ways that avoid privileging the human. One approach might be to conceptualize individuals and organizations as *exosomatic organisms,* that is “organisms whose survival depends on equipping itself with technical or prosthetic organs external to its own body” (Alombert and Krzykawski 2022: 306). In configuring organisations as exosomatic organisms, it becomes possible to overcome the dualism that distinguishes organisation from technology, and we are instead encouraged to adopt a relational unit of analysis that foregrounds the coupling of the organization and its technical organs. Research on organizational memory might ask how technical organs construct, influence and direct contexts of human reflection and deliberation. Future research might also attend more directly to the role of consciousness in mnemonic processes, which are typically assumed to be purposive, deliberative and strategic. For example, research might draw on Hayles’s (2017) notion of cognitive assemblages to explore how non-conscious cognition, externalized in technological infrastructures, functions to guide and direct attention, and the implications of this for the strategic, rhetorical construction of collective memory. Others might focus on the processes of *exosomatization,* that is “the production of technical organs by living organisms” and the role humans play in setting up and maintaining technological systems (Beverungen & Lange, 2018). In the context of organizational memory studies, this would entail a focus on the ways in which memory is embedded in (intentionally or unintentionally) in technological infrastructures, and shed light on how memory embed in technological contexts interacts with somatic memory in embodied contexts.

Second, at the organizational level, the idea of technology-as-memory might prompt consideration of the ways in which collective identities are technologically curated. Existing organizational memory research has identified how organizational actors engage in rhetorical mnemonic processes to construct, reconstruct and preserve organizational identity, and the implications for legitimacy (Zundel et al. 2016). However, the ideas we have advanced here suggest that the capacity to ‘remember’ strategically to affect identity may be problematic, since these processes themselves are conditioned by technology. Future research might explore how the capacity to establish identity claims is influenced by the degree of externalization of organizational memory. For example, research has indicated that material forms of memory are particularly important in identity (re)construction (Hatch and Schultz 2017) and maintenance (Anteby & Molnár 2012), but future research might go further in elaborating the notion of materiality, unpacking how the materiality of particular tools influence constructions of self and organization.

The notion of technical memory also has implications for research that has examined the role of mnemonic processes in the propagation of exploitative power dynamics (Anteby and Molnár 2012). Specifically, if mnemonic processes can no longer be fully controlled or directed by human agents, then is the capacity to mobilize these processes for preserving unequal power arrangements undermined? With what implications for entrenched power arrangements? Alternatively, future research might build on the notion of proletarianization described above, that is “the process that deprives individuals and communities of their knowledge... that occurs when the re-interiorization of knowledge externalized in technical supports is made impossible” (Alombert and Krzykawski 2022: 320). In contemporary organizational settings, characterized by algorithmic management, particular rationalities and modes of ordering may be concealed from, imposed upon, and internalized by workers. Research on organizational memory studies might explore the dynamics of this proletarianization, eliciting insights on how this insidious form of alienation might be resisted.

Finally, at the environmental level, it might be argued that exteriorized technical memory plays an active role in the collective memory making process that drives the formation of societal logics (Ocasio et al. 2016). In light of this, future organizational memory research might explore the role of technology in shaping representations of the past. It might look at how technologically constructed representations are propagated, and (re)presented to social actors, and the impact this has in the construction of meta-narratives and the emergence societal logics. As highlighted above, technological construction and propagation of representations of events increasingly unfold in temporal regimes that render conscious participation impossible - for example, the flash crash of 6th May 2010 (Lange et al. 2018). Future organizational memory research might consider how such novel temporal regimes function to undermine conscious reflection, deliberation and judgement which are central to strategic uses of the past. A key challenge for organizational memory studies, in light of technology-as-memory, concerns its role in cultivating wider reflection on the exteriorization of memory, the exclusion of the human from memorializing and the diminishing role of the social in creation, maintenance and use of organizational memory.

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1. Stiegler (1998: 68) makes the more radical claim that it is the human that supplements the absence of machines, up to the industrial revolution, by being a technical individual, right up to the point where the tool-equipped machine is no longer in need of such supplementation. [↑](#footnote-ref-1)