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The future of human creative knowledge work within the digital economy

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ABSTRACT

Current and near future organizational strategies are placing great emphasis on machines, robots and AI. Automation to reduce menial or repetitive jobs, digitization of work to render remaining workers more efficient and AI to provide more reliable and productive top-end professional work are all inter-related initiatives enacted by current dominant imaginaries of efficiency and maximization. We argue that there is an Ellulian phenomenon of efficient techniques spreading within technical logics that go beyond neo-liberal frontiers – namely, algorithmic approaches which attempt to capture and reduce *all* manners of human knowledge and meaning across the efficient explication, formalization and manipulation of signs. Such purely 'efficient' and analytical approaches fail to recognize the unique and inimitable characteristics of human creativity and its associated tacit knowledge.

Inspirations from more holistic interpretations of Jungian symbolism allow us to provide a starting point towards comprehending the complex, ambiguous, constantly emerging and essentially hard-to-define aspects of human creativity and tacit knowledge. This, along with the argument that there exists a relationship between the democratization of knowledge and democratic decisional processes, provides the basis to present an alternative imaginary of efficiency as proposed by Feenberg (1999). Such an imaginary, allows for the democratic participation of humans in the decisional process and development of technology; and also recognizes and enacts humans as full legitimate partners with technology in their mutual shaping capacities – thus, leading to human-centric organizations.

1. Introduction

What will the nature of human work consist of in the digital economy of the (near) future? A 2017 McKinsey and Co. report claims that about half the activities carried out by workers today have the potential to be automated, but that "for most occupations, partial automation is more likely than full automation in the medium term, and the technologies will provide new opportunities for job creation." More specifically, technology will create new jobs to compensate for those more highly impacted such as independent work and other work that can be replaced via automation.

Others, such as Kim, Kim, and Lee (2017), present a more sober analysis of technology's economic impact – arguing that even though in the longer run human workers will be in demand for more creative work, the current workforce will undoubtedly face higher unemployment, and that it is imperative governments provide various forms of intervention to ease the transition. Yet, not all seem convinced of more creative jobs for workers; studies have identified new forms of managerial control, such as Amazon's

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Mechanical Turk (Irani, 2015), a platform for outsourcing – and effectively hiding – the labour of coders. In a similar vein, The Economist (Sept.10, 2015) speaks of 'digital Taylorism' or scientific management's comeback across a much wider range of jobs beyond the traditional industrial context, including service workers, knowledge workers and managers themselves. Technology now plays a frontline role in dividing work across a wider range of jobs, conducting time-motion studies at newer levels, as well as linking pay to performance as a never-ending trial. Furthermore, some argue that the resistant and mobile creative class is now being captured back into the digital system across quantification, by promising much but delivering very little in terms of work valorization and recognition, all the while imposing the same spenceristic 'rank or yank' dogma (Moore & Robinson, 2015). The end-result would appear to be a continued knowledge transfer from both workers and knowledge workers alike towards management leadership, who in turn, have taken measures to re-organize work in a very techno-centric manner – that is, towards automation, platform technologies and/or learning algorithms. Along with this transfer of knowledge is the transfer of associated decisional powers towards these same technologies.

In parallel, artificial intelligence (AI) appears to be making significant advances into 'deep learning' and abductive-type algorithms, with the aim of providing more creative work, as well as capabilities to imitate the more tacit practices, until most recently considered to be the last bastions of capabilities reserved solely to humans (Bogost, 2012; Patokorpi, 2009). Hence, even here, one could argue that creativity is now being taken over by machines, thereby further reducing any human decisional powers within technology driven organizations.

This paper draws inspiration from the domain of responsible research and innovation (RRI), whereby we first conduct a hermeneutical critique of dominant imaginaries based on the notion of efficiency and maximization by establishing clear associations between recent/on-going developments within the workplace and specific neo-liberal and instrumental epistemological strands as previously discerned by authors such as Marcuse (1964), Heidegger (1977) and Ellul (1980). We also examine what we term as an 'efficient reflex' of knowledge truncation often occurring within numerous contemporary domains, including certain streams of computer supported cooperative work (CSCW), as well as what is known as artificial intelligence (AI). Here, we argue that the phenomena of sign manipulation representing codified knowledge leads to a highly flawed epistemology which assumes that all knowledge may be captured in an explicit manner, a view which we shall argue paradoxically enacts serious impoverishments in knowledge and creativity. This is because such an epistemology fails to recognize the holistic nature of human symbolism and its associated symbolic transformations. As such, an important aspect of human knowledge is neglected, mis-handled or virtually ignored, namely, in the form of tacit knowledge. Very closely related to tacit knowledge is human creativity itself, which in turn, we shall argue, relies on human heuristics which (again) involve symbolic transformations which allow us to make connections between seemingly unrelated or disparate events or elements, and thereby allow the expert human eye to identify relevance where novice eyes and machines (AI) alike cannot. As such, we make the key argument that human knowledge and creativity is indeed rich and far from being outdated by the onset of machine automation and AI. Finally, an alternative efficiency is proposed based on Feenberg (1999) vision as a starting point to reverse this latest attempt to shift knowledge and power towards the ruling elite and its associated technologies. It is an efficiency based on a human democratic engagement in technology development, as well as organizational arrangements, which aims towards overall human well-being. It is also an efficiency which echoes Dewey (1927) vision of enhanced democracy across a democratization in human knowledge and creativity.

1.1. A few words on methodology

As mentioned above, our methodological approach draws upon RRI, whereby we first conduct a critique of existing dominant imaginaries prior to proposing an alternative one (Grove et al., 2016; Simakova & Coenen, 2013). The concept of imaginaries has drawn attention from various disciplines such as sociology, philosophy and media studies (Alasuutari & Andreotti, 2015; Giddens, 1984; Habermas, 1996; McLuhan, 1964). Social imaginaries, or imagined versions of what 'reality' is, influence the way people make decisions – or as the Thomas theorem states: "If men define situations as real, they are real in their consequences". Similarly, the concept of imaginaries in the socio-technical sense involves ways in which dominant visions of societal futures centred around certain types of technological developments have effects on what happens at present – or as Jasanoff and Kim (2009: 120) explain, such dominant imaginaries involves "producing authoritative representations of how the world works – as well as how it should work".

It is argued that critical studies of socio-technical future imaginaries for RRI are necessary in that it allows for the assessment of assumptions underlying social priorities which have helped to shape possible (and actual) technological pathways (Grove et al., 2016). In addition, such studies allows for the exploration of more desirable social and material worlds which can emerge around given socio-technical arrangements (Macnaghten & Szerszynski, 2013). Furthermore, across the 'hermaneutic turn', the emphasis of technology assessment is placed on future societal developments (and respective social priorities) *with* technology, as opposed to future developments in technology alone (Stilgoe, Richard, & Phil, 2013).

Along these lines, our initial hermeneutical assessment will uncover how the basic Neo-liberal epistemological assumptions of efficiency and maximization, as materialised across both historical and more contemporary forms of Taylorism, are at the heart of many current and near-future workplace developments (ie. workplace automation, surveillance technologies, novel ways of self-imposed pay to performance, etc.). It will also be shown that the presence of dominant imaginaries of efficiency and maximization within current managerial and technological practices and developments can be extended into what is termed as AI.

Indeed, an interesting aspect of AI is in regards to its foray into 'reproducing' human creativity and tacit knowledge which is regarded by some as one of the final frontiers towards the objective of attaining intelligence that will be equal or superior to human intelligence (Bogost, 2012). This, in itself, is critically reviewed while attempting to define what many consider as (partially or fully) undefinable, namely, human creativity and its associated tacit knowledge.

Finally, an alternative imaginary will be discussed which builds upon the arguments that both creativity and its associated tacit knowledge are indeed uniquely human attributes – that is, to view and enact humans as legitimate partners with technology in both their mutual shaping capacities, and respective strengths and contributions in future organizations – namely, human creativity and its associated tacit knowledge in partnership with machine efficiency.

2. Dominant imaginaries based on efficiency and maximisation

In this section, we present dominant social imaginaries based on efficiency and maximization. Towards this end, we mobilize the positions and arguments of Marcuse and Ellul in regards to the inter-related socio-economic and socio-technical dimensions of efficiency and maximization. Adopting this hybridized view of the social imaginaries at play allows us to subsequently present a wider perspective on its possible consequences. Of particular importance, is in the complementary rather than in the traditionally oppositional manner in which both authors are be mobilised – Marcuse as a constant reminder that efficiency and maximization are deeply integrated within neo-liberal thought, using technology and techniques as a means to achieve its objectives; and Ellul as a reminder that there is also an autonomous vector of efficiency within technology and techniques which go beyond the frontiers of neo-liberal thought. This latter point will be further developed in Sections 2.4 and 2.5 to show how there is in fact an 'efficient reflex' embedded within various domains, including more collaborative spheres, such as certain streams of computer supported cooperative work (CSCW) for example (Sections 2.4 and 2.4.1), leading to the likelihood/risk of knowledge truncation or impoverishment. We begin this section with a brief description on the historical influences leading towards the neo-liberal socio-economic logics of profit maximization and organizational efficiency.

2.1. A brief retracement on the neo-liberal socio-economic quest for profit maximization and organizational efficiency

While it is not within the scope of this paper, nor do we claim to be able to fully explain, how successive historical periods culminated towards current neo-liberal thinking, a partial examination is perhaps of use. According to Saives, Ebrahimi, Holford, and Bédard (2017) and Aktouf (1999), the Renaissance was characterized by a series of revolutions, namely of a political, a philosophical, a technological, an artistic, a scientific, a religious and of a commercial nature. These reforms greatly influenced classical liberal ideology. Of particular interest was the Protestant-Calvinistic reform, in which The Book of Common Prayer became the Calvinistic foundation of future Anglo-Saxon Protestant ethics (Weber, 1958). Here, concepts of calling, predestination and individual achievement were manifested across the individual receiving "concrete signs of his predestination and election through the success of his 'earthly vocations'" (Aktouf, 1995: 135). As such, classical liberal thinking argued that the accumulation of wealth was no longer a vice, but in fact, a virtue. In parallel, was a first technological revolution involving the introductions of the first mechanical spinning machine (1733) and first steam engine. Liberal economists such as Smith, Ricardo, Say and Mill elaborated the first economic theories on productivity and production yields (Saives et al., 2017). This period was characterized by the first concentration of humans in workplaces containing machines – i.e. *factories*.

It is in reference to this point in history that Marcuse (1941: 49) argued that the philosophical reform consisting of the enlightenment principles of individual rationality, autonomous and critical thought and personal liberty were gradually sectioned off and drawn into conformance in a manner that "…holds good for the functioning of the apparatus and for that alone". For example, one notable reformer, Jeremy Bentham, envisioned a system of workhouses as a rational enterprise, across a design which he called a Panopticon. It was essentially a surveillance system with records and work-rules that became a key component of the liberal political program in schools, hospitals and factories (Clegg, Courpasson, & Phillips, 2006). Much later, the work of F.W. Taylor (1911 – *Principals of Scientific Management*), became responsible for creating the employee as a consciously designed utilitarian project by stressing the need for national efficiency, whereby "efficiency means achieving desired effects or results with minimum waste of time and effort; through minimizing the ratio between effective or useful output to the total input in any system" (Clegg et al., 2006: 48). The 'why' of this quest, according to Taylor (1911), was to attain higher profits for factory owners and higher wages for workers. But, as argued by Clegg et al. (2006), underlying this quest for efficiency was a shift in more power across control and surveillance into the hands of management. By then, Marcuse (1941: 49–50) had gauged the growth of modern technological rationality from the early stages of its modern development into its establishment in twentieth century industrial society consisting of "unconditional compliance and coordination (and) the subordination of thought to pre-given external standards". Fast forwarding into today's neo-liberal ideology, it is argued that efficiency remains a dominant "cultural logic" which "values the fastest and least expensive production and distribution of any product, as well as fast and inexpensive modes, technologies, and behaviors. This logic is concerned with balancing the quality of the product with the speed and cost of its production" (Clair, 2016: 176; Gere, 2008). By cultural logic, Clair (2016: 173–174) refers to a "construct that has been used by many but defined by few…as a shared and collectively imagined prescription for individual or collective social action… They are prescriptions and practices picked up and used by individuals in varying circumstances and contexts". In a similar manner, more recent manifestations of one of efficiency's ever-present prescriptions or mantras, namely, 'doing more with less', has been witnessed across both manufacturing automation (Autor, 2015) and increased work intensification amongst professional knowledge workers within more flexible work practices (Kelliher & Anderson, 2010). Accompanying this on-going quest, remains the panopticonic practice of surveillance and monitoring across wearables and other technologies (Moore & Robinson, 2015). In similar fashion, we can fast-forward the Liberal elite's Calvinistic quest for wealth accumulation to today's neo-liberal cultural logic of profit maximization in "inter-action" with efficiency (Clair, 2016: 174) – that is, "any product (material or symbolic) should be placed in the marketplace and should be priced in such a way as to maximize the economic profit the seller receives from it" (Clair, 2016: 175–176). In turn, Marcuse (1941: 41) argued the inter-relationship between

the growth of technology and the neo-liberal objective of making profit by "business, or power over other men", whereby "the development [of] machines have extended these aims and provided a vehicle for their fulfillment".

In the next sub-section we take a closer look at efficiency and maximization from the ternary socio-technico-economic perspective.

2.2. A socio-technico-economic view on efficiency and maximization

Efficiency is a major theme emerging from recent and current theorists on technology. According to Heidegger (1977), the essence of technology is anything but technological in that it is a kind of thinking that reveals to us only one way of existing whose essence is to seek more and more efficiency for its own sake – that is, producing the most with the least energy possible (Hanks, 2010; Van Vleet, 2014), whereby "expediting is always itself directed from the beginning…towards driving on to the maximum yield at minimum expense" (Heidegger, 1977: 15). In a similar, yet complementary vein, Ellul (1964) technological society is a society of techniques requiring that we always choose the most rationally efficient techniques for every endeavour. Technique is a mindset or ideology which values efficiency over all other things (Ellul, 1964: 1–20). This "certain frame of mind…of looking at situations", which seeks maximum yield with least amount of effort, involves a rationality consisting of mathematical calculations, systematizations and the creation of standards (Ellul, 1980: 23). And finally, Marcuse (1964: 158) rejoins Heidegger's explanation of technology's essence as consisting of a *Gestell* or enframing in which human agents and the natural environment are treated as resources, in that "technics becomes the universal form of material production, [in that] it circumscribes an entire culture; it projects a historical totality – a 'world'". Keeping in mind that both Ellul and Marcuse explicitly showed an on-going link and interrelationship between technical efficiency and the on-going economic quest for profit maximization and economic growth, it is not surprising that we find a great deal of technical efficiencies integrated within various workplace environments, such as in current and future workplace automation developments and objectives, which according to Autor (2015) is 'to do more with less'.

In a general sense, inherent to the phenomenon of efficiency is maximisation – whether we are speaking of Heidegger and Marcuse's essence of technology or Ellul's more socio-cultural stance, maximum efficiency is sought. This seemingly trivial point leads us to ask what or who is behind this objective of maximum efficiency. According to both Heidegger (1977) and Ellul (1964), technology is autonomous and all pervasive, thus proposing a substantivist stance on technology – ie. it is not neutral, but rather embodies values which shape our lives. Here, technology is both political and self-determining. For Ellul (1964: 133), techniques have become autonomous because of our refusal to interfere in any away with efficient reasoning. Although an essentialist, Ellul does not deny the psycho-social element of technological determinism (Harris & Taylor, 2005: 35; Holford & Saive, 2013) in that "he provides a detailed…account for the alienating properties of technology without denying, at the root, that human intention originally lies behind such subsequent alienation." Ellul's interpretation of efficiency and maximization includes the Weberian tendencies within capitalist-managerialist societies towards instrumentalisation of reasoning processes coupled with metrics of efficiency to achieve maximum profits. But for Ellul (1981: 155), the phenomenon of *Technique* is all pervasive and goes beyond capitalism – irrespective of whether we are speaking of neo-liberal capitalism or of a moderate and/or radical socialism. Contemporary adherents of this view include Son (2013) and Alexander (2008) who have argued that efficiency is prominent in contemporary society due to the force of technology. Son (2013) in particular, argues that the prevalence of efficiency can be attributed to the underlying assumption that all elements can be controlled, including human and social elements, and that as such, everything can be planned and measured.

Marcuse (1964) does not deny the control technology has on humans in that individuals are forced to submit to a one-dimensional, technological rationality which restricts and changes human thought and actions (Van Vleet, 2014). However, Marcuse's interpretation of a dominant imaginary of efficiency and maximization is different to Ellul's in one key aspect – namely, that technology is not autonomous and beyond the control of humans, but rather "technology is controlled by the elite and powerful in society. They have no concern for the well-being of humanity, only for personal economic gain and for absolute control of the masses" (Van Vleet, 2014). Yet, the pursuit of efficiency and maximization fit within both an Ellulian or Marcusian narrative of technology. Both views acknowledge today's digital culture's quest for efficiency and maximization across productivity, timeliness, dependability and salary reductions in not only monotonous tasks but in more complex professional tasks requiring elaborate analysis, calculations as well as more tacit work competencies (Gere, 2008). For example, high level reasoning can now be adequately codified via algorithms, resulting in computers outdoing humans both in terms of speed and performance in a variety of tasks (Autor, 2015). Various middle management echelons are now being replaced by management decision systems involving data interpretation via advanced data analytics, also known as algorithmic management. Such systems can replace highly cognitive and non-routine jobs, and are now being used in various crowd-sourcing platforms to manage people, and improve 'crowd' productivities (Yu et al., 2017). Furthermore, where more tacit type tasks are involved, machines can even master the task across emulation through a process of exposure, training, and reinforcement – known as machine learning (or 'deep learning') – Autor, 2015.

In the next sub-section, we illustrate how this digital environment appears to follow what many authors consider to be 'scientific' management principles resembling the Taylorism of past.

2.3. Efficiency and maximization across digital taylorism: enter the gig economy

Both Ellul (1980) and Marcuse (1964) referred to Taylorism or scientific management as one of the principal modes of how techniques of maximization and efficiency materialised themselves across weberian-like instrumental thinking. Today, authors such as Au (2013); Irani (2015) and Moore and Robinson (2015), argue that digital technologies appears to have either brought back

Taylorism or simply made it more evident in many contemporary management practices within the workplace. Brown, Lauder, and Ashton, 2011: 7–9), specifically refer to "Digital Taylorism", a system based on the global organization of both routine as well as "knowledge work", whereby the latter involves creative and intellectual tasks being subject to the same process as chain work. Their argument is that, once codified and digitalized, such tasks can be conducted by automatic programs with computerized decision protocols, thereby replacing human decisions and judgements. Such processes can be easily relocated across computerized global connections, thereby rendering many jobs easy to export, change or replace. Digital Taylorism essentially follows one or more of Taylor's original principals by:

1 Breaking down complex tasks into simple standardized ones
2 Measuring/surveilling everything that workers do
3 Linking pay to performance

The negative impacts of standardization have, for example, been felt in the US public school system as well as the Danish home care sector, whereby standardization has led to alienation amongst teachers and home care workers alike, thereby stifling job satisfaction, creativity, as well as innovative approaches tapping into worker competencies and experience (Au, 2013; Gerdes, 2008). Here, Taylorism is clearly identified across the planning/management vs execution delineation, whereby teachers, for example, are forced to execute standardized curriculum "that require no creative input or decision-making" on their part, while using "verbal scripts that define and limit what they can say as they teach" with the sole objective of addressing high stakes testing imposed upon them by the US Federal Government (Au, 2013: 31–32). In the Danish home care sector, over-emphasis on standardized protocols for patient care muzzles or truncates the tacit knowledge which experienced homecare workers have acquired, as well as reduces their levels of engagement within the profession, thereby affecting quality of services rendered (Gerdes, 2008).

Many of the technology companies that have set the tone for today's businesses appear to be applying Taylorism as well, such as Amazon's Mechanical Turk, an internet platform which allows companies to break jobs into smaller tasks and offer them to people across the globe, known as 'Turkers' or contract workers who perform small tasks for menial pay (Irani, 2015). This whole process known as crowd-sourcing can also involve training of AI systems to learn new tasks that were historically too complex for a computer. Here, Turkers are involved in menial and mentally wearing tasks involving the labelling of millions of data sets often in the form videos, whereby each individual can be repeating the same simple action hundreds of times. In a more general sense, crowd work can be defined as the performance of tasks online by distributed crowd workers who are financially compensated by organizations. According to Kittur et al. (2013), crowd work can replace some forms of skilled work with unskilled labour as tasks are decomposed into smaller and smaller units. For example, speech transcription and copyediting are increasingly being accomplished with crowd labor, whereby even more complex tasks such as writing, product design, or translation may be amenable to novice crowd workers with appropriate technological supports (Kittur et al., 2013; Yu & Nickerson, 2011). Such cognitive efficiency at the expense of education and skill development reflects yet another aspect of Taylorism in its original form, which according to Clegg et al. (2006), involves the depletion and transfer of workers' knowledge and experience towards total management control.

The growing use of surveillance systems is yet another characteristic of Digital Taylorism so as to monitor workers for two principal reasons: 1) to ensure they are following standardized tasks and procedures, and 2) to ensure they meet performance objectives often in the form of speed or timeliness (Parenti, 2001). Many companies now impose wearable monitoring technologies as part of the new form of time and motion studies (Moore & Robinson, 2015). Technological platforms which manage contract workers such as amazon's Turkers, Uber's taxi drivers, and other industries, is what is known as the gig economy – that is, labour markets characterized by the prevalence of short term contracts or freelance work as opposed to permanent jobs. Workers in this economy are required to measure their own productivities with wearable technologies not only within the context of standardized tasks, but also within more entrepreneurial and knowledge intense environments (Moore & Robinson, 2015).

In a more general sense, Moore and Robinson (2015) refer to the Taylorist influence within the more entrepreneurial and knowledge intensive environments as seen across the augmented use of steps 2 and 3 of Taylor's scientific management. As workers experience intensified precarity, intense competition and anxiety for jobs, they internalise the imperative to perform using their "mind to subordinate their body to the ego-ideal and hence to the economic system…a process increasingly supplemented by machines that expand processes of workplace discipline" across the use of wearable monitoring devices (Moore & Robinson, 2015: 2). Creative knowledge workers are now expected to incarnate a dialectic of self-observation and self-exploitation – leading to widespread deception as knowledge workers compare their actual achievements with the myth of what they are supposed to achieve in terms of valorisation and real monetary gains (Moore & Robinson, 2015; Schmiz, 2013). Furthermore, knowledge performance is based solely on what can be captured and codified as an end result, and thereby fails to recognize actions and tacit knowledge flows, thus undervaluing the total output of workers (Till, 2014).

The above examples of digital Taylorism confirms the spreading of efficiency and control in a manner echoing Ellul (1980) all-pervasive techno-instrumental logic and Deleuze (1992) neo-liberal society of control. Such systems have proven to be anti-creative (Deleuze & Guattari, 1987) in all spheres of work, including the creative working classes now increasingly under the control of digitized scientific Taylorism across (self-) monitoring and pay-to-performance – whereby discourses on the importance of creativity in the workplace has been in dissonance with the resultant deception, demotivation and over-worked conditions associated with knowledge workers in actual practice (Fisher, 2014).

From a Marcusian viewpoint of neo-liberal market dominance by the elite few, digital Taylorism leads to an inherent contradiction: today's neo-liberal economy in recognizing the importance of innovation and creativity towards creating new wealth, seeks to appropriate creativity within a digitized system of command and control to augment efficiency and maximisation, which in turn,

discourages human creativity in the first place.

In the next subsection however, we further develop Ellul's position that there is indeed an autonomous vector of efficiency within technology and techniques which goes beyond the frontiers of neo-liberal thought across what we will call an 'efficient reflex' embedded within various domains. Of particular interest is the domain of computer supported cooperative work (CSCW), in which certain streams manifest this 'efficient reflex' across a clear over-emphasis to capture and reduce *all* human knowledge into a codified or explicit form. Such a rationality, which ignores the ambiguous and emergent nature of human symbolic transformations, as we shall later argue in sub-section 2.4.1, leads to the likelihood of knowledge truncation or impoverishment.

2.4. Specific shortfalls of CSCW as examples of over-emphasis on explicit knowledge

The field of computer supported cooperative work (CSCW), according to Roth, Tenenberg, and Socha (2016), has been characterized by a variety of 'voices' or discourses. Sometimes viewed as a catch all term or concept concerned with people, computers, and cooperation in some form, people from different disciplines with overlapping interests and concerns have come together to study the current state of technology development and the understanding of use contexts within the workplace. Some, such as Suchman (2009), have taken a particular interest in CSCW as the design of computer-based technologies with a specific concern on the effect of socially organised practices on their intended users. Others, such as Bannon and Schmidt (1992): 12) however, view CSCW as "an endeavour to understand the nature and characteristics of cooperative work with the objective of designing adequate computer-based technologies". Ackerman (2000: 199), on the other hand, warns against such a technology-centric approach emphasizing artefact creation and generation of 'cool toys', while ignoring how people really work and live in groups, organizations, communities and other forms of collective life, thus leading to a gap between social requirements and technical feasibilityto produce unusable systems, while "distorting collaboration and other social activity". Some see such distortions manifesting themselves in crowd-sourcing (Kittur et al., 2013) as discussed earlier in Section 2.3.

Of particular interest is Schmidt (2011) contribution as to the concept of 'work' which attempts to provide a comprehensive description of what work actually constitutes, namely a description that goes far and beyond the prescriptive, so as to more fully understand what people actually do in terms of "real" work in regards to activities which managers typically ignore. This approach concurs with authors such as Saives et al. (2017) who speak of the wide gap often ignored by managers in regards to prescribed vs actual work. Schmidt (2016) also raises an important constructivist argument in regards to the various incompatible ways in which work awareness is viewed and theorized including the problematic ways in which the term 'shared' is misused, or when different kinds of textual work is conducted which ignores shifting metaphors and interpretations. An equally important point is that raised by Roth et al. (2016): 389–390), in regards to the *absence* of discourse in CSCW in regards to unconscious or tacit awareness, such as "the case for both interlocutors, who may navigate around some lamp pole on the way without being able to recall what they did even when they had to do so on opposite sides of the pole. In the same way, the conversation itself occurs within a world of text that does not need to bring to 'conscious awareness' anything other than the particulars of the specific topic of the talk". This point reflects Collins (2010) argument that tacit knowledge (such as in the form of collective knowledge) cannot be wholly reduced (or 'converted') to explicit representational knowledge objects. This holistic view illustrates the *entanglement* which occurs between tacit and explicit knowledge (Holford, 2018). Here, Polanyi (1962): 87) specifically explains that a person's tacit skills are always cooperating with his explicit knowledge, in that explicit knowledge involves articulated language made up of symbolic representations – yet the *very meaning of these symbols relies partly on the tacit* which cannot be articulated. Hence, to understand the most formalized sentences, a person is needed (Polanyi, 1962: 139–141), in that language involves tacit bodily or phenomenological aspects which go beyond what can merely be articulated (Kupers, 2008).

2.4.1. Mixing up symbols with signs: enter the efficient truncation of knowledge

The linguistic shortfall identified above is one that we find in various disciplines (IT, management, knowledge management, etc.), that is, where we attempt to formalize or encode language and practice with the assumption that all can be captured in the form of explicit knowledge (for example, Best Practices viewed as all-encompassing rules rather than as starting guidelines). On this issue, Needleman and Baker (2004: 55) provide an interesting comparison between so-called 'objective' unequivocal concepts vs the ambiguous constantly emergent characteristic of artistic symbols:

> "A scientific notion has an unequivocal meaning and, in the exact sciences, a mathematical form, in the sense of course, of quantitative mathematics. On the other hand, a symbol can never be taken in a final and definite meaning…a symbol itself possesses an endless number of aspects from which it can be examined and it demands from a man approaching it the ability to see it simultaneously from different points of views…A symbol can never be fully interpreted. It can only be experienced."

Symbols are a means of complex communication that can have multiple levels of meaning (multivocal and polysemic), some of which are ineffable – which is different from signs, as signs have only one meaning (Womack, 2005). In a similar manner, both Jung (1964: 20–22) and Ricoeur (1976) emphasize the inexpressible nature of symbols in that it expresses something vague, hidden or unconscious to us. People use symbols not only to make sense of the world around them, but also to identify and cooperate in society across discourse (Palczewski, Ice, & Fritch, 2012). According to Tillich (1987: 46), there has been a great deal of confusion between signs and symbols. More specifically,

> "The mathematician has usurped the term 'symbol' for mathematical 'sign', and this makes a disentanglement of the confusion almost impossible. The only thing we can do is to distinguish different groups, signs which are called symbols, and genuine

symbols. The mathematical signs are signs which are wrongly called symbols."

Words or sentences in languages can be both signs and symbols, whereby they can either point to one explicit meaning or to multiple levels of meaning (Tillich, 1987). 'Peter hit Paul' or 'Peter was hit by Paul' say approximately the same thing whereby the identity of meaning is attributable to the grammatical transformation rule from active to passive verb form (Rapoport, 1969). Yet, to recognize that 'every rose has thorns' and 'there are no unmixed blessings' goes beyond formal grammar and semantic rules – it involves symbolic transformations, "a jungle, whose depth psychologists have been valiantly attempting to chart" (Rapoport, 1969: 373). Narratives, across symbols allow humans to "make meaning and to forge connections between seemingly disparate bits of knowledge and experience" (Blyler & Perkins, 1999: 245). Sapir (1934) describes symbols as being highly condensed forms of behavior, and are saturated with both conscious and unconscious emotions. Symbols also serve as vehicles of conception for all human knowledge (Langer, 1953). As such, the symbol represents the complex entanglement of knowledge as being at once tacit and explicit (Polanyi, 1962; Sanzogni et al., 2017; Holford, 2018). The sign, on the other hand, represents that which has been explicated and reduced in the same way a word in the semiotic sense, stands to an arbitrary referent (Jung, 1964).

Today, Ellul (1980) all-pervasive technique (as an ideology of efficiency), consists of methods reminding us of Taylor's quest for the 'one best way': namely, a method consisting of dissecting and reducing all experiences and phenomena into explicit signs or codes, with the assumption that these signs and explications truly and completely reflect the ever-changing, emergent meanings of the symbolic and the experienced, thus leading in reality to significant levels of knowledge *impoverishment* (Tsoukas, 2003): in that, acts of knowing not only start in our head, but also in our *somatic* (ie. sensorimotor aspects, gut feelings, etc.) and *social* (ie. relational affinities, distributed quality, local interpretations, etc.) dimensions.

In the next section, we shall argue that this 'efficient reflex' or technique is clearly present within the current trend of algorithmic thought and AI, resulting in what we argue to be an accelerated trend of knowledge truncation with the accompanied stripping of *democratic powers* within organizations.

2.5. AI's efficient enactment of truncated knowledge

Both traditional and more recent learning algorithms involve the processing of data that has been restructured and formatted (Faraj, Pachidi, & Sayegh, 2018) within an objectivist (or representational) approach to knowledge that can be defined, measured and formalised/codified as words, signs and numbers (Szulanski, 2000). This IT view of the firm (Falconer, 2006; Selamat & Choudrie, 2004), as argued by Sanzogni, Guzman, and Busch (2017), neglects an adequate understanding of what indeed constitutes the tacit dimensions of knowledge.

Knowledge is embedded in practice (Gherardi, 2009). Such is the case with Collins (2010) collective tacit knowledge whereby, "dancing in a social setting, speaking a natural language, and riding a bicycle while negotiating traffic on a busy street are examples of collective tacit knowledge. This is a unique human characteristic constituting the 'ability to absorb ways of going on from the surrounding society without being able to articulate rules in detail'" (Sanzogni et al., 2017: 42–43 citing Collins, 2010: 125). We can also tap into the constructionist arguments put forward by Glasersfeld (2002) – in that human mental operations lead up towards mental/subjective constructions of reality. Such operations involve both the construction of action and symbolic schemes (the latter as interpretive semantics) leading towards sensorimotor and conceptual knowledge, respectively (Glasersfeld, 2002). Each of these schemes is constructed "based on unique personal experiences, which may be similar, but never identical to, another person's constructions" (2002: 158). As Carter, Clegg, and Kornberge, 2008: 62) state, "short of a brain transplant, the capacity to know [(tacit knowledge)] is not a transferable commodity".

The objectivist approach to IT and AI, on the other hand, dissects and stores all experiences across the practice of reducing complex, infinitely interpretable and partially ineffable aspects of symbolic and experienced phenomena to mere unequivocal signs (Faraj et al., 2018; Ananny, 2016), resulting in knowledge truncations and subsequent loss of human expertise. This is also the case with machine learning algorithms involving image recognition techniques to emulate difficult-to-articulate human experiences. For example, in the health care industry, such algorithms are guiding radiologists toward *certain* diagnoses that compare favorably with certified doctors, thereby initiating calls within the IT community to cease training radiologists (Mukherjee, 2017). Yet, deep expert understanding of these tasks are of utmost importance in that expert radiologists are still in better positions to make correct interpretations when looking at complex situations involving weak, contradictory and/or disparate signals (Faraj et al., 2018).

In a more general sense, such a quantitative turn towards the purely measurable and to that which can be formalized assumes that digital data can stand for social life – and when applied in a widespread manner, enact and structure to become "constitutive of that person" (Faraj et al., 2018: 64). Indeed, this Global Network of Machines, profuse in signs and automated representations, transforms meaning negotiations into symbolic violence (Berrio-Zapata, Moreira, & Santana, 2015). Network readers, as immersive readers of the information network, willingly accept the new myths (in the form of meanings and connotations) produced by this network of machine algorithms designed to standardize minds. In the absence of tacit expert knowledge, and the accompanied amputated senses and inability to transcend imposed paradigms, the digital global elite remain unhindered towards their goal of accumulating and exercising their power – in that Barthes's (1988) *possibility of meanings* are now reduced into families of paradigms across the unending machine generation of structured speech and rhetoric.

As such, with an increase in worker ignorance across knowledge stripping and thought control, comes the continued loss in power to engage in socially-structuring decisions. This last point constitutes one of our opening arguments leading towards an alternative imaginary as proposed in Section 4.

In the next section, we first look at the unique and inimitable nature of human creativity. We then show how AI's foray into

'reproducing' human creativity and tacit knowledge is flawed, yet also dangerous, in that once again, as we argued above, AI attempts to present itself as a legitimate replacement to human creative capabilities, and thereby further strip human workers/citizens of their democratic powers to influence and shape the evolution of technology.

3. The relationship of human creativity with the tacit/emergent dimensions of human symbolic transformation

Creativity has often been defined as the ability and process of creating something new and useful (Amabile, 1996). Boden (2004) defines creativity as the ability to generate ideas or artefacts that are new, surprising and valuable. (Seyidov (2013) has argued that human creativity is inherently paradoxical – in trying to isolate and model creativity, we impose rules and generalities to it, keeping in mind that creativity abhors rules in the first place. Researchers have acknowledged its complex and interdisciplinary character (Pearson & Ingleton, 1994). In cognitive psychology for example, creativity has been examined from different angles, such as the role of traditional intelligence as well as emotions in relations to creativity (Runco, 2007).

Of particular interest is on how symbols (as opposed to signs) can generate creativity. Here, Kuuva (2010) shows specifically how visual symbols evoke artistic creativity across hard to explicate emotions and imaginations. Symbols invoke not only explicit associations but tacit emotional concepts related to bodily or embodied experiences in the form of sensations and motor activities (Kupers, 2008; Womack, 2005). In turn, individuals create new knowledge when there is already a fundamental base of tacit knowledge to draw upon (Boden, 2004: 12). Alony and Jones (2007) illustrate this across a qualitative ethnographic study, on how, in the Australian film business, tacit knowledge residing within various film workers and specialists is transformed into new ideas which in themselves carry both an explicit and tacit dimension. This synthesis of both the tacit and explicit realms is further highlighted across researchers who have looked at what is known as 'embodied cognition' involving a synthesis of both mind and body and its importance on how it helps us address mathematical concepts across both visual and sensory-motor memories (Nemirovski, Rasmussen, Sweeney, & Wawro, 2012). Here, we posture, gesture, point and use tools when expressing mathematical ideas as evidence of our holding mathematical ideas in the motor and perceptual areas of the brain – whereby, when explain ideas, even when we don't have the words we need, we tend to draw shapes in the air (Nemirovski et al., 2012; Alibaba & Nathan, 2012). Hence, the body, which contains a great deal of tacit knowledge (Gherardi, 2009; Tsoukas, 2003), is an intrinsic part of cognition.

In the following sub-section, we argue that the sole emphasis on sign explication, formalization and manipulation within the field of AI poses two important consequences: 1) the likelihood of limiting creative outputs in the form of finite paradigms or families of creative ideas, and 2) structuring and limiting human creative thought towards an algorithmic logic of 'what is ineffable or isn't measurable does not exist'.

3.1. AI's truncation of creativity: once again confusing the sign for the symbol

In returning to Boden (2004) definition of creative ideas and artefacts needing to be new, surprising and valuable, we begin to appreciate the complexity and challenges facing AI. Coming out with something new is not enough. The manipulation of explicit signs (which is what AI algorithms do) may well give us a new combination never thought of before, yet is not considered creative (Boden, 2004). One must achieve an idea/artefact which produces a surprise in regards to existing social practices and beliefs, as well as producing value in regards to these same social beliefs and values. This is exactly what Boden (2010) refers to as being able to achieve an idea or artefact that is relevant between seemingly disparate ideas, objects or concepts. This, as previously explained in Section 2.4.1, is what humans do across symbolic transformations (such as in narratives). Furthermore, being able to achieve something significant and relevant requires knowledge of social beliefs, values and practices that are highly tacit (and often distributed) in nature, which Collins (2010) refers to as collective (or strong) tacit knowledge. For these reasons, this is also why according to Boden (2010 and 2015), who has worked on machine creativity, AI cannot be as creative as humans since machines cannot determine what is relevant to a human expert's eyes. This is partially because AI algorithms cannot manipulate or transform symbols; it can only manipulate signs. Symbols, in themselves are meaningless, yet, when in the presence of humans, reflect endless and emergent tacit/explicit meanings or significances residing within humans.

Recent work in AI has been especially interested in reproducing human abduction, which has been linked to the ability to generate new scientific discoveries. Human abduction combines logical reasoning, aesthetic judgement (the hypothesis must be 'elegant') and pre-reflexive moves (Peirce speaks of 'flashes') – in other words, it mixes intuition and reasoning (Lorino, Tricard, & Clot, 2011). It also involves the process of linking single events to the tacit knowing of "family resemblance" between those events (Adloff, Gerund, & Kaldewey, 2015: 133) – in other words, identifying relevance between disparate ideas. Human abduction involves direct perceptual judgements in which "the abductive suggestion comes to us as a flash. It is an act of insight" as well as an inference (Peirce, 1935: 181; Anderson, 1986). Peirce (1935: 189) gave the often-quoted formula:

The surprising fact, C, is observed
But if A were true, C would be a matter of course
Hence, there is reason to suspect that A is true

The first step of perceived surprise can be directly related to the tacit, complex aspect of human creativity, namely the holistic and ambiguous nature of relevance. On the other hand, AI's 'efficent reflex' has attempted to dissect out the human abductive process through a series of statistically derived algorithmic steps, which "entails interfering with the phenomenon through complicated data massaging" which becomes a form of truncation of the phenomena in question (Patokorpi, 2009: 124; Tsoukas, 2003). Such an approach has been viewed as highly reductionist in that assigning 'correct' probabilities to events ignores their inherent subjectivities (Tversky & Kahneman, 2008: 114). As such, the related question of relevance limits the capacity of machines to reproduce human

creativity only to what has already been defined (Boden, 2015). Hence, we can at best speak of pseudo-creativity involving combinations of related structures that are defined and depicted as having clear or strong links, as opposed to a Gestalt type creative process involving the connection of knowledge structures which were previously unexplored and unrelated (Sorin, 2013). Furthermore, as Sorin (2013) explains, to be creative, determining varying degrees of relevance (starting with weak relevance) is an important step whereby humans explore and connect seemingly unrelated structures in which, as argued previously, human symbolic transformation plays a key role – a step which cannot be defined with precision, and therefore, becomes difficult to emulate in any algorithmic model.

4. An alternative imaginary on efficiency and democratic decisional powers

As we have argued throughout this article, organizations, have in both the past and recent past, wrestled decisional powers from workers towards the managing elite across scientific management practices and digital Taylorism – while today, across new augmented technologies are now doing more of the same in regards to professional knowledge workers. These latest manipulations range from the phenomena of the quantified self, in which false senses of autonomy and conditioned identities are instilled across upper management discourses of hero-like creators coupled with self-monitoring and self-driven practices to achieve imposed objectives based in maximization at all cost (Moore & Robinson, 2015); to today's (and tomorrow's intended) use of AI to replace knowledge workers' creativity and tacit knowledge across flawed knowledge truncating and pseudo-creative algorithms based on pure sign manipulations. Marcuse believed human action could change the structure of technological rationality across a continuous and creative struggle with technology coupled with a reversal of decisional powers towards the masses from the current neo-liberal elite (Van Vleet, 2014). Marcuse's primary argument was that such power must be re-distributed towards more democratic organizational configurations which manifest authentic and co-active power within both society and the workplace (Follett, 1924). How this could be achieved, however, was not clearly addressed by Marcuse. Rogers (2008: 94), posited that the problem of the democratization of science and technology "is not a problem of science and technology per se, but is a problem with social organization and the way that the technological structures of industrial production enforce and reproduce the social structures of industrial society". As such, Dewey (1927) provided an important first insight into the possible dialectic which exists between knowledge and power. Dewey (1927) argued that the democratization of knowledge was primordial in the maintaining of democracy; whereby he believed in the capacity of human beings for intelligent judgment and action when the proper conditions are furnished, and that in turn, was a means for individual empowerment (Fenstermacher & Sanger, 1998). Interestingly, Dewey viewed knowledge as consisting of dynamic acts, that is, knowing-as-practice, rather than consisting of sterile static objects, "to be judged…by its purposive success rather than by some supposed standard of accuracy of reflection of its object" (Haack, 1996: 652). When we fast-forward to the current decade, Garrick and Clegg (2001)'s study of stressed-out knowledge workers within project-based learning environments also showsa clear relationship between knowledge and power. In re-questioning the authenticity of the learning environments involved, they argued that 'true' situations are in fact illusions whereby across "rules of inference, corporate capabilities are transformed into 'facts', social values as 'inputs' and irreducible assumptions become taken for granted as 'given'…The 'true' situation is that such frameworks are saturated with ideologies of technical-rationalism and market economics" (Garrick & Clegg, 2001: 123). Boje (1994: 447) describes the ubiquitous nature of such organised authority:

> "Learning occurs in the minute-by-minute interactions and the spaces along the hallways, lunchrooms and e-mail networks. The iron cage of the bureaucratic teaching machine is so ubiquitous and benign that the prisoners of modern learning no longer see the bars, the gears, or question the learning agenda"

Within this 'softly' orchestrated learning comes the loss of power to question and make authentic decisions. Hence, it is primordial that as a society we become mindful of the importance to retain our knowledge expertise and creativity, and as such, our ability to influence and decide. It is here that we canpropose an alternative type of efficiency as by Feenberg (1999) in which efficiency is aimed towards overall human and ecological well-being. It is above all, an efficiency that does not seek to shortcut or truncate tacit human experience and meaning, such as we saw within classical scientific management's quest for 'the one best way' across executions and instructions (whether human or automated), as well as with subsequent algorithmic 'sign' logics used in what is loosely termed as AI. Feenberg (1999) definition of efficiency recognizes the human capacity for symbolic transformation, and as such, human creativity. Similarly, Feenberg (1999) sees technology as a space to be contested in which social groups have the opportunity to influence and change technological design, uses and meaning. This rejoins, Garrick and Clegg (2001) call for dialogue and deconstruction which periodically puts in question social, political and economic issues – and where the resultant knowledge generated is not constrained to limited families of thought or paradigms (Rhodes, 2000). Thus, technology can be publicly questioned, in which society can demand or carry out changes, such that technology development becomes more accommodating to democratic debate and reconstruction to serve human needs and goals. This thesis is similarly echoed across both Touraine (1992) concept of individuals as subjects fully capable of being active and transformative agents of society, and Beck (2001) call for needed debate and conversation between socio-political and technico-economic spheres in regards to the question of technological development. Along these lines, McLoughlin and Dawson (2003) propose a perspective of mutual shaping of technology and organization. But beyond the mutual agentive capacities of both humans and technology, McLoughlin (2002: 7) emphasizes the human aspect of creative technological change in which humans actively and creatively shape technology across alternative imaginaries or "metaphors" – what Morgan (1986) refers to as 'imaginations'.

In complementary fashion, we also propose work configurations which will consist of people aided by technologies which facilitate and/or stimulate one or more of the following key conditions required to stimulate creative organizations according to

Robinson and Stern (2000):

1 Experimentation/trial and error
2 Serendipity
3 Creative stimulations
4 Communication
5 Authentic collaboration

For example, Stefan Sonnenfeld is a digital intermediate colorist who uses computers to alter the color of movies and TV shows until they look spectacular. According to Austin (2016), his artistry would not be possible without the technology. Such digital technologies provide individuals with the capacity to do rapid trial and error iterations, starting from reconfigurations to testing to subsequent interpretation of results. Other technological systems based in social web are argued to increase the likelihood of individuals experiencing serendipity through a combination of information, context, insight and activity; for example, certain mobile applications which can send text suggestions to users throughout the day, whereby the contents of these messages is informed by users' experiences and interests (Kefalidou & Sharples, 2016). A variety of media technologies can also aid individuals and/or groups to augment both conversation and collaboration.

We realise that the alternative imaginary presented above is nascent and preliminary in nature, both in terms of vision details and feasibility. Its prime objective is to provoke further discussion and debate. The spirit of the proposed alternative, however, further highlights the main argumentation of this paper – namely, that we are currently caught within an Ellulian-like phenomenon of efficient knowledge truncation and pseudo-creativity across the use of algorithmic logics consisting of pure explicit sign manipulations. It is a phenomenon which enacts further knowledge impoverishment and limited creative outputs in the form of finite paradigms across unending machine generation of structured speech and rhetoric. By presenting itself as *the* legitimate replacement to our unique human capabilities for symbolic transformation, it discourages us to exercise and tap into our full creative capacities. Reversing the current knowledge-creativity transfer away from workers (with its associated decisional powers) most certainly means facing barriers with deep historical roots.

While power is a human need (McClelland, 1961), "in situations with large power differentials, people with more power have the freedom to define reality, which means they need to spend less time trying to understand how reality is constructed" (Weick, 2009: 161). No doubt we are speaking of coercive power and control when we look at the Marcusian dimension of digital Taylorism (Deleuze, 1992; Fisher, 2014), and as such, organizational authorities that have adopted it wholeheartedly will most certainly be resistant towards adopting an alternative view. Digital Taylorism, as discussed earlier, is also being applied towards the creative workforce, leading to either exhaustion and demotivation or out and out worker elimination (AI). Digital Taylorism's pernicious and all-pervasive Ellulian dimension towards ever-increasing efficiency, also means that decisional powers are now being shifted towards *technological* entities (AI and learning algorithms) who's new-found autonomies also define our realities. Becoming conscious of this requires mindfulness on our part (Weick, 2009). Mindfulness involves an expansive 'attentional breadth' or directing attention toward external events and phenomena as well as internal states (Dane, 2011). It is the first step towards making sense of things or phenomena (Weick, 2009). And it is here that we would like to terminate on an encouraging note – namely, that making sense is recognized to be a highly politicised process whereby "…in reconstructing reality through discourse, actors in the field take part in the redistribution of power itself" (Zilber, 2007: 1037).

5. Conclusions

Current and near future organizational strategies are placing great emphasis on machines, robots and so-called AI – with the general aim to improve efficiency (productivity), and maximize profitability. This has manifested itself in various forms, including automation to reduce menial or repetitive jobs, digitization of work to render remaining workers more efficient (productive) and AI to provide more reliable and productive top-end professional work – all inter-related neo-liberal initiatives enacted by current dominant imaginaries of efficiency and maximization. Yet we have argued that this dominant imaginary also goes beyond a Marcusian reality of organizations to affect various domains such as CSCW, where, for example, there is an explicit or formal 'cooperation' between humans and technology. This is because of the Ellulian phenomenon of efficient techniques spreading within technical logics that go beyond neo-liberal frontiers across algorithmic approaches which attempt to capture *all* manners of meaning across the efficient explication, formalization and manipulation of signs as representations of explicit knowledge. Such purely 'efficient', analytical attempts to dissect and reduce all knowledge and experiences prevent us from recognizing one of humanity's inherent complexities and strengths, namely, creativity and its associated tacit knowledge. By becoming aware of the underlying instrumental imaginaries in both the technical as well as the economic domains of the digital economy, we can better understand the current contradictory logic of seeking to possess knowledge and creativity within systems of command and control that fail to foster its full richness by muzzling human creativity and its associated tacit knowledge in the first place. In turn, this has led to reduced decisional or democratic powers within the hands of workers, and now reserves the same fate to the professional creative knowledge working class.

Inspirations from more holistic interpretations of Jungian symbolism allow us to provide a possible starting point towards comprehending the complex, ambiguous, constantly emerging and essentially hard-to-define aspects of human creativity and tacit knowledge. This, along with the argument that there exists a relationship between a democratization in knowledge and democratic decisional processes (Dewey, 1927; Garrick & Clegg, 2001), provides us the basis to present an alternative imaginary of efficiency as

proposed by Feenberg (1999). Such an imaginary, allows for the active and democratic participation of humans in the decisional process and development of technology; and also allows us to view and enact humans as full legitimate partners with technology in both their mutual shaping capacities, and their respective strengths and contributions – thus, leading towards human-centric organizations. It is acknowledged that this alternative vision is preliminary in nature, and is meant to be a starting point for further discussion and debate.

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