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The Rise of Quasi-Humans in AI Fueled Organizations, an Ultimate socio-materiality approach to the Lens of Michel Serres

Charbel Chedrawi[1,*], Gloria Haddad[2]

[1,*] Saint Joseph University of Beirut, Lebanon, charbel.chedrawi@usj.edu.lb; School of Business, University of Nicosia, Cyprus, chedrawi.c@unic.ac.cy
[2]Saint Joseph University of Beirut, Lebanon, gloria.haddad@usj.edu.lb

Abstract

Background: *Artificial Intelligence (AI) technologies are reinventing industries through offering organizations the opportunity to realize formerly impossible innovations. Views about the role of AI in social change remain nevertheless controversial; on the one hand, it poses major ethical challenges and on the other hand, it is believed to be a tool for social good. The journey from assisted, to augmented, then to autonomous intelligence is part of a growing trend thus transforming firms into AI-fueled organizations. Among scholars and practitioners, there is a mounting recognition of the need to understand the potential collaboration of humans and machines and its implications for organizations.*

Method: *We draw on the Sociomateriality theory and on Serres' ontological view of the quasi-object/quasi-subject to explain the interplay between the social and the material in organizational settings. We propose a four-dimensional model that profiles future organizations populated with humanized machines and augmented humans.*

Results: *We propose a new ontological perspective for the understanding of ultimate Sociomateriality, extending the sociomateriality theory. We contribute to organizational development theory through discussing the implications of ultimate sociomateriality for organizational practices, and through proposing the 4E matrix with the four dimensions for AI-fueled organizations.*

Conclusion: *We shed the light on the interaction of the social and the material in the AI era. We proposed a theoretical development of the ultimate Sociomateriality theory based on Serres' philosophy, as well as a four-dimensional matrix (4E matrix) which profiles AI-fueled and quasi-human populated organizations. Practically, we inform technology providers to create AI machines that serve humanity and organizations instead of destroying it, and inform public policy makers and NGOs to act as regulators for human rights, highlighting the need to rethink business education to develop human skills while redefining human roles within organizations in order to avoid being ravaged by the AI revolution.*

Keywords: Artificial Intelligence, Ultimate Sociomateriality, Quasi-human, Quasi-object/Quasi-subject, Human-machine Collaboration.

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Introduction

Artificial Intelligence (AI) technologies are revolutionizing every industry aiming to reproduce human abilities including the capacity for learning and adaptation, sensory understanding and interaction, reasoning and planning, optimization of procedures and parameters, autonomy, creativity, and knowledge creation from large and diverse digital data (Yeung, 2018). Today, it is becoming obvious that the use of Artificial Intelligence (AI) in organizations has grown tremendously (Zaza et al., 2019), and are increasingly being explored by the academia and industry (Riera & Ijimia, 2019). In fact, we are witnessing numerous instances of new digital technologies constantly replacing those that are being used, a phenomenon coined as technology transition and customized Information Systems (IS) (Doolin & McLeod, 2017; Tarhini et al., 2018; Thakurta et al., 2018); however, many companies still struggle with "becoming digitally transformed" (Barthel & Hess, 2020).

AI, enabled by adaptive predictive power and machine learning techniques, exhibits today some degree of autonomous learning capable of analyzing its environment and adapting to new circumstances in this environment (Dellermann et al., 2019); it is dramatically advancing the human capacity to recognize patterns, anticipate future events, create good rules, make good decisions, and communicate with other people (Deloitte, 2019). Such AI outputs can be clarified through breeders and researchers by a reference to human–computer interaction (Harfouche et al., 2019). According to Davenport (2018), autonomous intelligence is the third stage of AI utilization, whereby machines, bots, and systems can directly act upon intelligence derived from them.

Beyond cognitive computational power, the market for affective computing (AI systems including emotional sensing, 3D printing, etc.) will see a tipping point in 2022, AI changing white collar jobs will be in 2025 and AI being responsible for decision making by 2026. The journey from assisted, to augmented, then to autonomous intelligence is part of a growing trend today, thus transforming firms into AI-fueled organizations. The good, the bad, and the ugly of AI has long been discussed. While the evolution of AI technologies poses major ethical challenges, it is nevertheless believed to be a tool for social welfare, which can bring solutions to the most challenging issues (Cowls et al., 2019). In the 'age of with' as described by Deloitte (2019), one could wonder about the collaboration between the human and the machine and its implications for practice in organizations.

In addition, the COVID-19 virus triggered a rising demand for rethinking business strategies, for remote work software (Forbes, 2020), and for more advanced technology in general, marking the end of the fourth industrial revolution and the beginning of the fifth. Demand for cognitive technologies is skyrocketing; Deloitte (2020) forecasts spending to reach US 77.6 billion in 2021. Shares of Tec companies around the world are skyrocketing: the NASDAQ index, for instance, broke the 10.000 threshold for the first time in history in June 2020. Is it the AI revolution, or the potential of quantum computing, or the moment when humans and machines combine in the workplace?

In this article, we draw on the sociomateriality theory to understand the relationships between the social and the material in organizational settings. The literature reveals two streams of thought which are not contradictory but rather complementary (Oberländer et al., 2018): the strong sociomateriality (Orlikowski, 2007) and the weak sociomateriality (Mutch, 2013). Later on, Haddad and Chedrawi (2019) proposed an extension of the theory, that they call ultimate sociomateriality, which comprehends the change produced by the advent of AI technologies in the corporate world. In order to provide a deeper understanding of ultimate sociomateriality, we dig into the ontological views of the French philosopher Michel Serres (1982) and we adapt his theory of the quasi-object/quasi-subject to interpret the Human/AI technology interplay. We suggest that the convergence of the humanized machine and the augmented human will lead to the rise of the quasi-human. In a world of quasi-humans, it wouldn't be simply the attributes

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of the social or the material that define them but rather their symbiotic relation and their embeddedness within each other that gives them their significance.

This conceptual paper is organized in two major sections: the first one is a review of the literature about artificial intelligence, sociomateriality theory; and the second proposes a theoretical development of the ultimate sociomateriality theory based on Serres' philosophy and it finally shows the four-dimensional matrix (4E matrix) which profiles AI-fueled and quasi-human populated organizations.

Theoretical Background

Artificial Intelligence and The Different Types of AI Systems

Artificial Intelligence (AI) is the term used to describe a machine's ability to simulate human intelligence. Actions like learning, logic, reasoning, perception, and creativity, which were once considered unique to humans, are now being replicated by technology and used in every industry (Business Insider Intelligence, 2019). In fact, AI encompasses a set of advanced general-purpose technologies that enable machines to do highly complex tasks (Bostrom, 2014). AI systems, capable of displaying intelligent behaviors, may achieve specific organizational goals, thus offering organizations opportunities to realize formerly impossible efficiencies and innovations by delivering value that once required too many people or too much time (European Commission, 2018; Andrews, 2019).

Kaplan and Haenlein (2019) link outstanding performance in organizations with three forms of competencies: cognitive intelligence (capacity to think systematically, to grasp complex ideas, and to solve problems), emotional intelligence (self-awareness, self-management, and relationship management), and social intelligence (collaboration, empathy, teamwork, and inspirational leadership). They adopt the form of competency as a standard to measure AI performance and they classify AI systems into three types as shown in the following figure (Figure 1).

	Analytical AI	Human-inspired AI	Humanized AI	Human Beings
Cognitive Intelligence	X	X	X	X
Emotional Intelligence		X	X	X
Social Intelligence			X	X
Artistic Creativity				X

Figure 1 - Types of AI systems – adapted from Kaplan and Haenlein (2019)

The three types of systems are explained as follows:

- Analytical AI have cognitive intelligence components. They learn from past experiences to inform future decision-making and they can mimic the brain's structure to derive knowledge autonomously out of a large amount of data. This type of AI systems is widely available across several sectors.
- Human-inspired AI have cognitive and emotional intelligence components. They cannot express emotions however they can be trained to recognize them. They can identify reactions like surprise, happiness or anger, and may consider them in the

decision-making process. This type of AI systems produces great value in interactions with customers.

- Humanized AI have cognitive, emotional, and social intelligence components. These systems can replicate human attitude to experience the world in a fundamental way. They are not yet available; however, they are the concern of technology providers today.

In fact, the recent proliferation of AI in the workplace is leading to an unprecedented proximity between employees and these emerging AI-based technologies. For Dellermann et al. (2019), machines will one day, be able to do and perform complex tasks or may even supersede humans in performing these tasks; but human input is also critical at multiple points in the process, which advocates for training and education of both computer scientists and users to fill the knowledge gaps (Harfouche et al., 2019).

The Sociomateriality Theory

Sociomateriality explains the relationships between social and material entities in organizational settings (Oberländer et al., 2018). It relates to preceding theories such as actor network theory, sociotechnical systems, and practice theory (Leonardi, 2013). The groundbreaking contributions in the sociomateriality field led to the advancement of two streams of thought: strong and weak sociomateriality (Oberländer et al., 2018).

Strong sociomateriality is based on agential realism; it presumes that the social and the material are intertwined, and that materiality is part of everyday life (Orlikowski, 2007). Materiality is not ignored or treated as a special condition but it is rather essential to organizing. This approach does not favor neither humans nor machines, but it reveals that "there is no social that is not also material and no material that is not also social" (Orlikowski, 2007). Strong sociomateriality claims that the entanglement of the social and the material assumes that there is no a priori independence of human and technology components, and that no unidirectional effects or mutual interactions happen between them. Humans are formed through relations of materiality, which are, in turn, generated through human practices. Human and technology components enact each other in practice. The intra-actions between the two entities make the boundaries of the social and the material manifest (Oberländer et al., 2018). Technological systems do not reflect powerful structures or high human development abilities but rather a dynamic sociomaterial interplay performed in practices (Orlikowski, 2007).

The following figure (Figure 2) provides a visual representation of the strong sociomateriality concept.

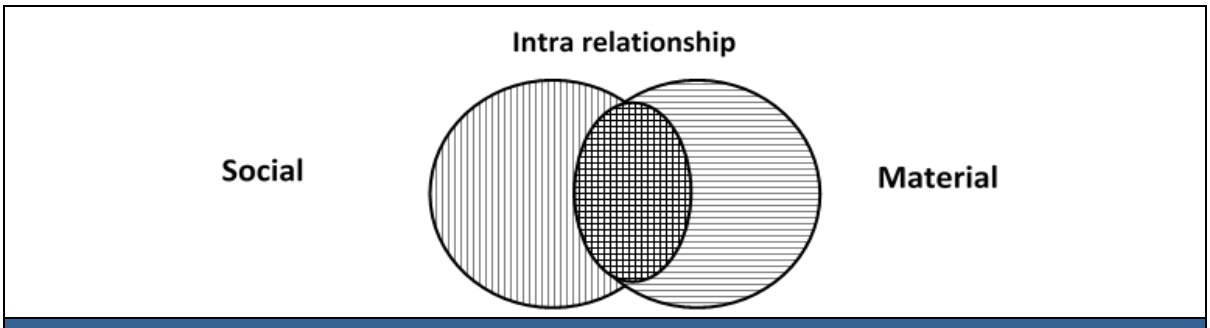

Figure 2 - Strong Sociomateriality

Weak sociomateriality is based on critical realism; it suggests another perspective of entanglement. Mutch (2013) introduces several concerns about strong sociomateriality. She explains that the concept is difficult to apply in practice, that it neglects the wider objective context in which practices are produced, and therefore it reduces the ability of researchers to

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take full account of factors when analyzing particular situations. She also points out that strong sociomateriality has limitations upon dealing with novel applications and data-intensive systems where human interference is limited. The critical realism approach that she recommends considers the social and the material as separate units, existing independently of each other, and pre-existing any relations (Jones, 2014). Social agency relates to human intervention and material agency relates to the reaction of the machine to human intervention (Leonardi, 2013). Mutch (2013) provides directions for future research in organizational contexts and highlights the need to analyze the way social and material actors intermingle and the effects of their sociomaterial interchange.

The following figure (Figure 3) provides a graphical representation of the weak sociomateriality concept.

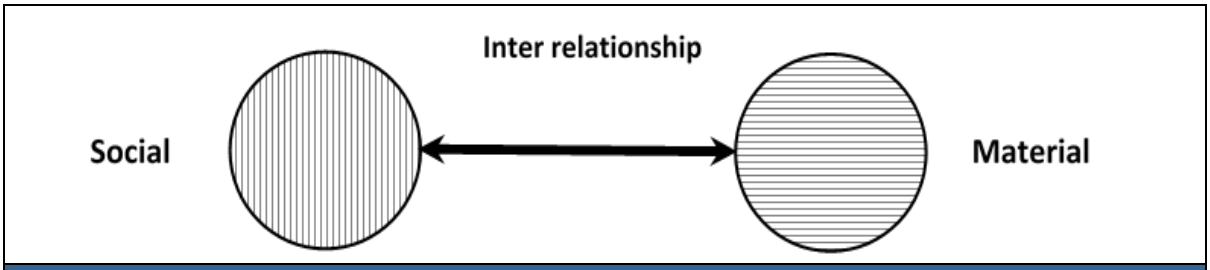

Figure 3 - Weak Sociomateriality

Scott and Orlikowski (2013) and Leonardi (2013) explain that agential realism and critical realism may coexist and operate alongside each other. While strong materiality (agential realism) offers a philosophical perspective to understand the world, weak materiality (critical realism) translates philosophical views into practical processes.

To grasp the change produced by the advent of AI technologies in the corporate world, Haddad and Chedrawi (2019) propose a model (Figure 4) which reveals the relationship between AI performance and the level of sociomateriality.

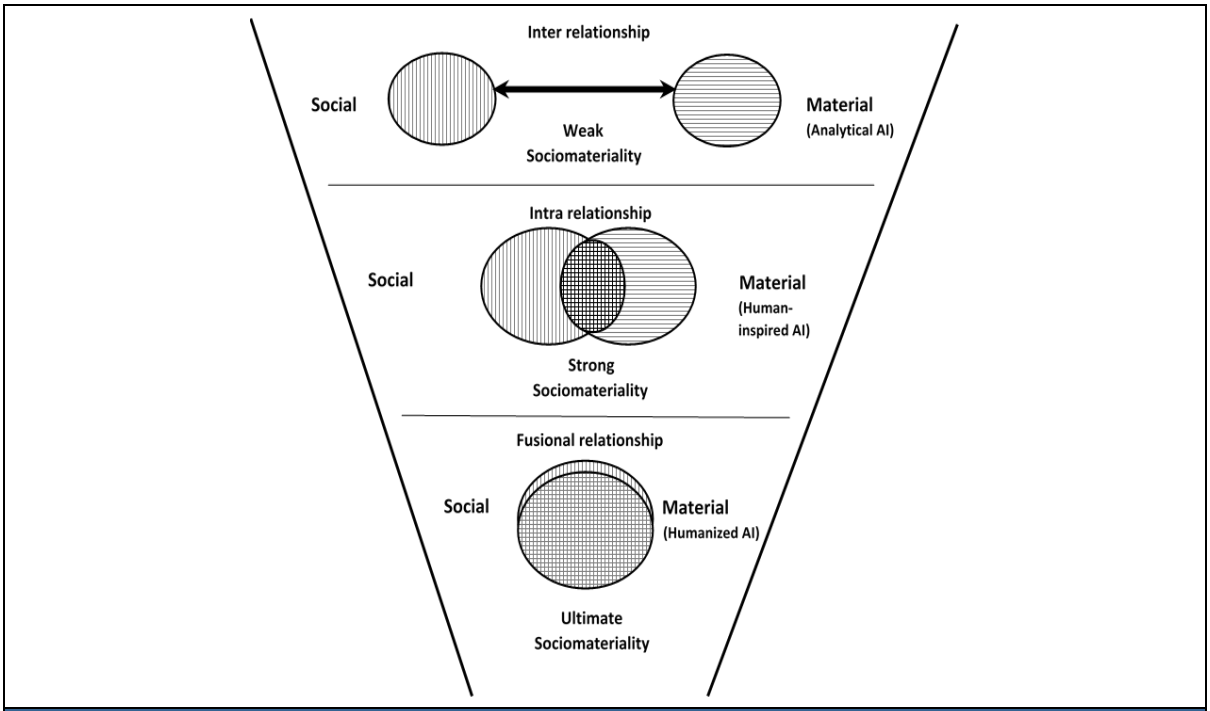

Figure 4 – Sociomateriality and AI performance

Haddad and Chedrawi (2019) explain the three-dimensional model as follows:

- First, they link analytical AI (cognitive intelligence components) with weak sociomateriality. In this dimension, the sociomaterial interplay consists of the material learning from past experience (cumulative data stored), understanding complex ideas, rapidly solving problems, and assisting the social in the decision-making process. In turn, the social feeds the material with the information needed, based on observations, thus enabling machine learning.
- Second, they link human-inspired AI (cognitive and emotional intelligence components) with strong sociomateriality. They explain that the ability of the material to recognize and understand emotions confers it a higher power and control over the social. The material inspires thoughts and courses of action, and therefore, it strongly influences social behaviors and co-produces practices with the social.
- Third and last, they link humanized AI (cognitive, emotional, and social intelligence components) with a new concept that they call ultimate sociomateriality to reflect the future ascent of AI materiality. In this dimension, the social and the material become almost totally embedded within each other, in a fusional relationship, through which, sociomaterial practices can be enacted. The material has the ability to experience the world in a fundamental way. It can think, feel, and lead. It does neither inform the social nor inspire it, it can simply augment it or replace it in organizational practices.

Theoretical Development of Ultimate Sociomateriality

An Ontological Approach Through the Lens of Michel Serres' Theory

Haddad and Chedrawi (2019) describe ultimate sociomateriality as the embeddedness of the social within the material and vice versa, as a fusional relationship that produce practices. Ultimate sociomateriality assumes a strong dependency between the two actors to the point of each one losing meaning and value when separated from the other. We propose to extend the ultimate sociomateriality concept, to give it an ontological meaning, through the quasi-object/quasi-subject theoretical lens of Michel Serres (1982).

The French philosopher explains his theory through the football game example. He identifies two types of players, the clumsy ones who handle the ball as an object, and the more skilful ones who treat it as essential in determining their moves thus tuning their game and positions according to the way the ball moves and bounces. Serres points out that the ball is not manipulated by players as it might be obvious to spectators, but it is rather the mean that produces relationships between them. Serres and Latour (1995) wrote "It is in following its trajectory that their team is created, knows itself and represents itself. Yes, the ball is active… It is the ball that is playing" (pp. 47-48). The collective football game is produced with the circulation of the ball, that the philosopher calls the quasi-object. In its ability to lie at the origins of sociality, the quasi-object becomes equally a quasi-subject (Serres, 1982). It is like a token or a joker in a deck of cards; it is a 'general equivalent' passed or thrown to whomever and defined by the exchange among subjects. In fact, for Serres (1982, p.225) "a ball is not an ordinary object, for it is what it is only if a subject holds it". When passing the ball, football players are weaving the collective; possession and running with the ball make the subject, thus defining the relationship between the two (Serre, 1982; Carr & Downs, 2004). In sum, the quasi-object/quasi-subject (the ball), when being passed (in the football field), creates relationships, makes the collective, and produces practices. When it stops, it returns back to be a dummy and ordinary ball. At the same time, the subject (player) returns back to its ordinary status of being just an individual. It is the individual augmented with the ball which produces the subject/player status, the team relationship, and the football practice.

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A Practical Understanding of Serres' Theory in Relation to AI

The Augmented Human as the Quasi-Object/Quasi-Subject

Merging digital intelligence and biological intelligence has always been a controversial topic. Although biohacking started to gain in popularity, it remains a concept most people are still uncomfortable with. Among supporters of human microchipping are Swedish organizations that encourage human augmentation through implants. Swedish workers accept to have computer chips/tags implanted under their skin because they believe that it would help them better interact with AI applications hence improving their quality of life (Barnhizer & Barnhizer, 2019). Another active supporter of natural and artificial intelligence wedding is the American company Neuralink, founded by Tesla founder Elon Musk, which is developing today implants that connect human brains with computer interfaces via AI. Flexible electrode threads inserted into the human brain by neurosurgical robots can detect brain signals and transmit them outside the human body. The outcome of this action is a scalable brain-machine interface (BMI) allegedly developed to help paralyzed humans control phones or computers. Through bypassing intermediary steps, like hands, the BMI creates a direct exchange channel between the brain and the machine and produces a more powerful digital version of the human. In fact, Musk (2020) sees in this project a means for the human to achieve symbiosis with AI to create the superhuman intelligence. He believes that humans need to be cyborgs (a hypothetical person whose abilities are extended beyond normal human limitations) to survive in the AI era (Hitti, 2019). Furthermore, he promises that Neuralink could soon be ready to put a version of its implant in a person to restore eyesight, hearing, and limb movement in addition to addressing diseases that affect the brain (Eadicicco, 2020).

The infiltration of AI into every aspect of life and the amazing breakthroughs that it offers in organizational settings, far beyond human capabilities, is a threat to normal human beings. Augmented intelligence seems to be the only way to save the human race through creating augmented humans that can exceed their current abilities to experience the evolving world in a new way (Lukosch, 2019). With this regard, we take the example of the Japanese Government initiative of Society 5.0 where human beings will find their bodies and minds transformed through the advances of neuroscience, robotics, AI, and other futuristic technologies. This initiative is seen as a means to guarantee citizens richness in minds and high-quality life. Millions of ordinary individuals are called to integrate artificial entities into their homes, their daily routines, and the most intimate aspects of their lives. While the Japanese government's initiative aims at keeping the human being's position at the core of society 5.0, it would be quite hard for humans to remain central actors because nowadays digitalization is shaping the character of society (Fukuyama, 2018; Gladden, 2019). Indeed, the merging of humans and AI seems inevitable for human beings, in the near future, to avoid being outmoded by AI in the workplace (Schneider, 2019). When human beings are augmented with AI, and when AI penetrates the human consciousness, what would be left of humans? They would be quasi-objects manipulated by machines; they would lose their identities, each enhancement bringing them one step farther from their true selves.

The Augmented Machine (Humanized AI) as the Quasi-Object/Quasi-Subject

What if the prediction of Steven Hawking was true in his interview with BBC News in 2014 when he said that technology "would take off on its own, and re-design itself at an ever-increasing rate?" Would humans be able to control their own inventions? In the long term, the synthetic intelligence will be the next evolution of intelligence on Earth (Schneider, 2019). What if technology itself could become more human? What if a bot appearing on the screen in front of our faces could engage us with the kind of emotional acuity and perceptive nuance that we expect from human-human interaction? (Deloitte, 2020); these questions and much more are popping up more frequently. In fact, AI agents are currently able to rely on a combination of text analytics, voice analytics, voice recognition and response, video analytics,

and more, to measure physical states and detect likely emotional states in order to respond more appropriately (mirroring mood, gestures, and tone) (Deloitte, 2020).

A vigorous sponsor of augmented machines is Google DeepMind whose AI technology has already found its way into our lives through a variety of Google projects and devices (Google Home, Google Assistant Voice recognition, Assistant Voice Generation, Google Image Search, Google Lens, …), allowing Google's voice recognition tech (such as WaveNet), to achieve an impressive level of accuracy for the English language, to the point where it is as accurate (more natural) as a human listener. WaveNet, for instance, relies on samples of real human speech but does not use the samples to synthesize new voices. Instead, it analyzes the samples of human speech to learn how the raw audio waveforms work. This allows the program to speak different languages, use accents, or even be trained to sound like a specific person. Another example is Google Lens, a visual search engine that allows a person to take a picture of an object in the real world and instantly pull up information about it; Google Lens is able to look at the pictured object and figure out what it is while performing a variety of more advanced actions. In addition, Google DeepMind is currently working on computers that mimic the function of the brain, to increase the capabilities of computers by combining aspects of data processing and AI and come up with what is called now a Differentiable Neural Computer (DNC) (Rajna, 2020). They are presently working on systems to use and manipulate memory in useful ways through DNCs to overcome the current decision trees' deficiency, allowing for the creation of computer systems that are not only able to learn, but which will be able to remember what they have learned and then to use that information for decision making when faced with a new task.

Serpa and Ferreira (2018) suggest that the integration of artificially intelligent actors into society brings with it major practical, ethical, and security challenges. Non-human social agents are not designed to be passive tools or anonymous parts of the environment but rather an integral part of human society like house pets and working animals (Charles & Davies, 2011). In the foreseeable future, they are expected to be full participants and members of societies; the next evolution might even force the society to consider them as moral subjects who deserve merit and recognition of their efforts. The humanized machines are doomed to play increasingly larger roles in shaping economic growth and addressing declining labor productivity (Gladden, 2019). Indeed, the theoretical concerns about the respective roles of artificial entities and human beings in organizations have become ever more real. The humanized machines, which possess physical, intellectual, emotional, and social competencies that exceed those of human beings, will ultimately perform the work that had been previously performed by human beings. Madry (2019) envisions a world where intelligent robots design, produce, and distribute products and where few humans would have jobs left. In fact, Yoon (2020) points out that, by 2025, grocery retailing will no longer look the same as the world will witness robotic retail through robotics' application called micro-fulfillment, disrupting this 100-year-old, $5 trillion industry. Retailers will operate at a higher order of magnitude on productivity, which will in turn result in positive and enticing returns in the online grocery business. Additionally, with 5G networks in place tied directly into autonomous bots, goods would be delivered safely within hours; hence, the roll-out of 5G will lead to self-driving bots along with a mobility-as-a-service economy (Yoon, 2020).

While the evolution of AI technologies poses major ethical challenges, it is nevertheless believed to be a tool for social welfare, which can bring solutions to the most challenging issues such as educational and environmental challenges, health and hunger, security and justice, equality, and inclusion (Cowls et al., 2019).

The Social and the Material Embedded…The Rise of the Quasi-Human

The world has been watching so far two distinct sources of sensing, deciding, and acting: the natural human agency and the cyber agency possessed by robots and AI (Fleischmann, 2009).

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The future will watch self-aware and context-aware machines that are capable of complementing and augmenting human intelligence. Technology, machines, robots, will become sooner or later, entrenched in people daily life and in human brains (Kharkovyna, 2019). With Neuralink special gadgets and flexible electrode threads implanted into the human brain and their scalable BMI producing a digitally enhanced human on one side, and Google DeepMind AI projects (WaveNet…), devices (Google lens…), and DNCs mimicking the functions of the brain and allowing the creation of decision making, self-learning computer systems on the other side, the marriage between the augmented human and the augmented machine is taking place soon. Such conjugal shall push the cooperation between the social and the material to become seamless and continuous thus taking the shape of a symbiotic relation. The social dimension will be embedded in the material and the material will be embedded in the social to augment it. This will lead to the creation of superorganisms, the quasi-humans.

According to Latour (1996), it is modernity that has led to the ontological distinction between objects and human subjects, whereas the world is filled with quasi-objects and quasi-subjects. It is, in fact, one of the qualities of the quasi-object to become a quasi-subject. The whole notion of quasi-object and quasi-subject is a move toward a more liberal object-subject division; a division that does not separate objects and subjects, but sees them as an extension, an inseparable whole. Serres describes quasi-objects as active beings with an ability to circulate, to bring together, and to combine. To put it in his own terms “The quasi-object is not an object, but it is one nevertheless, since it is not a subject, since it is in the world; it is also a quasi-subject, since it marks or designates a subject who, without it, would not be a subject” (Serres, 1982 p. 225). This means that the subject/object relation will be better understood through the concept of quasi-object. It is not simply the attributes of a subject or an object that define them. It is their relation to each other and to them as a whole that gives them their significance. It is through the quasi-subject that we know how and when we are and are not subjects (Serres 1982: 227; Simons, 2017).

If we attempt an assimilation with Serres’ example to understand ultimate sociomateriality, we can suggest that it is through the quasi-human that the convergence of the material (ball) and the social (individual) makes sense, the social becomes a player (football player), the collective is weaved (team relationship), and the practices are produced (football game). Indeed, the relationship between the social and the material implies that both entities can no longer operate independently of one another, and they would be unlikely to survive in organizations if they got separated from each other.

Implications for Organizational Practices in Ultimate Sociomateriality Era: The 4E Matrix

Cognitive technologies, such as machine learning, neural networks, robotic process automation, bots, natural language processing, neural nets, and the broader domain of AI, have the potential to transform nearly every industry. These technological innovations, which personalize and contextualize the human-technology interaction (allowing businesses to provide tailored language and image-based information and services, with minimal or no human involvement) through a global architecture of cognitive technologies and computers shall turn the intelligent world-spanning organism into a more personal and contextual human-technology interaction.

We believe that the advent of quasi-humans would deeply impact organizational practices. However, the extent to which organizations embrace ultimate sociomateriality and invest in augmented people and machines is contingent upon societal influences, cultural factors, governmental policies and regulations, and market acceptance of AI predominance. We therefore suggest a four-dimensional matrix (Figure 5) that reflects the degree of engagement of organizations on the road to be fully-fledged AI-fueled organizations.

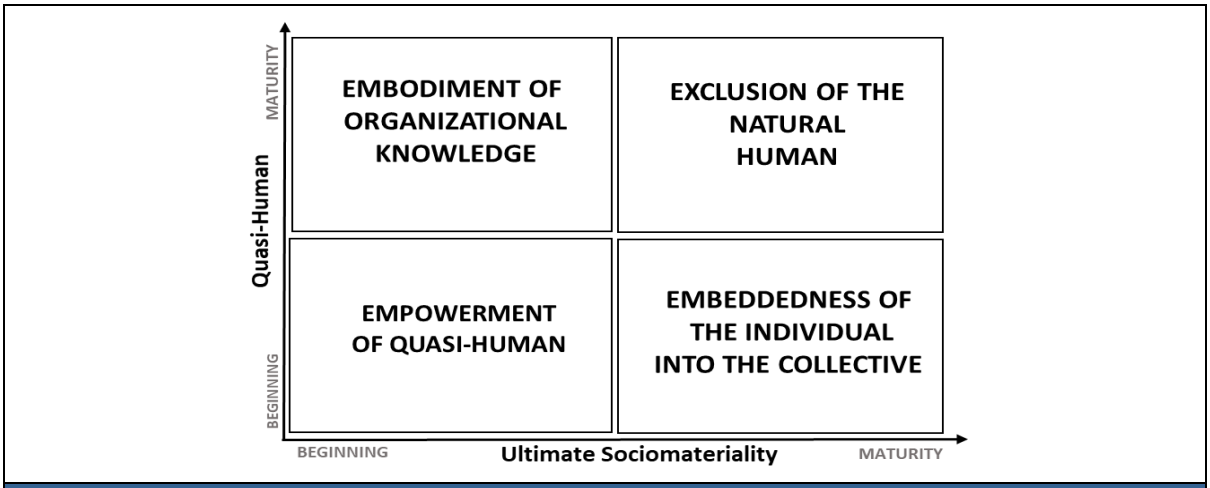

Figure 5 –The 4E matrix of Ultimate Sociomateriality

Empowerment of the Quasi-Human

Beginning of quasi-human integration into the workplace / Beginning of Ultimate Sociomateriality

Today, for the first time in human history, technology makes it possible to monitor everyone all the time. In their battle against the coronavirus epidemic (the biggest crisis of our generation), several governments have already deployed the new surveillance tools by closely monitoring people's smartphones, making use of hundreds of millions of face recognizing cameras, and obliging people to check and report their body temperature and medical condition. Thus, augmented intelligence is now the solution that helps governments to rely on ubiquitous sensors and powerful algorithms instead of flesh-and-blood spooks, and in the days ahead, each one of us should choose to trust augmented technology and scientific data (Harari, 2020).

In fact, South Korea and China won the fight against Corona virus, using big-data analysis, AI-powered advance warning systems, and intensive observation methodology:

- South Korea's government-run big-data platform stores information of all citizens and resident foreign nationals and integrates all government organizations, hospitals, financial services, mobile operators, and other services into it. They used the analysis, information, and references provided by this integrated data platform to promptly convey real-time responses and required information to people with different AI-based applications (Seoul, 2020). This is in fact an advanced stage of Surveillance Capitalism that was used efficiently against the Pandemic
- As for China, they fought the Corona Virus totally at a different scale; they showed some very effective ways in which robots helped combatting the spread of the virus; Robots were used either to act as nurses or to deliver medicine, food, and disinfect rooms (Ackerman et al., 2020).

Effectively, augmented intelligence systems find hidden meaning within all data and transform user engagement by providing the right advice, at the right time, with the right evidence across any contact point. Consequently, it is all about AI fueled organizations with their new cognitive computing technology that is based on digital brains (quasi-humans) that are continuously evolving and learning over time, driving new business processes and innovation, and making a successful cognitive business that covers all companies' departments (Deloitte 2020; Sabhikhi & Sanchez, 2019).

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To tackle the empowerment of the quasi-human in the context of ultimate sociomateriality, we recall Michel Serres' philosophy to explain how AI fueled organizations can leverage their quasi-humans and undertake actions in order to prevail over competition. In fact, it's almost straightforward, there will be either the "Have" or the "Have-not". Going back to the football game example, playing is nothing else but making oneself the attribute of the ball as a substance. The ball is the subject of circulation; the players are only the stations and relays (Serres, 1982; p. 226). Those who hog the ball are bad players and are soon excluded from the game. The ball isn't there for the body. The exact contrary is true: the body is the object of the ball; the subject moves around this sun. Skill with the ball is recognized in the player who follows the ball and serves it instead of making it follow him and using it (Brown, 2013). Players who will follow the ball shall flourish.

Another example illustrating Serres' quasi-object is from Stichus (2013): he who is not discovered with the "furet" in his hand is anonymous, part of a monotonous chain where he remains undistinguished; he is not recognized. Organizations without quasi-humans shall not survive the ultimate sociomateriality era. The simple question that need to be answered about: who are they? Are they those who pass the "furet" or those who don't have it? Like there would be no exchange without money and commodities, and no war without weapons, there would be no future for organizations without quasi-humans.

Proposition 1: Empowered quasi-human in AI fueled organizations shall compensate the various limitations in the current abilities of machine-learning and deep learning techniques to extract and process big data in their raw form, capturing predictive features while providing abundant opportunities for innovations.

Proposition 2: The empowerment of quasi-humans in AI fueled organizations/societies/countries will define competitive advantages and the power struggle in the new "have" and "have not" era; such empowerment will be the key resource for those who have, enlarging and deepening the gap with those who have not

Embeddedness of the Individual into the Collective

Beginning of quasi-human integration into the workplace / Maturity of Ultimate Sociomateriality

To explain the concept of embeddedness, we will start reviewing the work of Ulieru (2014) who builds upon the logic of holonic systems to explain the manifestation of self-organized systems where individuals are nested within dynamic forms of social organization. The author argues that these new rules of connectedness are transforming organizations and the way people live and work. Ulieru (2014) discusses the challenge of self-organized systems that consists of sustaining a balance between the individual and the collective, thus keeping individual systems autonomous and separate, while promoting cooperation in the individual/group dynamics to achieve common goals. She argues that individuals may relate to each other through two possible ways: the subject/object way of knowing that is impersonal and driven by narrow personal interests, and, the subject/subject way of knowing that is driven by subjective world experiences and an increased sensitivity to the wholeness of the system. Ulieru (2014) points out that the subject/subject mode is currently more valued in the emerging new forms of workplace organization. In our conception of ultimate sociomateriality, based upon Michel Serres' philosophy, we explain how the subject and the object converge to produce the quasi-human in AI-fueled organizations. Consequently, we cannot consider subject/object or subject/subject relationships anymore, or the individual and the collective, since the individual loses autonomy and uniqueness, to be part of a greater whole, of the collective. To illustrate that idea, we shall go back to the example of Serres about the football game to safely assume that the ball and the player cannot produce value unless they interact together and with other players to create the game. Similarly, ultimate sociomateriality implies first, the destruction of silos that are often produced by individual wants and needs, by power

struggles and conflicts of interests; second, the creation of automated collaborative spaces designed to share knowledge and ruled to maximize value; third, the bridging of performance gaps through collective practices. We therefore suggest:

Proposition 3: Ultimate sociomateriality in AI-fueled organizations refers to the creation of value through collective practices and seamless collaboration between embedded, interconnected, and empowered quasi-humans, designed to function in a holistic approach.

This surely raises accountability issues when the emergent collective practice of quasi-humans only matters and when the contribution of each entity alone is no longer meaningful. It also jeopardizes diversity and inclusion. However, it allows organizations to be more agile, and to translate technology adoption into efficient, profitable, and streamlined business processes. Furthermore, through brain-computer marriage, organizations can leverage real-time analysis of emotional data to improve individual employee wellness, performance, productivity, and safety by instructing workers to take breaks when they're tired, changing the difficulty or the format of an interactive training or onboarding process when an employee is unfocused, or switching the employee to a less stressful task. Thus, we assume the following:

Proposition 4: The adoption of holistic systems with interconnected quasi-humans dismisses the uniqueness of individuals however it increases the efficiency and the agility of AI-fueled organizations.

Embodiment of Organizational Knowledge

Full quasi-human integration into the workplace / Beginning of Ultimate Sociomateriality

The management of strategic knowledge in organizations has a greater impact than ever before in the growth and sustenance of organizational competitiveness (Secundo et al., 2019). AI-powered knowledge management systems are redefining how organizations manage customer experiences and govern operational efficiencies. Indeed, AI captures knowledge, carefully develops it, shares it, expands it, and transforms it into the right format in organizations (Singh, 2018). It enables a new approach to enterprise search that solves time and cost consumption (KM World Staff, 2020). Organizations can use the power of AI to simplify knowledge (bring it to users directly), modernize it (through intelligent, context-driven delivery touchpoints and predictive ability), and automate the process of its delivery by embedding it directly in tools and processes (KM World Staff, 2020).

A study by Pee et al. (2019) explains that organizations seek to embody knowledge in entities such as electronic documents, expert systems, and robotic systems with artificial intelligence. In fact, four types of knowledge can be embodied in AI machines: declarative (rules and principles), procedural (methods and processes), conditional (understanding of situation and events at the point of action), and teleological (understanding of purpose and intention behind actions). The authors (Pee et al., 2019) provide a framework of AI knowledge embodiment that shows, for each type of knowledge, the level of embodied cognition and its impact on work transformation and the role that robotic systems play in organizations. The strongest form of knowledge embodiment in their framework is expansion whereby robotic systems acquire teleological knowledge, extend human cognition, augment human work, and become coopetitors of humans. The extent to which knowledge can be embodied in machines is contingent upon the form of embodied AI. Prior research by Chrisley (2003) identified weak and strong forms of embodied AI starting with the basic form of physical realization and embodiment (integrated software and hardware), spanning "organismoid" embodiment (a system that is somewhat human-like), reaching organismal embodiment (a system that is organic and alive).

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To tackle knowledge embodiment in the context of ultimate sociomateriality, we first go back to the definition of embodiment in organizational knowledge literature then we explain its implications for quasi-humans and organizations. The concept of embodiment refers to being grounded in everyday experience and integrally connected to a social community and a structural system in a constant interrelation. Learning takes place within contextual embodiment or situatedness where beings mediate between subjective and objective, internal and external, individual and collective experiences (Kupers, 2008). Learning is not static but rather created and re-created in the dynamics of daily practices; it is contingent upon motivational drives, ego development, visual-spatial abilities, analytical capacities, and interpersonal skills among other factors. Organizations usually suffer from lagging lines of development, which are areas of weaknesses and under-developed capacities of learners that limit the effectiveness of knowledge-accomplishing activities (Kupers, 2008). Learners in ultimate sociomateriality are quasi-humans: embodied agents that can perceive, learn, choose, decide, and have an optimal behavior. They are augmented machines (organismal embodiment) that possess capabilities and sensory inputs allowing them to navigate the physical world like humans. They are augmented humans, who, through injected knowledge, overcome the obstacles to effective learning accomplishment and close the gap in non-strengths areas and lagging lines of development. The embodied knowledge that quasi-humans accumulate requires complex patterns of data creation and integration from multiple internal and external sources and confers them the ability to directly act upon intelligence derived from them.

The skills that form the basis of their performance would remain unknown and unarticulated. Their bodies and their minds have no longer special roles. They become the same as a collection of objects and events that work together to produce effects. No differentiation exists between biological organisms, living bodies, and machines since their performance is ruled by the external world and by those who hold power over them. Ultimate sociomateriality transcends then the concept of expansion of Pee et al. (2019) and reveals an advancement of AI that produces holistic knowledge (beyond teleological knowledge), augments human cognition (instead of extending it), and disrupts natural human work (instead of augmenting it). Based on theory and our discussions, we suggest the following propositions:

Proposition 5: Ultimate sociomateriality in AI-fueled organizations refers to the constitution and reconstitution of knowledge through the augmentation of humans and machines to instantiate optimal functional patterns. It also refers to the creation of a holistic knowledge ecosystem that enables faster, effective, and efficient integration of organizational members to the workplace.

Exclusion of the Natural Human

Full quasi-human integration into the workplace / Maturity of Ultimate Sociomateriality

Mor Barak and Cherin (1998) define inclusion-exclusion as a continuum of the degree to which employees perceive they are part of key organizational processes such as the access to information and resources, the ability to be part of decision-making, and the connectedness to supervisor and colleagues. Nishii (2013) describes an inclusive work environment as the place where “individuals of all backgrounds - not just members of historically powerful identity groups – are fairly treated, valued for who they are, and included in core decision making” (p. 1754). The level of inclusion-exclusion perceived by employees depends upon the extent to which their experiences at the workplace satisfy their needs for belongingness and uniqueness (Shore et al., 2011). While the inclusive organization values differences among its members and contributes to increasing their feeling of belongingness, the exclusionary workplace is based on the perception that all workers should conform to preset norms and values (Barak & Daya, 2014). While human beings have a pervasive natural drive toward building social connectedness, exclusion thwarts the need to belong hence leading to harmful effects such

as physical and mental illness and a broad variety of behavioral problems (Baumeister & Leary, 1995).

As quasi-humans possess cognitive, emotional, and social intelligence components, they would have the ability to work accurately, around the clock, and without complaints. They will present a great opportunity for organizations to improve the way they perform their business operations and to achieve their goals in the most efficient ways. The quasi-humans are tomorrow's talents and the most valuable resources for organizations. Their competencies will be unmatchable which makes natural human beings highly disadvantaged in the race. Their presence in organizations will lead to high performance expectations that every worker should conform to (Barak & Daya, 2014) and to employee stereotyping that disrupts uniqueness. On the other hand, natural humans may suffer from the inability to build and sustain authentic relationships with their quasi-human counterparts, which can negatively impact their sense of belonging, their satisfaction, and their engagement towards the organization (Barak, 1999; O'Reilly et al., 2014). Failing to achieve uniqueness and belongingness, they will end up excluded (Shore et al., 2011) if they do not manage to reinvent their functions, to transform their work processes, and to create collaborative spaces and innovative interaction with quasi-humans. We therefore suggest:

Proposition 6: Natural humans in AI-fueled organizations would endure exclusion since they can lose their sense of uniqueness due to employee stereotyping and performance standardization, and their sense of belonging due to poor work relationships with quasi-humans.

Our proposition brings some ethical questions to the fore about the fate of humans who refuse to be cyborgs or the advantage gap that might arise between people having access to augmented intelligence and the underprivileged ones who do not. It also opens the door to discuss exclusion in relation to two key organizational processes: the access to information and decision-making (Mor Barak & Cherin, 1998). The acquisition of humanized AI and technology systems that augment human intelligence will surely become the major source of competitive advantage of AI-fueled organizations. There will be inevitable imbalance between natural and quasi-humans when it comes to the access to information. While humans strive to access key information and be part of decision-making processes, quasi-humans will produce, possess, and process the information for decision-making. This calls attention to the danger of not integrating natural humans in decision-making in the presence of quasi-humans, empowered with cognitive, emotional, and social components, and prepared to think, feel, and lead (Kaplan & Haenlein, 2019). We therefore propose:

Proposition 7: Natural humans in AI-fueled organizations would endure exclusion due to the unequal access to information and the full control of quasi-humans over the decision-making process.

Conclusion

Emerging technologies trend are shaping modern society (Tarhini et al., 2019), while AI is affecting the workplace by performing creative jobs that were previously reserved for humans (Zaza et al., 2019). The existing IS research refers to this integration of humans and AI as human-AI hybrids (Sachveda & Bala, 2020) as part of a symbiotic relationship (Harfouche et al., 2019).

In this paper we shed the light on the interaction of the social and the material in the AI world. Our theoretical contributions are threefold: first, we extend the sociomateriality theory through proposing a new ontological perspective for the understanding of ultimate sociomateriality in the light of the advent of AI technologies in the corporate world; second, we contribute to

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organizational development theory through discussing the implications of ultimate sociomateriality for organizational practices, and through proposing the 4E matrix with the four dimensions that characterize AI-fueled organizations.

On a practical note, we inform technology providers about the need to create AI machines that serve humanity and organizations instead of destroying it. We also inform public policy makers and non-governmental organizations about the need to act as regulators and watchdogs for human rights. We also cast light on the need to rethink business education to develop human skills that help human beings redefine their roles within organizations, interact with machines in a beneficial way, keep control of their destiny, and avoid being ravaged by the AI revolution.

This work suffers from a few limitations mainly related to the applicability of the model across various contexts; therefore, we recommend that future studies take into account cultural factors and societal conditions and regulations that might facilitate/hinder the evolution of organizations in their path toward ultimate sociomateriality. We also missed to discuss ethical challenges and governance issues as well as inequalities and discrimination when it comes to the access to quasi-humans as valuable organizational resources. We did not provide as well a roadmap for action on how organizations can adapt changes to become AI-fueled organizations. Further research may capitalize on these limitations to expand our work and consider the changes needed in organizational culture, forms, processes, and practices to embrace ultimate sociomateriality and the quasi-humans at the workplace.

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About the Authors

Dr. Charbel Chedrawi holds a PhD in Business Sciences from University Paris 1 Pantheon – Sorbonne. He is currently an Associate Professor in the Faculty of Business and Management (FBM) at Saint Joseph University (USJ) in Beirut. Prof. Chedrawi is a multidisciplinary researcher focusing mainly on the various facets of the 4th Industrial Revolution and its implications on various field and sectors among which economic, health, higher education, public administration, banking and security and defense. He's the author of more than 20 articles in national and international conferences and Journals. He is a member of the Association for Information Systems (AIS), the past-president of the International Association ICTO based in Paris, and the head of the "5IR" (5th Industrial Revolution) research team.

Dr. Gloria Haddad is a professor of management with an experience of teaching and consultancy in the Middle East and Europe. She acted as academic program coordinator in international projects and Dean of the Faculty of Business administration at the Lebanese Canadian University. She is member of the Women and Economic Renewal research chair founded by Grenoble Ecole de Management. Her research interests extend to AI, social inclusion, social entrepreneurship, ethics in managerial practices, individual and social behavior in organizations. She is winner of the Outstanding Author Contributions 2019 award in Emerald publishing 26th annual Literati Awards for Excellence.

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