Essay

Sustainability Is Social Complexity: Re-Imagining Education toward a Culture of Unpredictability

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Abstract: Research on sustainability must take into account both the need to create a sustainable world and the urgency of undertaking a radical rethinking of our approach to planning and foresight that encompasses a full understanding of the ineludible unpredictability of the complex systems we are dealing with, which can only come about through long-term inter/multi/transdisciplinary educational processes. Those calling for a "culture of sustainability" need to become aware of the systemic and relational dimensions that characterize all processes and dynamics of reality and of the ecosystems we are endeavoring to inhabit. What this signifies is that a culture of sustainability is a culture of complexity. Complex systems are exclusively living systems, whose intrinsic unpredictability cannot be managed, predicted, or controlled by technology. The misleading idea that technology is our only pathway to sustainability is part of the "great mistake" we are making today: the belief that the solution to every contemporary problem is an accelerated combination of digital and technical skills, obtainable through a predominantly applicational form of education based on simulation, velocity, and connectivity, which teaches competences and know-how rather than stimulating what is so direly needed today: the capacity for reflective knowledge and critical thinking.

Keywords: sustainability as social complexity; hypertechnological civilization; culture of complexity; automation vs. autonomy; great mistake; unpredictability of complex systems; radical rethinking; inter/multi/transdisciplinarity

1. Introduction and Objectives

Itineraries in Social Complexity and Implications for a Culture of Sustainability

If, as Zygmunt Bauman once said, the driving impulse of the human pursuit of happiness is the ambition to evade uncertainty, that is, to escape from the naturally uncertain ecosystem we were born into, this would explain why happiness itself is like a pot of gold at the end of the rainbow, or an ever-receding mirage on an eternal horizon [1]. Certainly, this does not diminish the nobility of such ambitions. One of our human pursuits, in fact, which has recently reached a level of utmost urgency, is the global need to restore sustainability throughout our planet, among both environmental and social spheres. Sustainability research, in fact, is currently taking place in all sectors of human activity. In order to be fruitful, however, research on sustainability must take into account both the need to create a sustainable world and the urgency of undertaking a radical rethinking of our approach to planning and foresight that encompasses a full understanding of the ineludible unpredictability of the *complex systems* we are dealing with [2–62], which can only come about through long-term inter/multi/transdisciplinary educational processes. Those calling for a "culture of sustainability" need to become aware of the systemic and relational dimensions that characterize all processes and dynamics of reality and of the ecosystems we are endeavoring to inhabit.

What this signifies is that a *culture of sustainability* is a *culture of complexity*. Complex systems are exclusively living systems, whose intrinsic unpredictability cannot be managed, predicted, or controlled by technology. One of the reasons for this is that complex adaptive

systems (CASs)—which evidently include all human and social systems—possess *emergent properties*, which means that subtle changes in the more basic elements of these systems, and/or through interconnections with the surrounding environment, can (and often do) bring about enormous changes in the systems themselves, giving rise to *spontaneous self-organization* [7,11,30,37,42,63–65]. One of the most fascinating emergent traits of CASs is the ability to think; indeed, thought itself is an emergent property. Thus, the kind of thinking we engage in becomes extremely important.

The main objective of this essay, therefore, is to provide a theoretical framework for a reflection on the importance of understanding the "complexity of complexity", as it relates to the possibility of rendering our social systems and organizations more sustainable, by way of illustrating the intrinsic and intriguing properties of complex adaptive systems, as they have been represented by great thinkers and innovators from a wide array of disciplinary fields, which can be inferred from the literature cited above. This includes the application of these concepts to our modern social systems, whose fatal conjectural flaws— despite the aforementioned sources of knowledge, which are more available today than ever before—including the tenacious belief that these issues can be solved by technology, are the very factors which are preventing the spread of sustainability.

Readers of this article will not find indications for a linear, well-managed pathway to sustainability, nor for a methodology for organizing or managing complexity, precisely because such things are non-existent, despite the tendencies in the recent scientific literature to claim the opposite. What can be found in these pages is a signpost to the deconstruction of the hegemonic narratives and theoretical-interpretative models abounding among today's scholars; it is an invitation to become lost rather than found. As can be inferred from the great variety of disciplinary fields cited in the references, this article hopes to offer a starting point for each reader to carry out in-depth multidisciplinary research and begin an exploration of the myriad of interconnecting and relational pathways that will lead to a truly systemic thought system, capable of envisioning a more sustainable lifestyle by learning to inhabit complexity, rather than attempting vainly to regulate, manage, or predict it.

2. The Thought Crisis Standing in the Way of Sustainability and the Progressive Alienation of the Human Dimension

Unfortunately, the act—or the art—of thinking has become an arduous endeavor lately; these are very hard times, especially for those who are attempting to take an approach based on thought or on a *thought system*, which means so much more than what passes these days for "systems thinking". Harder and harder has it become for those who wish to engage in this activity without incorporating narratives that are either too reassuring or too catastrophic into their mental pictures. Yet in this age of automation, how can we reconceptualize thinking without falling back on mechanistic metaphors, such as calling for a "re-start"? It would perhaps be useful to consider our needs from a horticultural point of view, proposing that what needs to be planted and nurtured are the "seeds" of a new kind of systemic thinking, which can only be cultivated through the *vitality of vital educational processes* [2,19,20,32,50,51,66–79]. In any case, if our goal is, as it should be, to enable "tangible long-term thinking" (almost an oxymoron in our days), what is needed— what has been lacking for too long—is a radical *rethinking* of education and of research on education and on didactics. This rethinking, which should first involve the education of our educators themselves, must be capable of providing a methodology that can be applied from the earliest years of school, no small feat to be accomplished in the kind of times we are living through.

There is no doubt that these are tough times to live through, even beyond the never-ending series of global emergencies, from pandemics to war(s) to the risk of famine, so formidable, so forbidding, that have paradoxically supplied new steam to *time-worn discourses*. The problem facing our hyperconnected civilization is that, once again, simplified, reductionist, and deterministic narratives have been reintroduced to solve problems that,

on the contrary, are complex, non-linear, and non-deterministic (see Figure 1). These are certainly very hard times for those who are striving to construct long-term strategies, for those who are capable of recognizing the urgent demand for creating a culture of responsibility and prevention, for those who are in the habit of studying and reflecting on this long-emerging predicament, much more significant than a linguistic crisis, because independently of its many-varied hues and accents, it is essentially a *crisis of thought*.
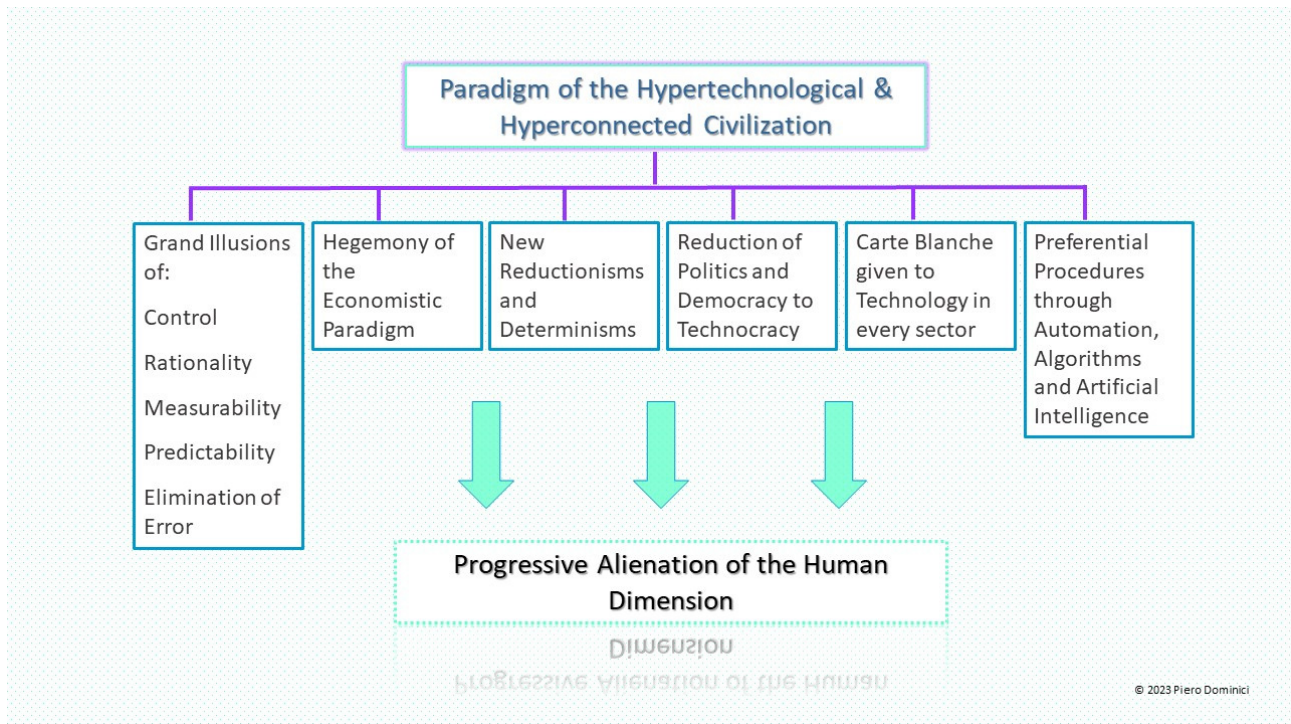
Figure 1. Paradigm of the hypertechnological and hyperconnected civilization.

This thought crisis, along with a series of grand illusions regarding our capacities for rationality, control, and measurement, as well as the delusive idea that we can foresee the future, eliminating error from our systems, has been reinforced by the dominating vision of technology, in particular of artificial intelligence [80], in which our main objective is to "facilitate everything", or at any rate, to at least appear to do so. This adds another grand, gigantic illusion to the five-listed above: the seductive, *self-harming illusion* of "easiness".

In this hyper-accelerated age of *automation without autonomy*, the urgency of creating a sustainable world—which can only be obtained through a global and truly horizontal teaching of human equality—and the necessity of rethinking education have become paramount, which in turn are intimately related to the recently established rules of engagement for an imminently global citizenship, which must cease to be considered solely a matter of laws and norms. The concept of citizenship, along with the citizenry that make it up, have been entirely remolded into new forms of inequity and inequality, which are also being generated and duplicated within the very halls entrusted with carrying out the education and training of our new generations. As a result, we are seriously in danger of making *citizenship* into an empty box: *a box with no citizens.* Unless we radically modify the itineraries of our schools and universities, there will only be *simulated sustainability*, along with simulated participation in the dialectics of democracy. Because a system ruled by a multitude of subjective identities (and what is a democracy if not that) inevitably signifies complexity, all democracies are by nature complex [51,53,54,56,81]. Democracy itself implicates an incessant exchange and mediation of dialectics between the often-conflictual concepts of liberty and equality, acknowledging the necessity for debate and disagreement. It means engaging in critical thinking and discussion, in analysis abetted by philosophical

discourse, which seems to have fallen by the wayside in this era where science, technology, engineering, and mathematics (STEM) are hailed as the panacea to all our troubles. On the contrary, it has never been so crucial to practice the art of inhabiting the tensions, the oppositions, the diversities, the unforeseeable twists and turns, and the social multiplicities of human lives. It is an art that can only be mastered through an educational methodology capable of healing the artificial cracks and chasms between fields of knowledge, which are the *false dichotomies* (*ibidem*) (see the table "False Dichotomies", related to epistemological fractures characterizing our educational and organization cultures, in previous publications [50,51,53,54,56,82] (not only within our educational institutions), an educational methodology which encourages Morin's *epistemology of uncertainty, a creative and empathetic act of doubting*, and a *culture of error* [81].

The fatal quagmire that we must be wary of falling into, however, is a perniciously widespread faith in the infallibility of digital, technical, and technological solutions, principally based on a tightly controlled combination of algorithms and artificial intelligence. The educational method that we are advocating, a method which is only superficially acclaimed from every academic corner today, is *not* a method in which technology is designated as the solution to all of our complex problems, which have, by the way, become *hyper*complex today, mainly through the exponential accelerations of technology and the new virality of communication.

In fact, the social and cultural burdens of modernity, the tyranny of the individual, and the weakening of social bonds [83–87], all factors which tend to nullify any ambition toward genuine sustainability, have been intensified in this "hypercomplex society" [49] by the increase in cultural and cognitive asymmetries, in which the human factor has fallen under a hugely overgrown techno-control, thus dangerously diminishing the territory of responsibility. Within the hypertechnological civilization, with its "intelligent" machines, founded on an objective of total control and on the illusion of predictability, the ongoing transformations, featuring a rising trend toward human marginalization, inevitably lead us to rediscover how urgent it has become to rethink and redefine the human dimension as the central core of human society [8,88–91], within ecosystems which have done away with the borders between the natural and the artificial [53–55]. Consequently, information and communication take on an even more strategic relevance in their interaction with the variety, the ambivalence, the unpredictability, and the complexity of the processes. A context characterized by "objects of study" and processes that are in reality "systems" rather than simple objects, requiring us to analyze them under a systemic perspective. This perspective is the only one that can teach students to accept unpredictability as an intrinsic feature of the complexity of life; indeed, they must learn how to inhabit complexity and the uncertainty it implicates, in a mind-frame stimulated to accept—and even celebrate— *the inevitability of unexpectedness* [56]. One of the areas that can create the conditions for teaching the new generations how to recognize and comprehend this complexity is philosophical discourse (thus the strategic centrality of schools and universities); another is the "*epistemology of error*" [50,81], which perceives *erring* to be an integral part of discovery and learning.

3. The Tyranny of Concreteness in the Society-Mechanism of Simulation and Automation

In the meantime, within what has become a "Society-Mechanism" (*ibidem*), we are definitely being dominated by data, statistics, facts, and figures. All essential factors in our professional and educational organizations, it must be conceded, but today they are being presented as if they were the only relevant and inevitable "facts of life". Nevertheless, if studies on the methodology of research and epistemology were undertaken more seriously today, it would become clear that facts and data "can never speak for themselves". Despite the current belief that it is only this kind of element, along with digital competences, of course, that counts, it will not be long before we discover how much genuine knowledge is missing from these formulas. Know-how, data collection, and automation are all aspects

of the hegemonic mindset making up the "tyranny of concreteness" [50,52]; see also: [92]. In recent times, it is algorithms and artificial intelligence which are being evoked as a semi-magical solution to all our ills; somehow, digital technology will be able to solve all problems of sustainability and inequality, which really comes down to awaiting the arrival of a newfangled *Deus Ex Machina* which will be able to reform education, citizenship, and democracy (those three interconnected and interdependent features of civilization). In fact, the misleading idea that technology is our only pathway to sustainability is part of the "great mistake" we are making today: the belief that the solution to every contemporary problem is an accelerated combination of digital and technical skills, obtainable through a predominantly applicational form of education based on simulation, velocity, and connectivity, which teaches competences and know-how rather than stimulating what is so direly needed today: the capacity for reflective knowledge and critical thinking. Furthermore, the obsessive pursuit of simplification at any cost can only lead to the trivialization of our analyses and of the various solutions put forth.

Although it is well known that along scientific itineraries, the development of knowledge and innovation necessarily requires the questioning of established facts and the necessity to doubt our ingrained convictions, today the general tendency is to give lip service to these processes, without truly challenging the dominant paradigms or consolidated methods and models. It goes without saying, however, that without identifying the frailties and flaws in our standards of knowledge, without breaking down the sources of our stereotypes and prejudices, we will become more and more conditioned by these very factors. One reason we may choose to avoid questioning these elements is because in some ways we find them reassuring, because they supply us with what we believe to be effective tools for deciphering and decoding the reality that surrounds us, and for assigning meaning to our lives without truly searching.

Hence what we insist on asking for are quick, smart, and snappy answers and simple solutions to complex problems. It seems that everyone is grimly set on learning (and teaching) the "how to" aspects of every procedure or challenge, without ever stopping to ask "why?" We demand that these solutions—which must be found in less and less time—become faster and faster in their application as well. In general, every action is performed in such an accelerated manner that mere human beings could never keep up, forcing us to rely totally on high-tech (and obviously non-human) mechanisms such as algorithms and AI, which are granted *unconditional trust* and *complete carte blanche*, under the preposterous, and frankly pathetic, delusion that error and unpredictability will somehow disappear. With profoundly disturbing repercussions, not only on the human factor, by turning management over to machines, but also on surveillance, with methods rapidly approaching an absolute "Panopticon", and, above all, on *responsibility, which disappears from our linguistic and psychological landscapes*.

As a result, throughout our societies, such little time is allowed for questioning, reflecting, critical thinking, or analytical research that only the *dominating narratives*, both in public and private discourse, persist. What little time remains, accordingly, passes by in a flash due to the increasing speed of our technologies.

4. Speed vs. Thought

Reflection and Social Bonds in an Accelerated Age

The complexity of the interaction between the new digital (hyper)velocity with humans and with social relationships, which, despite wishful thinking on the part of hardcore transhumanists, eludes and will continue to elude the possibility of predictability and control through algorithms and artificial intelligence, eagerly sought by governments and corporations, illustrates an essential ambivalence which has, in any case, always characterized social and cultural change. The ambivalence revealed today through the hyperconnected/hypertechnological complexity of our global system lays bare our inadequacies; our personal, organizational, and social inefficiencies; and above all, the limits of

our educational institutions, which continue to ignore the full significance of the ongoing paradigm shift.

Even more importantly, the sheer speed of information production and processing in our society and our personal lives, as underlined before, makes it impossible for us to engage in true thinking, in reflective thought, leaving us unable to critically analyze events as they are unfolding, not to mention to comprehend the twists and turns of (hyper)complexity itself, as it relentlessly reveals the gaping inadequacies of our traditions, our cultures, our paradigms, our interpretations, and our organizational models, not to mention our trusted tools for monitoring and managing our social and professional lives. (Culture, intended in a general sense, is a historically determined set of practices and beliefs, of models and instruments appertaining to a specific historic–cultural context, which could also be defined a la Weber, as "a finite segment of the meaningless infinity of the world process, a segment on which human beings confer meaning and significance", with meaning and significance, naturally, from the Subject's point of view (see Weber, 1922, p. 96, [93]).

In a nutshell, therefore, it is more than evident that velocity—in particular, excessive velocity—seriously limits and stands in the way of "reflection". It has an almost identical effect on the practice of *logic* (which should be taught from the very first years of school on), along with "critical thinking". Even the mere idea, or vision, of speed, which has produced a veritable *culture of acceleration* as a requirement for contemporary life, impedes reflection and analysis. In other words, there is an insurmountable incompatibility between reflection and speed, which can be confirmed by the significant shortcomings and failings of our organizations and general governance. Even more alarming is the possibility that this acceleration, which has even produced a new sort of anti-human, anti-natural dogma known as accelerationism, is becoming a sort of social pathology, whose pernicious effects not only resonate on our perceptions and actions but also on our manner of relating to space and time [94].

There is never *enough* time: time for thought, for reflection, for living, for vitality, and for complexity. Never enough time and never enough awareness of our needs, including a certain contemporary need for critical and systemic thinking, as well as for an actual "*right to ponder*", by which we mean a kind of right to be conscious and capable of critical analysis/reflection, to be able to muse and perhaps to distinguish possible solutions to one's own existential dilemmas and issues about one's relational spaces; *a right to realization* can become a praxis for postulating and pinning down new problematics at the basis of knowledge (not only scientific knowledge) and of the substance of life.

In this sense, an epistemology of error is a fundamental instrument for defining interpretative models, transparent actions, and "well-made heads" (Montaigne). These well-made heads, on all analytical levels, may well represent the only authentic antidote, on the one hand, for the "*reclusion*" of the fields of knowledge into narrow (and sterile) disciplinary furrows, and on the other, against what could be called the No-Knowledge Society, an unexpected side-effect of the ongoing *mutation* in a society (ourselves and our social networks) deeply shaken by asymmetrical information/cognitive conditions, which are not only calling into question social bonds and community values but also the very principles of (global) citizenship and of democracy [56,67,95–103], as well as the prospect of establishing sustainability in our habits, markets, and governance. *No-Knowledge Society* is a term coined by this author as a more realistic version of what is commonly—and erroneously—called the "Knowledge Society". The *No-Knowledge Society* is a type of society, characterized by the devaluation and the deterioration of its educational and training processes, in which the exponential growth of available information and (shared) knowledge corresponds to an equally exponential growth of ignorance, conformism and hetero-direction [104].

It is, therefore, time to have the courage to reconsider the human dimension, beginning with the ambiguity of its interaction with all forms of "tech" (technicisms, technique, and technology): a relationship which cannot exist without triggering a *complex synthesis* (*ibidem*), whose consequences and evolution we are not yet capable of foreseeing or evaluating. This

is not to deny that technological and digital innovations are valuable and important factors of modern life; nevertheless, facing these crucial issues from this approach, in any case, summons up predicaments that must be dealt with, because the implications for future generations are significant (See Figure 2).
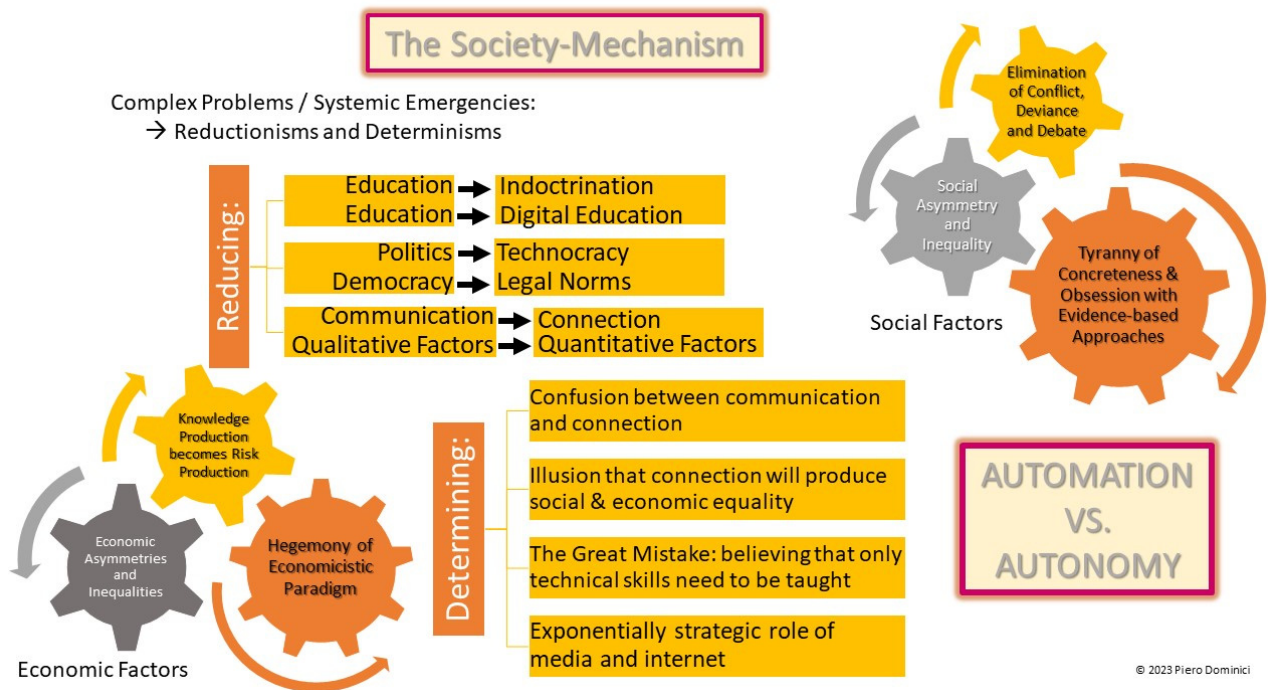
Figure 2. The Society-Mechanism.

One implication that we need to become aware of is that the rift between natural and artificial processes, mirrored by a similar division between humanity and technology, must be repaired by those who will be capable of reformulating the complex relationship between these spheres, uniting the theoretical with the practical, fusing knowledge and skills. It is they who will reunite studies in both the *humanities* and the sciences who are the owners of the future. It is they who will define future professions and careers, delineating the new intersecting and interdisciplinary pathways of education and training.

It is necessary to radically correct our structural inadequacies in all sectors—above all, perhaps, in scientific research and in education—rewarding and encouraging interdisciplinarity, multidisciplinarity, and transdisciplinarity, not only through words but through actions as well. Restoring the human dimension, bringing emotion, creativity, imagination, and vitality back to these sites where education and training take place, back to their communication zones and their relational spaces. Re-imagining education within an *epistemology of error**, without fearing the unpredictability of life.

5. Education Is Innovation, Education Is Inclusion, Education Is Sustainability, Education Is Democracy

It is no secret that a school system without quality or equality has always provided the ideal conditions for producing and maintaining an asymmetric, unfair, and unjust society. In no time at all, a scholastic system based on inequality is capable (and recently appears to have every intention) of sending us back to a feudal structure based on ignorance, to the aforementioned *No-Knowledge Society*, in which social mobility can only be horizontal. Our educational institutions themselves have ceased to perform their most important function, that of social elevators, and are no longer supplying our society with the "rules of engagement", which younger generations are finding elsewhere, deeply conditioned by manipulative techniques on the part of the social media giants. As shown in Figure 2 above, when communication is

mistaken for connection, education risks becoming indoctrination, politics and democracy transform into technocracy or mere legal norms, and quantitative factors are hegemonic over qualitative factors, we are in the throes of a Society-Mechanism. These issues can only confirm that inclusivity, innovation, and democratic praxis are all, without exception, indissolubly linked to education [49,52,67–69,72,96,102,105–109], as well as introduce a more contemporary correlation between education and the urgent need for sustainability. Considering the many factors of risk—which are also factors of opportunity—inherent in today's hypertechnological civilization, with specific emphasis on the blank check which we have chosen to give to technology, the issues that are affected, involving (ir)rationality, precariousness, trust in institutions, and the safeguarding of the citizenry, as well as the weakening of social ties, concern matters that are absolutely essential for social systems and organizations. In dealing with and developing these facets, we must be well aware of the intersecting situations and criticalities, whose interactions on different planes of analysis and mediation can no longer be ignored.

If we are to successfully address the challenges facing us as educators, students, and citizens in a global world, we must wade our way through the factors that are limiting our approach to education in order to face them (and take steps to change them) one by one. First and foremost, we are suffering from the want of a thought system based on a systemic view, which is the result of a series of long-standing mistakes stemming from our inability to realize that innovative transformation for the entire society can only be brought about in those institutions where teaching, training, and opportunities for research activities are made available to all (rather than to a select handful of individuals).

The most pernicious of these mistakes, based on an incredible miscalculation of priorities, is the neglect of policies conceived for the long period and the failure to invest adequately in the abovementioned educational initiatives. This woeful attitude is even found within the educational institutions themselves, whose most deleterious characteristics include the absence of correct orientation policies for students, replaced by pure marketing strategies, as well as the obsolete vision of schools and universities as two separate bodies.

By far the most harmful principles encouraged by our educational institutions and ministries is the idea that knowledge and fields of knowledge, kept separate by arbitrary borders and false dichotomies and fatally weakened by indiscriminate standardization in both methodology and evaluation, must be focused exclusively on *what is useful*, pushing students to chase mindlessly after business and markets at a moment when the rapid obsolescence of models, skills, knowledge, and professional profiles is at its peak.

But how can we ready our youth for the future, how can we train or teach them competences and expertise that will be requested in tomorrow's workplace? And considering the rapidity with which professions and skills are becoming obsolete in our own times, how can our students engage in long-term preparation for a career in an unknown and unforeseeable job market? Rather than attempting to answer these questions with formulas or predictions, it would be far preferable if we would instead encourage young people to use their imagination to explore and pursue their own interests, dreams, and passions. The kind of studies that need to be undertaken—no matter whether in the humanities or in strictly scientific fields (whose separation is one of the primary forms of the false dichotomies fostered within educational and social institutions)—require creativity and inspiration but also a critical capacity for observation, hypothesis, and verification (or rebuttal) through scientific experiments, analysis, and even through hit-and miss endeavors, in order to postulate theories and potential explanations to form a basis of truly scientific knowledge, which implicates constant doubt, duplication, and even contradiction. It is regrettable that in these past decades, our scholastic systems and halls of higher education alike have adopted a pseudo-scientific, zero-sum dogma that evaluates everything we teach and study, all that we can learn to do or perform, on the basis of its utility, measurability, and certifiable evaluation, on the basis of its capacity to generate material outcomes or economic profits, in a manner that can be controlled and predicted. This dogma, as mentioned

above, is none other than "the tyranny of concreteness". On the contrary, the primary function of schooling should be to arouse and stimulate each student's interests, aspirations, and enjoyment, by steering them towards mixed itineraries combining analysis and imagination, letting intellect and passion merge thought and feelings into actions, whereas today's curricula in both universities and schools unfortunately holds these factors in very little consideration. The current emphasis on data, statistics, factuality, measurements, and outcomes should be balanced by factoring error into educational praxis. Forming a culture of doubt, unpredictability, and error within the educational framework, creating a veritable *epistemology of error* compatible with a systemic vision of our socio-biological ecosystems: that is how teaching should be currently evolving, an evolution in which a "culture of unpredictability" plays an important role as a "tool" for living a fuller life. As mentioned at the beginning of this article, the intrinsic unpredictability of complex systems, in which a very small change in one part of the system can have an enormous effect on the entire system, is one of the features that render the system capable of self-organization leading to the spontaneous emergence of novel parts and processes [51,53–55].

6. An Epistemology of Error
Blueprint for a New Approach to Education

How can an epistemology of error be put into place? First and foremost, we must do away with the signposting, stigmatization, and penalization of error, beginning with the very first years of primary school. One of the first mechanisms that young students catch on to, through our grading and approval/disapproval system, is that repeating by rote is preferable to making their own mistakes. Is it any wonder, then, that they soon become afraid to venture into unexplored territory, choosing to "play it safe" rather than ever taking risks? Have our educators forgotten the value of learning by trial and error, learning through error as opposed to learning that there is only one method for approaching a problem, only one possible solution, only one way to tell a story, only one accepted point of view or opinion, and only one official "thinking box"? Are we forbidding our young (and not-so-young) learners to start asking "why" instead of just "how"? The neurological pathways and thinking trajectories that the new generations are being trained to use will never allow them to become anything other than efficient—and unhappy—executors of functions and rules, whose capacity for reflecting or contemplating (even these very same functions and rules) has been irreversibly bred out of them. And it is not only our students who have been caught in a trap that limits their perception but our educators as well, from nursery-school staff to doctoral faculties. It is a trap that blinds them to the possibility of seeing the interconnections, the interactions, the interdependencies, and the intersecting pathways which are structural and functional features of the complexity we are trying so desperately—and futilely—to dominate rather than inhabit. Yet education should list among its priorities the goal of teaching how to see and make connections. Seeing the connections, perceiving the interactions, taking a systemic approach to learning and to living, using logic and the scientific method to think with their own heads, learning from the first years of school to engage in critical thinking: these are the factors that will allow our students to become *hybrid figures**, capable of interdisciplinary, creative thinking. These days, complexity and systems thinking have become the talk of the town, so it is both ironic and astounding how dismissive we still are of the strategic relevance of thought, how inadequate our comprehension is of the prevalence of complexity in every act, in every sphere, in every field, how unaware we are of the essentiality of error and of the inestimable privilege we enjoy in being free to make errors. The epistemology of error that we are missing is something that needs to be taken, not with a spoonful of sugar, but with a spoonful of unpredictability.

The education that students need from us is one that can highlight the connection, interconnections, and interactions that characterize living systems, such as human society in general and our contemporary globalized society in particular. This kind of understanding is paramount for any kind of teaching that intends to illustrate the value of sustainability

to young learners. Only by understanding the interconnections and interdependencies of living complexity, the feedback loops that determine new situations, and the total autonomy of self-organization which gives rise to emergence (without the need for imposition from the upper levels or from elements external to the system) can the next generation of human beings fully comprehend that striving toward achieving sustainable systems, governance, and organizations is a self-healing process. One of the most important educational factors which can foster this deeper understanding is through the adoption of *genuinely* inter/trans/multidisciplinary fields of study (and not merely slogans or "good intentions"), which implicates the blurring of the narrow fields of disciplines, the healing of the fracture between false dichotomies, and the breaking-up of the tightly defended "clans" of knowledge and teaching. Another important element is the encouragement of experimentation and the re-evaluation of the virtue of error, as it is especially error, improvisation, and unforeseeable developments that so often lead to new discoveries and innovations. Error as an epistemology truly highlights the importance of diversity, of different pathways to solutions, indeed, of different solutions themselves, which must not be buried under the fervor of efficiency or global one-size-fits-all concepts, as sustainability implies diversity as well as solidarity.

There are also connections that on many levels join our specific cultural conditions and contingencies in this moment of history to a stronger and stronger need for philosophical thought, as well as for what we have called above the "right to ponder". In the age of automation and hypervelocity, the Hypertechnological Society, founded on certain grand illusions—the illusions of control, measurability, rationality, predictability, and the *elimination of error* [81]—calls for a systemic approach to (hyper)complexity which will allow us to rebuild the missing bridge between knowledge and skills. In today's interconnected society [110], a sturdy epistemology of error is an important tool for opposing the new information and cognitive asymmetries. A culture of unpredictability, both as a right and as an instrument, can also provide us with the necessary lucidity for rejecting the rationale of seeking "simple solutions to complex problems", for refusing the rhetoric of disintermediation, founded on simulated participation and horizontality, for fully realizing why sustainability is democracy, why democracy is complexity, and as follows logically, why *sustainability is complexity*.

Within the hypertechnological civilization, whose founding concept is the programming and monitoring of processes and actions, characterized by a progressive—or rather, exponential—growth of what is technologically controlled, the challenge presented by these changes is precisely that of *putting the Person back into the core of our environments and ecosystems*, in which the borders between natural and artificial no longer exist. Today, as never before, it is necessary to redefine the *complex architecture of the fields of knowledge* and, at the same time, to reclaim the diverse dimensions of educational complexity: empathy, critical thinking, and a systemic view of phenomena, education, and communication, as well as the dimensions that have been deliberately removed, such as imagination and creativity.

Hypercomplexity, which characterizes our current "hyperconnected society", demands a new kind of imagination for rethinking the processes of education and training, for teaching empathy and communication, for teaching liberty/responsibility rather than fear, for teaching complexity and the "scientific method"—maintaining awareness of their respective criticalities—and for a systemic approach to problems and phenomena.

7. Sustainability, Equality, Unpredictability

Beyond an Economistic Vision of Society

The kind of independent and critical thinking that needs to be triggered among children too young to even understand the term "epistemology" nevertheless leads us to re-evaluate the relevance of a philosophical background, in countertendency to recent decisions in some European school systems to eliminate this subject from their scholastic curricula. We hold instead that critical thinking can be learned through an in-depth

study and exploration of philosophy, which in spite of having gone through several critical phases [27,111,112], in spite having been accused of being "unscientific" and being held in scarce consideration by the political world, in this era dominated by technocracy and technocrats [113] and by a certain (instrumental) idea or vision of rationality, seems almost paradoxically today to have earned the right to find itself at the heart of the matter, in practice as well as in theory. We are slowly becoming aware that the crisis we are facing is incompatible with an economistic vision of society, indeed that the crisis itself is not merely economic but above all civil and cultural. All of this supports and renders even more meaningful the need for a renewed centrality of philosophical thinking; it may well be that what we are talking about is a demand for "sense" [114] missing from the hyper-technological civilization in terms of *responsibility* [115] but also of *inclusion* and (global) citizenship, veritable prerequisites for establishing a culture of sustainability. Indeed, as we show our students that a culture of sustainability is also a culture of unpredictability, we can deepen their understanding of the meaning of life, the kind of mental horizons that are revealed are pathways to freeing their often-stifled imagination, doors to creativity and empathy which have been opened by a wider view of life.

However, none of this has any meaning unless we address the "real" issue, regarding the fact that in many cases today—more and more frequently in the so-called developed world as well—the basic pre-requisites of inclusion and *equality of starting conditions*, which must be satisfied before we can even begin to discuss the conditions for putting into practice what the "right to ponder" requires, are not guaranteed at all. What is more, new forms of inequality [116], which cannot be traced to economic indicators (quite the contrary, *despite the persistence of a predominantly economicist paradigm*), are further unfolding, precisely in this phase of great change: the current historical–cultural context continues in fact to evolve through differentiation, in a manner that is by no means linear, and it is not by chance that on every side voices are being timely raised regarding the question of a (necessary) paradigm shift [112,117–120]. These are questions that in any case have already been posed in the past [19] and today return with an urgency that has become even more evident, due to scientific discoveries and technologies capable of heavily impacting biological mechanisms with far-reaching consequences (it is *cultural evolution, at this stage, that is conditioning biological evolution*) [49,81,82,109], not only on social systems and complex organizations but also on the (individual and collective) social actors themselves, on their personal histories, their identities, and their bodies (see Figure 3).
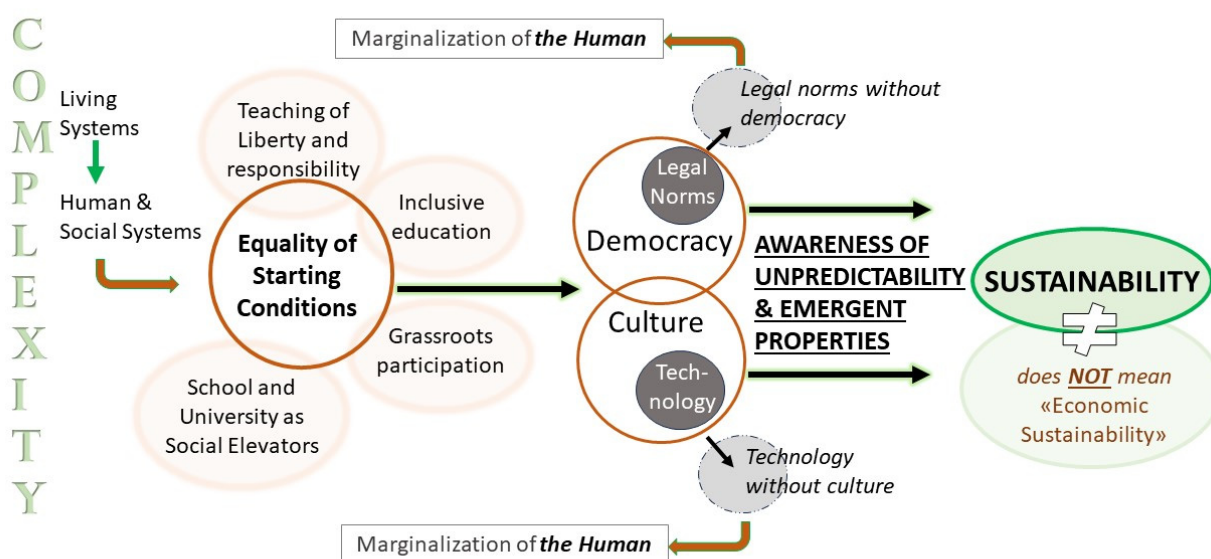

Figure 3. Sustainability.

A culture of unpredictability—we repeat—is once again the "contraption" which can put us in the condition of recognizing and inhabiting complexity, the only method capable of making us ponder things from the point of view of the "Big Other". The concept of the Big Other, reproposed by Slavoy Zizek in the wake of the Lacanian school of psychoanalytic thought, is meant here to refer to the comparison with all that is outside of us, the comparison with minds and personalities diverse from ourselves. This takes on even more meaning within the *lifeworlds* [121], ever more contradistinguished by uncertainty and insecurity (conditions that have become, at this point, existential), by differences among contrasting systems of value orientation, and by more and more diversified languages and communication codes. An epistemology of error which cannot "simply" consist of teaching and thinking, but which should (must) express itself through transparent and accessible institutions, as well as through truly inclusive democratic regimes, aimed at the dismantling of an economistic hegemony through a genuine culture of sustainability, capable of guaranteeing—at least—the equality of starting conditions (see also: [122]). The institutions themselves, like the laws and rights that are always *crystallizations* of pre-existing social and cultural norms, represent, in fact, a working translation and a symbolic mediation of social and cultural demands arising from within a specific historical–cultural context, historically determined. The right to engage in critical thinking, therefore, takes on an even more significant value precisely because it is linked to the hypercomplexity of the current social systems and stands as a fundamental pre-requisite of the right to citizenship, which needs to be re-considered going beyond the sole aspect of the norms of procedural democracy.

We are going through the ultimate *anthropological transformation* [81] and, as written in the past, we find ourselves "hurled into hypercomplexity" (*ibidem*): a hypercomplexity that is cognitive, social, subjective, and ethical. An anthropological transformation which is bringing about an unprecedented mutation in symbols, cultural codes, productive models and means of sharing, and hierarchical connections (*disintermediation*/re-intermediation); the complexity of this process touches important aspects of both citizenship and inclusion, with extensive effects on the identities and subjectivities at stake. Furthermore, concerning the relationship between the natural and the artificial, what is risky, in my opinion, regarding the interaction man-machine today, is not so much that machines are being designed to be more and more human but rather that the ambition of human beings is to become more and more similar to machines, with the risk of losing their humanity in this obsessive search for total control (*illusion of predictability*), for an exponential improvement of potential, and for a post-humanistic u(dys)topia [49,51,52,79,90,91,123,124].

8. Epilogue

Co-Creating Sustainable Societies

Co-creating sustainable societies means activating long-term processes of systematic change that call directly on society's educational and training institutions, whose operational approach must be systemic, involving genuine multi/trans/interdisciplinarity and a new *epistemology of error*.

Co-creating sustainable societies cannot be undertaken through the alienation of the human dimension, sacrificing autonomy for automation. Co-creating sustainable societies requires first of all the construction of a *culture* of sustainability, which is inseparable from a *culture of complexity*.

A culture of complexity is unequivocally a culture founded on a certain gaze, on a way of thinking, and on an epistemology that are radically different from the currently hegemonic narratives. It is a gaze, a thought, an epistemology that does not only admit but fully recognizes and acclaims error, doubt, unpredictability, ambivalence, conflict, contradiction, deviance, and an inexorable dynamicity as essential constituent elements of our lives and of the ecosystems we inhabit [56,125,126].

The time for *speaking* of a paradigm shift is over. Despite the slogans, there have been no significant changes in the traditional fields of knowledge, competences, or in their

related models or approaches. What has changed is reality itself, which has undergone a revolutionary and *irreversible* transformation. The weak links in our quest for sustainability, therefore, are the fields of knowledge and their dramatic incommunicability, in the midst of a *sea change* that has already become reality.

The paradigm of the hypertechnological and hyperconnected civilization, based on simulation and on the illusion of succeeding in eliminating error, doubt, and unpredictability, leads to, as said above, the progressive marginalization of the human. Perhaps a new epistemology of error, along with a culture of unpredictability, can help us find the answer to the two crucial questions we need to ask ourselves: *whether it makes sense to delegate the management of sustainability to purely technological means, and above all, whether auto-determination and autonomy are possible in the age of automation.*

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