



ICTs Connecting Global Citizens, Global Dialogue and Global Governance. A Call for Needful Designs

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Abstract. Humankind is on the transition to a supra-system of humanity, according to which social relationships – that organise the common good – are re-organised such that global challenges are kept below the threshold of a self-inflicted breakdown. In order to succeed, three conditions are imperative: (1) *Global governance* needs a *global conscience* that orients towards the protection of the common good. (2) Such global governance needs a *global dialogue* on the state of the common good and the ways to proceed. (3) Such a global dialogue needs *global citizens* able to reflect upon the current state of the common good and the ways to proceed to desired states. Each of these imperatives is about a space of possibilities. Each space nests the following one such that they altogether form the scaffolding along which institutions can emerge that realise the imperatives when proper nuclei are introduced in those spaces. Such nuclei would already support each other. However, the clue is to further their integration by Information and Communication Technologies. An *information platform* shall be launched that could cover any task on any of the three levels, entangled with the articulation of cooperative action from the local to the global, based on the cyber-subsidiarity model. This model is devised to ensure the percolation of meaningful information throughout the different organisational levels.

Keywords: Ethics and policies for a digitalized world · ICTs and society · Information society · Digital transformation of society · Global governance

1 Introduction

This proposal puts global governance in the **context of human evolution**. This is innovative and productive in two ways. First, the historical significance of the establishment of global governance can be imagined so as to allow a comprehensive picture. With the words of Edgar Morin [1], we are still living in the “prehistory of human spirit”. **Global governance that transforms the global risks into challenges that can successfully be handled** would mark a decisive step in hominisation and usher in the **transition from humankind to humanity**. A proper world society could materialise as “Homeland Earth”. The current crises turn out as coming-of-age problems of the human species. But the future is open. *Homo sapiens-demens* can succeed or fail.

Second, apart from visioning Homeland Earth as common goal, taking human evolution into account provides methodological hints on how to establish global governance in a realistic way. This is not a detailed blueprint for a determinate set of institutions to deal with one singular aspect of the many-faceted global challenges. At the contrary, it is an **evolutionary framework of enabling spaces that allows for a diversity of institutions to emerge such that they are set up to converge to an overall system of global governance**. The latter way goes over the **agents** of change, which are global citizens, and their **interaction**, which is a global dialogue, heading for **collective action** on the planetary level, which yields global governance.

The question to be answered here is how are those organisational relations of social information processes specified such that appropriate designs of supporting information and communication technologies can be developed.

2 Problem Statement

Systems emerge through organisational relations when co-operation of agents produces **synergy** effects [2]. The less friction is in the interaction of the agents as a consequence of relations promoting synergy, the more enduring are the systems. Natural systems we witness today succeeded in being most enduring in virtue of their ability to adapt to synergy requirements.

Social systems crystallise in social relations that allow the proliferation of the **common good**, the social synergy, for participant actors. Global challenges embody a crisis in the worldwide availability of the common good. They show that hominisation is an ongoing process. A re-organisation is needed as never seen before that is all about the common good.

Two major steps of **anthropo(socio)genesis** – the becoming of humans and society – can be distinguished so far [3]:

- (1) The transition from a less developed state of co-operation among our animal ancestors to a state of sporadic, but ever-increasing co-operation in **dyads** of early humans **based on joint intentionality** (about a common goal, common initial conditions and a common strategy to achieve the goal). Dyadic co-operation guaranteed the common good for both actors.

- (2) The transition from dyadic co-operation to an obligatory **triadic form of social relations** that mediate the interaction of individuals in the context of society. A common culture provides the ground for **collective intentionality**. The third of the triad is not another individual but rather the generalised other in the sense of George Herbert Mead. It is relations of society that relate individuals to each other with respect to the common good – even if the concrete content of the common good became a matter of disputation and conflict.

Today, another transition is about to start. A **third step of anthro(socio)genesis** is in reach, by which the collectivity of human intention would be topped by a **cosmopolitan sharedness** on a planetary scale. The desired relationship is a **new triad**, materialising social synergy, so to speak, an omniad, when generalised onto the level of Homeland Earth.

There are three kinds of social relations:

- (1) **Antagonistic relations** that make positions conflict with each other in a contradictory, mutually exclusive manner. They threaten humanity with extermination because there is only one solution – the elimination of one side of the antagonism.
- (2) **Agonistic relations** that make different positions indifferent to, and co-exist with, each other in a compossible manner. They seem indispensable to social life [4], but do not suffice for collective action on a planetary scale.
- (3) **Synergistic relations** that enable mutually supportive positions that complement each other for any goal and for the common good too, humanity-wide.

Antagonistic relations have to be reduced to a minimum, and agonistic relations have to be put in the service of truly synergistic relations to enact this third step of human evolution.

First of all, such a transition is **necessary**, since the social relations of any partition of humanity are based on the principle of othering of partitions that are considered outside of them, thus not doing justice to legitimate self-interests of the rest of the partitions. Frictions from which the global challenges emanate render the continuation of civilisation unsustainable. They are caused by the lack of relations that would be valid for all partitions from a bird's eye view, that is, from a meta-level perspective. The establishment of such relations would mean the abolition of those frictions by a new supra-system in which all existing systems take part and shape according to the new relations on a higher level, following the application of the **subsidiarity principle** (in its positive sense) as a basis for the preservation of diversity and autonomous agency [5, 6]. This needs not to mean a world government. But it means global governance by rules, regularities, resource regimes, eco- and techno-structures that in our time need to be transnational and trans-state in reach.

Furthermore, this step is not only needful but **also possible**. Despite some literature based on biologicistic biases unable to imagine a transgression of the conceptual framework of the nation-state “we”, transnational relations have been taking shape. There is empirical evidence of co-operation between culturally homogeneous groups several tens of thousands of years ago, between cities around five thousand years ago, and between modern states since the seventeenth century [7–9]. This co-operation between collective actors like groups, cities and states has already been paving the way

for co-operation among the whole of humankind in the same way that dyadic, interpersonal co-operation between individual actors opened up the space of possibilities for triadic, societal co-operation. Examples are, as **top-down** models, a diversity of historical empires and contemporary regional federations with an economic or political focus like the EU as well as a diversity of organisations that fill the space beyond states, with the League of Nations as forerunner, and international organisations after 1945 like the UN family. Both supranational and international organisations turn rather in the direction of transnational organisations. Though they are still mirroring changing geopolitical balances of power, managers that have been running them developed an identity beyond the nation state, at a higher level [10]. Besides the top-down models, another model of transnational institution building has emerged that pays attention to **bottom-up** processes too. Examples are self-regulating communities, in particular in the economic field [11] as well as the large number of civil society organisations (CSOs), part of which are non-governmental organisations (NGOs), in particular, international NGOs (INGOs). And there have been social movements flashing up.

However, all those developments taken together will not accomplish the third transition in human evolution by themselves. Additional and specific efforts by the actors are needed for both quantitative and qualitative reasons.

Any transition from a state in which originally independent systems have become dependent on each other to a state in which a critical mass of them establish a suprasystem – a system of which they become elements that are able to complement each other for the sake of each of them and for the sake of the whole system – emerges not before a **quorum** of them catch up with the complexity of their interdependence that manifests in frictions. Any such suprasystem reduces these frictions. This is due to a reduction in the difference of complexity between a certain number of the suprasystem's elements-to-be and the challenges they face. They increase their complexity through the **generation of requisite information** to counterbalance the frictions [12]. The systems would remain in the old state as long as the conditions allow or would even disintegrate, if they failed to generate requisite information [13].

This is also true for a possible world society that steers itself. Faced today with the global challenges, all actors, whether individual or collective, if they were to survive and thrive in the foreseeable future, would need to adapt the actuality of their interaction full of friction to the potentiality of harmonisation with proper social relations on a level beyond and above the contemporary global players. At least, a considerable number of actors are able to go ahead, raise their intelligence and institute those relations.

In that context, developments in the direction of global governance as listed above are, so far, lacking the **right balance of qualitative and quantitative features for coping with the complexity** of the current state of interdependence of the social systems populating the planet. Either the form of institutions is still missing the **right content** for a world society that takes successful measures to mitigate the global problems or, if the content is right, the **critical mass** to tackle the problems has not yet been accomplished.

Deficiencies hamper the full realisation of self-organised social information processes that would underpin the appropriate transformation of the social systems involved. As one of the authors has analyzed elsewhere from a network theoretical

perspective, the **deficiencies of the current ICT networks**, powered by big-data technologies, as regards the generation of the requisite information to bring about the third step of social evolution [5]. Deficiencies appear in the fields of co-operation, communication and cognition. In each of the fields a potential can be identified the actualisation of which is **imperative** in order to execute the third step in social evolution.

- (1) Co-operative information processes play the role of **consensualisation** on the social systems level, about the goal and the means to achieve the goals. The deficiency is that actors still do not explicitly **dedicate** the social relations they are (re)producing **to** the advancement of **the common good**. But, in principle, common intentionality can underlie the complex structure that administrates the commons. **Global conscience and global consciousness** can emerge in a hyper-“commonalist” vein, which means caring for the commons from the local to the planetary scales in a subsidiarity scaffolding, and can gain dominance over traditional relationships that cause violent global frictions.
- (2) Communicative information processes convey **collaboration** between actors, that is, preparing support for the decisions upon goals and means by bringing together different perspectives as well as guiding and monitoring the process of achieving the goals, and preparing adjustments of means and goals. The deficiency is that actors do not yet **deliberate commonly** as much **upon possible goals** as upon possible means. But, in principle, there can be consilience about the larger picture. A **conversation on the design of another world**, open to any actor, can be carried out globally.
- (3) Cognitive information processes conceive the **co-ordination** of possible activities according to the position in the social system a single actor finds herself placed on. The deficiency is that actors do not yet **discern** sufficiently the possibility of **extending their scope of action** that is currently restricted because of frictions and the lack of meaningful information, properly adapted to the action level. But, in principle, they are able to reflect upon the quality of social relations and understand that friction-free relations would benefit each actor. They are able to anticipate a meta-level of possible new social relations on a global scale and make improvements they **concern**.

Co-operative, communicative and cognitive information build a hierarchy in that co-operation builds upon communication and communication upon cognition. The imperative of hyper-commonalism on the co-operative level of information benefits from being underpinned by all-inclusiveness on the communicative level and the imperative of all-inclusiveness benefits from being underpinned by meta-reflexivity [14] on the cognitive level. The lower levels are necessary conditions for the higher ones so that the higher levels shape the lower ones.

3 Proposal

3.1 Starting Point

What follows is the proposal of how to bring about the emergence of a nested network of new civil society institutions at different levels, all based on cosmopolitan principles and the idea of the common good, which together form a task force for the needed societal change at a global level.

The institutionalisation of global governance that is targeted on a successful resolution of the social dysfunctions causing the global challenges would be doomed to failure if it ignored the **informational imperatives** described above. As a consequence of the analysis, these imperatives need to be taken into account to tackle the global challenges in a proper way:

- (1) on the *systems* level, the imperative of a **commons-oriented global conscience/ consciousness** that guides global action for the sake of the common good in an adequate subsidiary concert with the lower action levels;
- (2) on the level of the *actors'* interaction, the imperative of an **all-inclusive global conversation** open to any local actor of any perspective with the aim of exchanging positions on possible solutions of how to deal with the global issues;
- (3) on the level of an *individual actor's mind* as well as of organisational goals of a collective actor, the imperative of a **globally concerned meta-reflexion** about the transformation of social relations on which the fate of humanity depends.

Future-oriented global governance is based upon these conceptual cornerstones. How can these imperatives be met?

3.2 A Framework of Enabling Spaces

It is true that global challenges that threaten the survival of humanity in totality can be alleviated only by acts carried out as if humanity were united. But the success of global action depends on how fast the deficiencies identified in social information processes can be fixed and a critical mass of knowledgeable and determined actors can assemble as "spearhead of the willing" before a window of opportunity closes.

All actors today are **exposed to the three information imperatives**. Though all actors share a responsibility for the future of humanity, even if in different grading and often not wittingly, they are free to respond to the imperatives in different degrees and cannot be expected to be as responsive as they should. Since a critical mass of actors suffices, anyway, a framework needs to be designed that enables any actor to participate in the spirit of global conscience, global "conversability" and global concernedness and to form an emergent critical mass. Such framework functions as an environment of "**enabling spaces**" [15] that are accessible to any actor.

Enabling spaces are spaces of possibilities that are anchored in reality, namely, in the current realities of co-operative, communicative and cognitive information processes. The spaces of possibilities build a hierarchy of necessary conditions according

to the hierarchy of real information processes and the informational imperatives. This hierarchy of the spaces of possibilities works as scaffolding along which new effective spaces can emerge.

To turn the order upside down, the following spaces of possibilities to be realised can be considered as enabling spaces building upon each other while giving successively room to each other:

- (1) At the bottom is the cognitive field where meta-reflexive actors can raise concern about global issues, can develop a new cosmopolitanism and become ready to live **global citizenship**.
- (2) Evolving global citizens can, on their part, populate multiple planetary communicative spaces in which they start to conduct an all-inclusive debate about global issues, a **global dialogue**, in particular, about facts and figures of global development and how to assess them, which, in turn, has repercussions on the cognitive field so as to solidify global citizenship and recruit new global citizens.
- (3) The communicative spaces of the global dialogue in *statu nascendi* can, on their part, contribute, eventually, to the establishment of an all-embracing global public sphere at the top of the hierarchy at which **global governance** is to be completed – decision-making in the name of, and mandated by, the whole humanity as well as the implementation of measures to safeguard the commons and the common good for the world society, guided by an emerging conscience along with a consciousness on the global level, which, in turn, feeds back to the intermediary level so as to strengthen the multiplicity of planetary communicative spaces for the task of collaboration and, as preparation for decision-making, for the task of impact assessment as well as to create new such spaces if need be.

This framework enables the respect for the informational imperatives to the greatest extent without use of strict enforcement. The social space of global citizens helps attain global concerns, the social space of planetary communication furthers global dialogue, and the social space of the global public contributes to global consciousness with a global conscience.

According to that framework, global governance is **distributed** along nested information processes: every level provides a space for information processes that are conducive to the emergence of information processes that comply with the imperative on the next higher level and every level is a space that reinforces those information processes that it necessitates on the next lower level. The meta-reflexions taking place in the space of global citizens are conducive to the global dialogue and the space of the global dialogue that includes the former space shapes the reflective processes there as these are part of it; at the same time, global dialogue is conducive to global governance, while global governance demands global dialogue as part of it. Thus, the model proposed here conceptualises global governance as unfolding in time over levels of relative autonomy, as emergent product of a **punctuated bottom-up process** that entails a **top-down process** that re-organises the preconditions from which global governance arises and upon which it builds. Since individual actors reside on the bottom level, interact with each other on the intermediate level and produce social relations of synergy on the top level once they co-act, global governance is a process of social

self-organisation in which agency is the driving force that is nudged by the structure it produces. Nevertheless, it is an open-ended process that scaffolds from the local to the global in a subsidiary manner.

3.3 Instituting Nuclei

The framework of enabling spaces for global governance addresses anybody without discrimination and shall provide an environment friendly to the emergence of changing institutions to safeguard the global common good. Given the right environment, right **nuclei** have to be instilled in those spaces as seeds for desired institutions. The nuclei work as **clues that can be taken up by any of the actors to make them consider global issues in any field of information processes they are involved in**, particularly if, according to the subsidiarity principle, they concern the global level, and make them turn into (1) “citizens of the earth” who engage with initiatives, movements, organisations in a (2) “communicative democracy” for a (3) “politics of humanity and civilisation”, as Morin formulated [15].

The overall objective of providing such nuclei is to strengthen the forces that are already there and try to shift the balance towards Homeland Earth. They shall be supported to gain power through **integration without skipping their differentiation**. In a qualitative respect, a **screening and revisiting of the political aims** they pursue in the light of the global informational imperatives is compulsory. In a quantitative respect, an **aggregation in a common network** they join is mandatory as long as a critical mass shall be acquired.

Such a stepwise, piecemeal institutionalisation of global governance can comprise the building of particular, **new institutions** and the insertion and incorporation of particular, required **new traits in old institutions** as well. Nuclei can go either way.

A combination of nuclei described in the following paragraphs seems most advisable and feasible to concretise the enabling spaces framework. There are three suggestions to give existent institutions on the global citizens, global dialogue and global governance levels each a kick. And the suggestion to install germs of novel institutions for the technical integration across all levels must be based upon the analysis of the demand of new organisations of those social information processes. The suggestions here attend to the subsidiarity principle.

Reform of Thinking and Education for Citizens of the Earth. According to Morin, the reform of thinking together with a reform of education is the *conditio sine qua non* for any substantial change towards Homeland Earth [15].

What is needed is complexity thinking in every-day thinking, an understanding why trans-disciplinary approaches are required, a logic that stretches beyond deductive reasoning, systems and evolution literacy, ethical, inter-religious and inter-cultural education to build intellectual and emotional capacities of open-minded actors fit for a new planetary era.

Having said that, the organisational innovation to be supported by newly ICTs is as follows: to support initiatives in any country to reform the education systems to include **pedagogy for peace, global social justice and a thriving planet**, wherever applicable, from the kindergarten over the primary and secondary schools to universities and

to continuing education. Artists shall be encouraged to write fiction, to write songs, to perform theatre plays, operas, musicals, dancing, to produce pieces of artwork, installations and exhibitions that are dedicated to the new way of thinking required or put given pieces into the context of today's challenges. Similarly, scientists should be stimulated to focus their research on such issues. A "Global Youth Exchange Programme" shall be planned [17]. Social impact foundations shall be asked to offer initiatives in the field the opportunity of applications for funding. These foundations could develop a co-ordinated programme.

Constructive News for Communicative Democracy. Communicative spaces enable humans to grasp the world they live in through exchange with, and adapt their views to, each other. What Morin calls democracy in that context is the insight that none of us owns the absolute truth but that we can converge to consilience by adding our individual perspectives until common pictures emerge. In the age of global challenges, it is mandatory not to exclude any perspective because it might prove precious to save civilisation.

Media are influential and condition the free intercourse. It is a fact that worldwide mainstream media are biased and convey partisan interests of elites [18]. Journalists maintain not only connections to INGOs like think tanks propagating a certain political agenda but also to governments and the so-called intelligence communities of certain states. Editorial offices gather to arrange how to label certain phenomena of the political and economic world like political leaders and groups or economic measures in a way that reminds of Orwell's Newspeak. Due to deteriorating working conditions, investigative journalism is hard to practice and P.R. industries that economically outbalance media industries feed the media with fabricated news that are not questioned. Commercialisation reinforces echo chambers that trigger off the public's most primitive instincts and even diversion plays a role in that topics relevant for a peaceful future of different cultures in harmony with nature are neglected.

"Transformation-oriented", "impact-oriented", "future-oriented", "solution-oriented", "constructive journalism" are denominations of a new genre. According to that, journalists shall not bring bad news but constructive news and direct their attention to problems and the attempts to solve them, including failures to learn from them. Already existing examples are medias like *Le Monde Diplomatique* or *Lettre Internationale*. Film-makers follow this trend, e.g. in the Austrian movie "Die Zukunft ist besser als ihr Ruf" or the French movie "Demain/Tomorrow – Take concrete steps to a sustainable future".

Having said that, the organisational innovation to be supported by newly designed ICTs is as follows: the establishment of a **constructive media fund** fed by social impact foundations to support media outlets that comply with the imperative of a global dialogue for the sake of civilisation. Only such an independent body can guarantee the production of communication free from private or state interests that tend to block interests of whole humanity. In addition, it shall provide materials for self-organised learning and teaching materials in the line of a **pedagogy for peace, global social justice and a thriving planet**.

An Addendum to the UN General Assembly for a Politics of Humanity and Civilisation. Now that globalisation has produced an infrastructure of a world society without a common consciousness, according to Morin, a regime of global governance, based upon a somewhat revised United Nations, would be required to produce a new civilisation [16].

There is a growing number of social entrepreneurs, philanthropists, retired politicians, professionals, intellectuals, artists and others, working in not-for-profit sectors, who have also become part of social movements or civil society organisations, from the local to the global, all of which – individuals or collective actors – anticipate in their actions, some values, norms and principles of social relations, that could be universalised for all of humanity. They would represent the vanguard of a global conscience. More often than not, however, they are scattered around the world, focusing sometimes on a narrow section of a global challenge and become blinded through such a routine, that they lose the larger picture, if they ever had one, and hence do not develop a common, comprehensive, single integrated strategy. Many of them refrain from programmatic work, developing political demands, entering political negotiations, and even when some of them, form independent forums, or when they are invited to join international meetings or the UN system, they are sometimes not treated as being on an equal footing with the policy makers. Their influence on politics is as a consequence, rather marginal. Some of the latest examples may be the Global Solidarity Summit in July 2017 in Hamburg, organised by a coalition of more than seventy organisation and initiatives, attracting more than 2.000 people, or those NGOs that had been operating rescue ships in the Mediterranean, to save refugees and migrants on their way to Europe, from being drowned.

On the other hand, there have been proposals to sidestep the UN by proclaiming a global parliament [19] or, if not, to reform the UN such that the present General Assembly (GA) would become one of a two chamber world-parliament. Whereby the second chamber should represent the world population by members of the national parliaments, if not through direct elections as Václav Havel proposed. Such a solution would create legislative powers for the whole parliament, which would replace the present *international law* – that, in principle, is only binding for those nation states that share a consensus. *Transnational law* would be binding on all subjects and promote world jurisdiction on a par with a world government of a world state [20]. Since current governments are so far not inclined to give up sovereignty, these plans for a world parliament are, in effect, stalled. This is especially the case since re-nationalisation is taking place on a worldwide scale, sometimes even comparable to the international political situation a hundred years ago.

Having said that, the organisational innovation to be supported by newly designed ICTs is as follows: The idea of using the momentum of global civil society movements and organisations that enact global ethics shall be taken up, along with the idea of designing an addendum to the UN GA to finally outbalance some of the negative effects of national sovereignty. The transnational, avant-gardist civil society momentum needs to better translate into international politics and international politics, in turn, needs to receive an impetus to go transnational. Thus, the UN shall establish a **permanent expert group (PEG) of global civil society representatives** that have

expertise and valuable performance of work in transnational fields. These representatives shall not represent the people of the world, as it is, but, so to speak, the future population of a united world. They would represent CSOs and global movements that act for a viable and flourishing future, guided by an emergent global conscience, or would be persons who as eminent persons make outstanding contributions to the betterment of the world. All those persons would be chosen by the UN in due consideration of the criteria are outlined above. This PEG shall be endowed with the right to elaborate, in constructive sub-groups, on **proposals on any aspect of dealing with the global challenges to be presented to the UN GA**, which, for its part, can prepare resolutions and reach consensus decisions incorporating those proposals. Thus, the PEG at the UN GA would, in the course of a third generation of UN-CSOs relations, enjoy consultative status with the GA itself, as well as with diverse UN agencies.

This suggestion would confirm the agreement at the Millennium NGO Forum in May 2000 that a permanent assembly of CSOs should be established to meet before annual sessions of the GA. The important point here is that there is no need to change the basic mechanism of current procedures of the UN GA. The state representatives are free to vote in favour or against such resolutions or abstain, or simply absent themselves from voting. The civil society representatives that would enjoy an enhanced status, by being accredited members of an official UN body, could build up political pressure at a higher level and could achieve this, the more reasonable their proposals are. Progress could also be achieved through states that are willing to form coalitions and implement measures, without waiting for all states to take part. Such an example is the Treaty on the Prohibition of Nuclear Weapons that was negotiated through the adoption of a mandate of the GA and signed by a group of member states.

What occurs at a United Nations Organisation, complemented in such a manner, would deserve proper media coverage. Apart from traditional media, the *constructive media fund* could make a specific focus of media coverage of the activities of the PEG of global society representatives and its sub-groups.

4 ICTs for Homeland Earth

The suggestions above concentrate on the promotion of an eventual “global mind” – global consciousness with global conscience – as the essential feature of global governance. A global mind needs a “global brain” [21]. The penetration of societies with Information and Communication Technologies (ICTs), the Internet and further advancements, are looked upon as the technical requisites for the global brain of humanity. ICTs mediate all social information processes – cognition, communication and co-operation. Also, social media can be designed and used for the support of cognition (through, e.g., websites) of communication (through, e.g., online news portals) and of co-operation (through, e.g., wikis) [22].

Having said that, the technical recommendation for the support of the re-organisation of social information processes from the world level down to the most local level along the nuclei discussed above in relation to the imperatives of our time is as follows: An **information platform** shall be launched that provides applications that serve the growth of any of the aforementioned nuclei – first, the pedagogics for peace,

global social justice and a thriving planet, second, the constructive media fund, and third, global civil society's PEG at the UN. That is:

- (1) On the *cognitive level*, online materials and online courses, video recordings of artistic performances and pieces of art, electronic fiction books that abide by the pedagogical principles in question shall be offered.
- (2) On the *communicative level*, the participation in producing and using constructive news and in events of deliberating on which path societies should take shall be offered.
- (3) And on the *co-operative level*, the PEG shall be offered online tools that facilitate their tasks of working out solutions.

Moreover, synergy effects would arise that reinforce the *integration of the three levels* and boost global governance.

To serve the purposes of global governance on all levels of information processing, this platform must be, on the one hand, run by some non-for-profit structure instead of classical private for-profit-corporations to keep it free from private interests, on the other hand, modelled in such a way that very strong **consistency conditions** are satisfied including, for example, (a) an easy and fair access of meaningful information for all involved actors, (b) a quality control making sure that all content is serious and true-to-fact, as well as properly and transparently related to the various tasks and goals, filtering out hate-filled, discriminating, sexist, racist, and inhuman contributions, (c) a security regime that prevents any manipulation and corruption, and (d) an adaptable information management architecture, described below, based on the subsidiarity principle from the local to the global levels, through which the information flow is substituted by synthetic information percolating 'meaningfully' across organisational levels.

4.1 ICT Architecture Based on Cyber-Subsidiarity

Though so far we have focused our attention to the level of global governability, this shall be based on the participation of citizens dealing with issues scaling up from the local to the global. However, the very common citizen has a very restricted autonomous capacity to move through the digital network gathering the information which is mostly meaningful to the issues at stake, as discussed in [5]. At the same time, the capacity to manage relevant information, from our-selves and the environment we are living in, offers new avenues to deal with issues of significant social concern.

If we compare the information management model within the living organism with respect to the model that corresponds to the internet powered by current big-data technologies, we observe a significant difference [6]. Concerning their respective sizes, the information volume in living beings is interestingly much larger for the time being. However, while the internet is notably characterized by the overload of information agents (among which we can mostly find information dwarfs and a few information giants), the former is based on the minimization of information management requirements at the higher levels and the recursive coordination of autonomous agency (*ibid*). This is a result of the application of the aforementioned subsidiary principle to the organisation of living beings, and a natural pathway to the emergence of sustainable systems from the local to the global, as intended hereby [5].

As argued in [5, 23], the *free-scale network* structure exhibited by the Internet routing network offers a sound footing for the instantiation of the subsidiarity principle. However, the real structure of the internet, particularly when it is powered by current big-data technologies in the present situation of strong inequality, represents an important breach in the subsidiarity principle. Moreover, current big-data technologies seem to intensify the already intolerable inequality, pushing the periphery outwards and consequently increasing cultural and social exclusion (*ibid*), thus hampering the necessary transition discussed in Sect. 2. To overcome this issue, we propose a **cyber-subsidiarity model** for the organisation of human cooperation backed up by subsidiary information management following the *Viable System Model* proposed by Stafford Beer [24]. This model, consisting of a decentralised multi-layered organisation of autonomous operational units, offers at a time a means to preserve autonomy, identity, environmental and social sustainability at different levels, from the local to the global.

The *Viable Systems* (VS) model, devised from the analysis of the necessary and sufficient conditions of viability of living organisms as a paradigm of sustainable autonomous organisation, is based on three fundamental principles: (i) The *principle of recursion*, stating that any VS is composed of nested VS (s. Fig. 1a); (ii) The *principle of requisite variety*, stating that the variety of a system must be greater than the variety of the issues the systems is facing; (iii) The *principle of subsidiarity*, stating that the variety is resolved at the lowest (recursive) level, so that only the residual variety percolates to the upper organisational level (firstly to the metasystem or system's management bodies; secondly, to the upper recursive level).

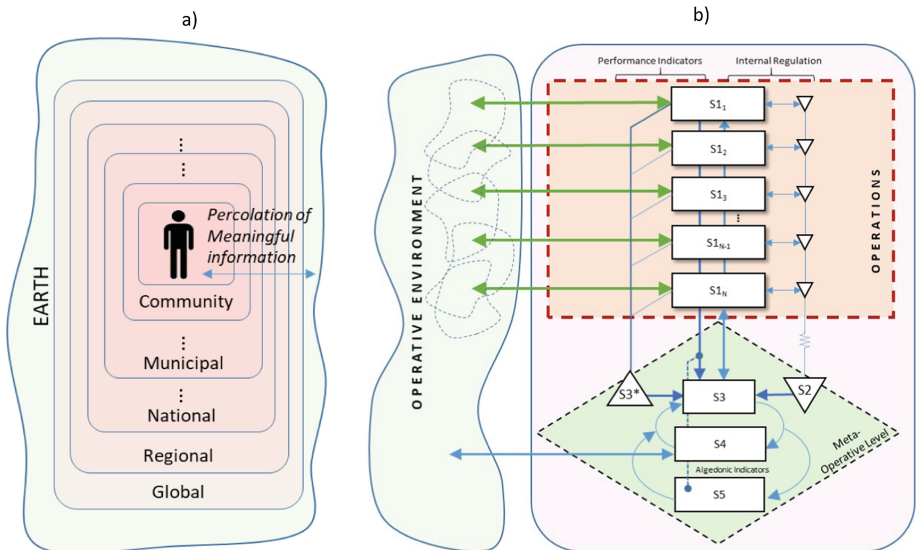


Fig. 1. Cyber-subsidiarity model: (a) Vertical nesting, (b) Horizontal organisation.

The viability of each nested system means that it is able to autonomously manage the variety of its operational context (namely, solving the problems related to its own activity and subsistence), by means of a proper information management to coordinate cooperation, facilitate meaningful communication, and enable the development of meta-reflexivity. To ensure the necessary and sufficient conditions of system's sustainability, VS must be composed of five subsystems that interact with each other, represented in Fig. 1b:

(S1) Every VS embraces several primary activities of which different operative units take care. Each operative unit is a VS itself, according to the principle of recursion and performs at least one of the fundamental functions of the organisation.

(S2) represents the information channels and functions that allow the primary activities in S1 to communicate and cooperate with one another while facilitating S3 to supervise and coordinate activities in S1. It is responsible for the immediate programming and sharing of resources to be used by S1, conflict resolution and stability.

(S3) encompasses the structures and controls arranged to establish S1 rules, resources, rights and responsibilities. It guarantees internal regulation, optimize capacities and resources and looks after synergy at the operational level. It has a panoramic view of the processes developed in S1 used to carry out strategic planning, while it offers an interface for S4/S5 to comply with and facilitate forward planning and preserve system's identity. Within S3, an audit subsystem, System 3* (S3*) is devoted to assess sporadically overall performance.

(S4) has the function of giving account of environmental changes in order to forecast forthcoming scenarios. At the same time, it takes care of how the organisation has to adapt to preserve its viability in the long-term, developing forward planning.

(S5) is responsible for political decisions in the organisation as a whole, balancing the demands of different parties and guiding the organisation as a whole. It preserves and keeps up-to-date system's identity.

These subsystems respond to a triple role in the dynamics of system's adaptation: systems 1–3 deal with the “Inside and Now” of the operations of the organisation; system 4 deals with “Outside and Then” as a strategic response to external, environmental and future demands; and system 5 deals with balancing the “Inside and Now” and the “Outside and Then” with political and axiological directives that maintain the identity of the organisation as a sustainable entity. According to the principle of recursion, VS is composed of VS, which can be symbolically stated as: $VSM \stackrel{\text{def}}{=} \{ \{S1\}, M | S1 \stackrel{\text{def}}{=} VSM; M \stackrel{\text{def}}{=} \{S2, S3, S3^*, S4, S5\} \}$.

In addition to the aforementioned fundamental principles, other regulative principles, devoted to the distribution of variety, action and information, provide sufficient directives for the design of sustainable organisations and sustainability assessment of already established organisations. As regards *information management*, most of the information is handled at the operational level. Here, the information input is filtered in order to focus on the activities and issues the unit is devoted to (to this end, group's ontology play an important role). Since this approach holds at any organisational level, only the information that is needed in order to handle the issues not solved at a given level will percolate to the upper level. More details are provided in [25, 26], describing the application of the model to the dealing of issues of planetary concern.

5 Conclusion

This paper shows that the design of IT need not be restricted to technical considerations alone that promise high returns on the markets. It can take social factors into consideration when it comes to questioning the underlying design objectives, which is an asset of integrated technology assessment and technology design, and it needs to do so if and because the evolution of humanity is facing threats of exterminism that renders profitable efficiency secondary. The deliberation of design objectives requires, furthermore, an extension of the focus of research and development towards social sciences and humanities – hence an inter- if not transdisciplinary account. Transdisciplinarity itself is best carried out with the help of systems thinking.

This paper demonstrates how the inclusion of social and human science issues can work in a systems perspective to provide a sound basis for the alignment of IT design issues with humane goals. It provides an example of how such a collaboration can work out in the case of finding ways to implement global governance, based on the cyber-subsidiarity model to articulate cooperative action from the local to the global.

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