Chapter 11

Organic Governance Through the Logic of Holonic Systems

By Mihaela Ulieru

THE BIGGEST CHALLENGE MANKIND FACES TODAY is not the development of more breakthrough technology; it is to create a society whose institutions integrate the knowledge that must precede any such technology, including knowledge about these institutions themselves. The inherent problem stems from our limited capacity to comprehend the interplay of large crowds of people and to transcend our own individual psychology rooted in interactions with groups of tens to hundreds, not billions.[1]

There is no doubt that our world has evolved to be complex, a phenomenon that reflects the ultimate manifestation of self-organized structure embedded in the physics of everything as archetypes of naturally emerging design.[2] This tendency occurs because all of nature is not comprised of physical objects as such but rather as a complex of flow particles merging into systems that change and evolve their configurations over time. The interrelationships that govern flows tend to create greater access to the circulating forces, which in turn propels new complexity. Anybody who has participated in the phenomenon of viral social media understands this intuitively – namely, that there are characteristic ways that flows change their configuration over time to increase their flows more. Social systems adapt to demands that enhance or obstruct these natural flows, much as natural systems do, through gradual modification and selection.

So, in the quest to design institutions and organizations that can perform more flexibly and effectively, we need to focus on how to enhance creative flows via structures that afford higher degrees of

freedom. For this, we find plenty of inspiration and guidance in nature and the Universe.

To overcome the significant challenge in learning how to organize our daily life together in groups whose interactions are larger and more complex than we can intuit, we have to design rules of conduct and incentives that align our individual actions with collective interests so that both converge and yield synergies. *Over a long enough timeframe, manmade designs can emerge and behave like natural flow systems. But the puzzling thing for us as humans in the modern world is the persistence of bad designs, of intractable configurations limiting freedoms that could improve flow.* The rigid structure of our social, political and economic systems tends to thwart adaptation and agile responses to unexpected and emerging needs. Our macro-institutions often block effective, necessary solutions.

A recurrent problem is our failure to understand that human endeavors are part of holistic, living systems, natural and constructed, whose constitutive elements are mutually defining, expressive and constantly evolving. In actual circumstances, the individual cannot be cast as against, below or above the group; the individual is in fact nested *within* dynamic forms of social organization. Living organisms have subjectivities, intersubjectivities and behaviors that are nested within larger living systems. The dynamic complexities rapidly multiply, outpacing simple cause-and-effect logic and crude narratives.

Holonics is an empirically based theory of living systems that seeks to overcome these limitations. By blending multiple scientific and humanistic disciplines, holonics seeks to understand the rules and laws of self-organizing systems and, in so doing, point to the ways by which we might change the cultures in our organizations and transform how we live and work. But this challenge requires that we consider a radical shift in the ways in which we interact with (and within) our socio-politico-economic systems, as well as with the natural environment.

Holonics: Healthy Hierarchies

At its broadest scope, holonics is concerned with the evolution of the universe.[3] The basic idea is that every living entity is both

an autonomous whole unto itself as well as part of a larger holistic system. This perspective enables us to see certain recurring patterns of self-organization among interdependent natural systems at many different scales, from atomic levels to earthly physics, biology and ultimately to the Universe.

In the 1960s the writer Arthur Koestler postulated that many biological and social organizations simultaneously display part/whole relationships. In other words, every entity is self-contained while concurrently existing as an individual member of a larger collective. Koestler proposed the term *holon* to describe the elements of these systems. This term is a combination of the Greek word *holos*, meaning "whole," with the suffix *on* meaning "part," as in prot*on* or neur*on*. The term is meant to reflect the tendencies of holons to act as autonomous entities that also cooperate to form nested hierarchies of subsystems. The classic example is the nested hierarchy in biology of the cell, tissue, organ and system/organism. In this holarchy, as Koestler called it, each holon is a subsystem retaining the characteristic attributes of the whole system (Fig. 1a). What actually defines a holarchy is a *purpose* around which holons are clustered and subdivided in subholons, at several levels of resolution. Each entity (or *holon*) must act autonomously *and* cooperatively to achieve the goals of itself and of the wider system.
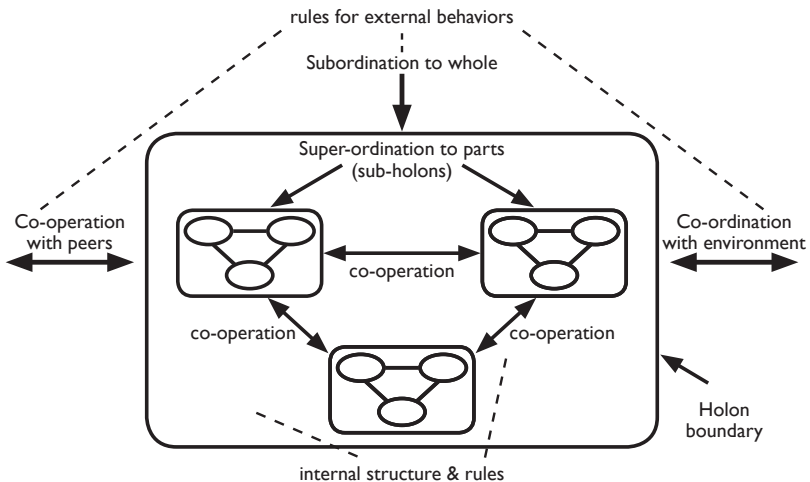

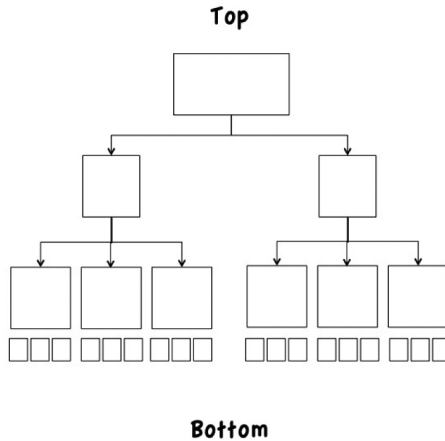*Fig.1a: Holarchy as a nested hierarchy*

Fig. 1b: Rigid (pathological) hierarchy

Holonics, then, is an *organizational paradigm* inspired by the self-organizing properties of natural systems. Holonics scales systems in nested clusters – as shown in Fig. 1a – whose collaborative rules drive them towards a *common purpose*. For example, a confederation is a *political holarchy* in which – at the highest level of resolution – the country and its governance rules (the federal government) are concerned with international politics and federal regulations. At the immediate lower level, there are provinces with their own set of governance rules that are concerned with things more appropriate to their scale, such as education and health matters. Finally at the "lowest" level in a nested hierarchy of confederation, there are cities with their municipal governance rules for such needs as snow removal and firefighting. Each citizen is an "individual agent" ("primitive" or "basic" holon) within this social holarchy.

Holarchies can take many forms.[4] For example, a university is organized as an *educational* holarchy comprised of the President's office, to which faculties (e.g., engineering, science, medicine, etc.) are directly subordinate to a dean's leadership; and each faculty in various departments (e.g., electrical engineering, manufacturing engineering, civil engineering, etc.) is subordinated in turn to the leadership of a department head. Each academic lecturer and each student is a primitive holon. An enterprise is a *purpose-driven/market-driven* holarchy. A manufacturing system is a *production-driven* holarchy. A liv-

ing organism is a survival-driven holarchy. The Universe itself can be seen as an evolution-driven nested hierarchy, a holarchy. Hierarchies are ubiquitous in nature and social organization. But there are problematic hierarchies that we can designate as "pathological hierarchies." These are rigid, top-down, "tree-like" hierarchies (Fig. 1b), rather than holonic, nested hierarchies akin to nested Russian dolls (Fig. 1a). In pathological hierarchies, a "higher level top agent" (e.g., a university president or a manager of an organization) assumes the role of the whole and treats subsidiary systems as simple parts. Such higher level agents may use a coercive authority to micromanage the "lower" holons by issuing top-down instructions for each step of a process. This kind of pathological hierarchy can not only stifle human dignity, it can block the natural generative flows through which human creative potential manifests itself.

Unfortunately, such pathologies pervade our current entropic industrial order, in part because they rely upon reductive categories of thought and centralized forms of control that cannot flexibly align individual and collective interests. In a holonic system, by contrast, the autonomy of nested systems (at "lower levels") is recognized by allowing them to self-organize their own appropriate rules. Cooperation among interdependent parts in a holarchy (Fig. 1a) produces far more stable and effective results than traditional hierarchies (Fig. 1b) in which people are assigned rigid, constrained roles that underutilize their capacities.[5]

As this analysis suggests, it is important that we grasp the dynamics of holonic systems if we are going to change the pathologies of top-down approaches to organizational governance. It is possible to design agile systems that empower individuals to use their full capacities, but that will require a more holistic perspective of the interrelationships of holons and the flows that are enhanced (or blocked) by the respective individual-group dynamics.

The Logic of Holonic Systems:
Embracing the Individual *and* the Collective

The greatest challenge facing any holonic system is "the whole in the part" dichotomy, which can be understood as a set of built-in,

contradictory tensions. Individual systems (wholes) holons are animated to be autonomous and separate – yet they are also constrained as parts of the holarchy to work cooperatively with other holons towards the common goal around which the holarchy was formed. This duality of contradictory forces within a holarchy – between autonomy and cooperation – is reconciled and balanced via "holonic design rules" that define the functionality of systems of semi-autonomous holons. The rules enable and "regulate" the flows through which subsystems can adapt to changing demands facing the holarchy when dealing with problem-rich environments. The rules thus endow the disparate holons with interdependence and an enduring coherence: in essence, the structural capacity of the holarchy to integrate its various parts. A crucial feature of the rules is their capacity to coordinate with the local environment – that is, with other holons and subholarchies.

A deeper dive into the inner workings of holonic systems reveals the mechanisms supporting this interdependence, which may be more familiar to us as "team spirit." The underlying feature is a "holonic logic" that balances autonomy and cooperation in the individual/group dynamics within the holarchy. As shown in Fig. 2, this logic must reconcile two equally foundational epistemologies: the *subject/ subject* way of knowing (which arises through *participation*) and the *subject/object* way of knowing (which arises as individual agents interact with(in) heterogeneous social forms).[6]

The *subject/object way of knowing* is rooted in an individual's objectively verifiable observations of the world. For example the weight of a bag of groceries is objective because it can be put on a scale that every subject (individual) can read and conclude that it weighs, say, twelve pounds. It is practically impossible to relate to other individuals in this manner, since a person is much more than their precise weight or height; it is a complex conglomerate of subjectivities that cannot be perceived nor dealt with properly in such a reductionist manner. Such objectification not only prevents us from perceiving another individual in his or her wholeness, it obscures our own cognitive biases rooted in preconceptions, preferences, desires, etc. Unfor-

tunately our Western culture favors the "objective" way of knowing, thus encouraging an impersonal, instrumental way of relating to others to satisfy one's narrow personal interests.
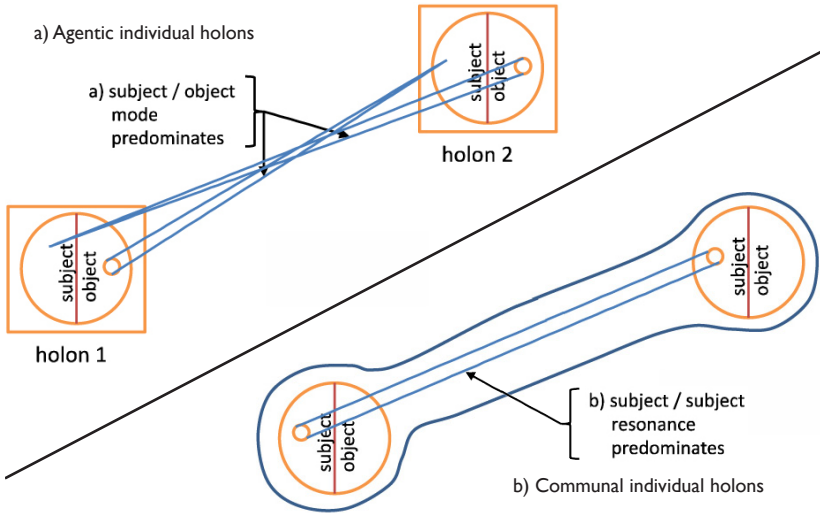

Fig.2: The two ways of relating in the holonic dyad

By contrast, the *subject/subject way of knowing* is rooted in an individual's subjective experiences of the world, which are private, internal events particular to the individual experiencing them. The bag of groceries that objectively weighs twelve pounds may feel subjectively lighter to an athlete but heavy to a frail, older person – or it might start to feel medium-heavy to someone after carrying it a few blocks and feel really heavy by the time she makes it home. Once we can acknowledge that perceiving other individuals (or elements of nature) is an inherently subjective challenge, we can realize that "the other" is *always* a richer, more complicated entity than our "objective" ways of knowing can encompass. Subject/subject knowing, then, is a way by which we can embrace and reclaim the "wholeness" of "other" individuals and nature.

As the individual develops from childhood to adulthood its individuality crystallizes against the forces of the group (family, peer pressure, societal norms, etc.) to which he/she applies the subject/object-based epistemological relation of two individual holons (Fig.

2a) that constitutes the basis of individual agency (and its social communion). This is necessary for the proper development of individual agency. However, once a person reaches adulthood, he or she becomes aware of the inherent subjectivity in everyone's cognition and with this capacity can begin to implicitly identify with "the other" in an empathic way – a connection called "subject/subject resonance" (Fig. 2b). This empathetic connection between two individual holons – to treat another as you would wish to be treated – constitutes the basis of individual communion with "another." The subject/subject resonance over time increases the social agency among a group, or what might be called the strength of "holonic togetherness."

By the terms of holonic logic, just as one individual cannot logically exist as a subject/object except in relation to another subject/object individual, so every individual is embedded by way of holonic resonance in a larger structural whole, the collective. This implies a dynamic, dialectical interplay of "individual mind" and "group mind." The agentic and communal poles of both individual holons and social holons blend in a kind of cross-dialectical model. (See Fig. 3.) The social holon exerts its agency through its cohesive structure, which applies a "counter-pressure" on the developing individual holon. This helps maintain the coherence and shared purpose of the social holon. At the same time, the social holon exhibits *communality* through its openness to other species and cultures. In human terms, this may consist of everything from intertribal mixes to culturally complex nation-states and now global culture.

The "world arises" in each moment as an individual in the subject/object mode of relating encounters "another" in a subject/object mode of relating (Fig. 3a). At the same time this evolves and unfolds in relation to the holonic togetherness that arises through the subject/subject resonance of group-mind and nature-field at every level (Fig. 3b). The psychologist routinely sees individuals struggling to integrate this "holonic dichotomy" – the need to develop individual agency over and against societal norms, that is, to differentiate themselves, while being integrated and "accepted" by the others at the same time (Fig. 3a). From another perspective, the sociologist sees

societies as complex holons of individuals coming together through cultural paradigms, shared beliefs and narratives, and continuously evolving through each individual's own development (Fig. 3b).

The psychologist's view presumes an *agentic society* grounded in resonance and immediate commonality, while the sociologist's view presumes a communal society grounded in intentional agreements. Neither approach leads to the other: they are different (polar) ways of understanding the same world. But they are partial perspectives that holonics seeks to integrate. Holonic systems embrace in equal measure both the individual with its differentiated agency *and* the collective (the group/team, society, the state, etc.) on the same level (horizontally). This integration occurs on the same level because the collective does not constitute a *higher level* whole or a *separate environment* of which the individual is merely a part; the integration is a result of *both* individual agency and communion with the collective, reconciling their differences through the mechanisms of holonic interdependence – a kind of "synergistic togetherness" that blends the individual and the social.[7]
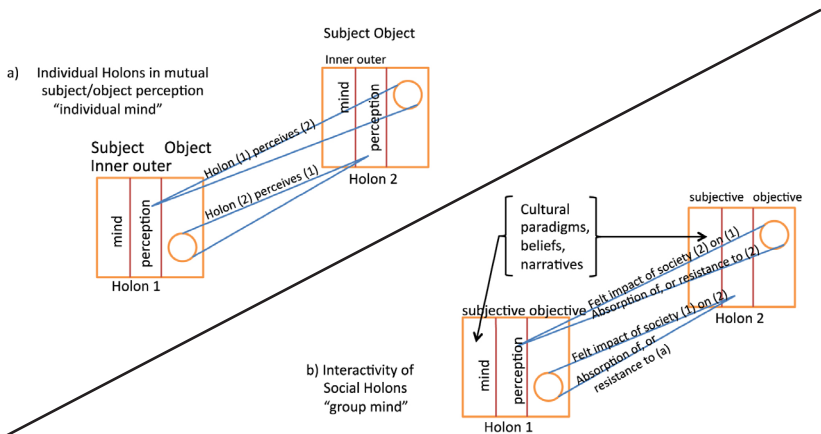

Fig.3: The two polar ways of understanding: a) "individual mind" and b) "group mind"

Most of the problems we face today stem from an overemphasis on the subject/object ways of relating to one another and to the world in general. This way of knowing and relating privileges indi-

vidual agency and the propensity to build rigid individual hierarchies that do not take account of intersubjective cognition. An individual approaches "others" and the world from a solipsistic perspective and treats everything as subservient to individual wants and needs. At its extreme, this paradigm of beliefs and narratives manifests as the reductionist "man reigning over" nature and everything else in the Universe – a paradigm that has been disastrous in all areas of life, from climate change and energy crisis to societal and organizational governance.

However, as individual agency *and* communion move toward a balance, so do sociocultural agentic and communal ways of being and relating. As a society, we are now witnessing a shift away from maximal agentic individuality and social communion, toward an intensifying individual communion and social agency. The dialectical "either/or" which constitutes the familiar dualisms of subject/object, mind/matter, individual/social, and the cognitively dissonant "right/wrong," is beginning to move toward a new polarity of "both/and," which is characteristic of the subject/subject resonance. The subject/subject mode of knowing is becoming more deeply valued as we rediscover our place vis-à-vis each other as well as within nature and the Universe.

The time has come for us to step down from the top of our imaginary hierarchies to integrate ourselves within the larger whole(s), at the same level. This can only be achieved by approaching "other" and "nature" with empathy, which gives rise to a greater communal holonic resonance. This reorientation is key to redesigning societal rules that will turn us from selfish predators into altruistic, generative creators,[8] and to redefining our relationship to nature from scavengers to responsible caretakers. A new social agency begins to arise rooted in local group identity, which manifests through a culture of deep caring and understanding of "the other" from "the inside," approaching all living creatures, nature and the universe with the same desire for their well-being as we have for ourselves.

Reconceptualizing Social Change: Holonics as a Moral Choice

How can such insights help to change the societal game? The current set of rules, shaped and amplified by modern technology, essentially require business models based on increasing returns to scale (a scenario that classical economics deemed impossible). Contemporary rules also favor single winners with world-spanning power along with a diminishing circle of people controlling a greater and greater proportion of our society's wealth. Under these circumstances, markets, individual self-interest and libertarianism are incapable of solving societal and environmental problems because they are committed to the illusion that man occupies the top of a cosmic hierarchy and that power and politics are tools to enforce certain rules that favor "winners." This perspective is unable to encompass care about human beings in their wholeness, as can be actualized, for example, through the commons and by working together for the greater good. While Adam Smith may have theorized that the Invisible Hand would naturally and automatically yield the common good, his ideas were born in a society with pervasive social, political and legal constraints on individual license.

The challenge of our time is to embrace the reality of group interests and to devise governance systems that include those marginalized by elites who have commandeered "the system" to secure their economic authority. Collective provisioning, as in group health insurance, is not a state-based "socialism" but in holonic terms, a blending of the interests of the whole *and* of each and every individual. Having won the most significant battles against labor, companies and investors are now buying the electoral process – the very set of "governance rules" on which the "winners" thrive in our "pathological" society. It is time to change the rules with more inclusive and generative ones and embed them into constitutional systems that can enable free flows of creativity in trusted structures that are resistant to capture.

The great appeal of holonics is that it places societal communion at its core, giving the human spirit a chance to address our massive failure of social governance. With the *human* compound-holon that we know as society *and* as the individual, the logic of holonic sys-

tems offers a way to reconcile the two polarities of individual agency and social communion. Holonics insists that we recognize subjective experience as a legitimate domain of inquiry equivalent to the privileged objective domain of traditional science. At the same time it clarifies the logical, interconnected relations of individual and society.

Taking holonic principles seriously, however, requires a whole new mind – one that allows the range and diversity of our ontological narratives to continuously compose and decompose themselves. This new mind enables us to become participants in a persistent plurality of novel relationship that embraces differences and thrives on them. The incommensurability of beliefs that pervade our lives can serve as a source of generative novelty in a unified process of "shared becoming." Holonic principles invite us to move beyond the idea of separation and conflict, which are the only plausible ways for the dualistically constructed dialectical mind ("either/or" – "right/wrong") to resolve differences.

With the logic of holonic systems we can redesign our relationship and relatedness to others in the social web. It is possible to construct open, self-organizing fellowships of personal commitment and shared response-ability, in an intimate field of deep interpersonal relatedness and care. In this field of holonic resonance, we are better able to develop clear mind, right body and vital spirit with agency: our personal journey toward self-mastery.

But it is also evident that the greatest strength and power reside in social communion as the relational ground that unites each fellow into a more excellent whole. We can reimagine the design rules of our education, politics and business systems with a focus on discovery and wisdom. We can design processes that enrich the qualities of interdependent care, integrated development, and deeply shared trust that arise from basic human kindness and well-being. Generative transpersonal fields that reclaim both the individual and the collective are capable of transforming the world in powerful and extraordinary ways.

One result of cultivating generative transpersonal fields is that new sorts of creative clusters can self-organize in new, emergent

ways. This can foster both human evolutionary development as well as technological development, producing unprecedented flows of local "socio-technical combinatorics."[9] (See Fig. 4.) Another result is a new emphasis on collective diversity over and against the forces of global homogenization, which dismisses the uniqueness and diversity of each individual. Having over-emphasized a "social communion" in which the individual is depleted of its "unique flavors," such homogenization has squandered the particular gifts and talents that each individual can contribute to the "whole" and thus the richness of the whole. By reclaiming the individual in its wholeness of "flavors," holonics unleashes this very richness of social agency into a new world order. The creative expression arising from every "group mind" can produce a synergetic blend of diversities (whether local or virtual) that can offer effective solutions to the challenges facing us while enriching the global tapestry of life on our planet.[10]
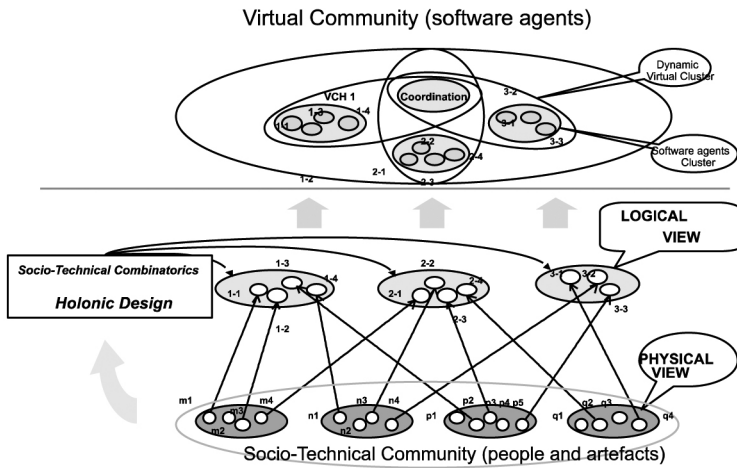

Fig. 4: Holonic Software Infrastructure

Holacracy: Holonic Design for Agile Organizational Governance

The types of interpersonal relations and authority that industrial organizations rely upon (entirely based on subject/object modes of interaction) naturally result in either competition, consensus or compromise as the default modus operandi. These are nongenerative patterns that run our rigid institutional hierarchies. They obstruct great

flows of creativity and innovative potential. The logic of holonic systems can unleash entirely new and generative forms of human relationships and organizations in which the total is greater than the sum of the parts.

A promising alternative is *holacracy*. (See holacracy.org for more details.) The term is meant to emphasize a departure from conventional representative democracy as a governance system ("of the people, by the people and for the people") and instead embrace governance of the organization, through the people, for the *purpose*. Holacracy embeds a generative mix of autonomy and cooperation in a flexible fabric of *holonic design constitutional rules*. It constitutes a new operating system for organizations that regulate the individual / group dynamics to eliminate on one side the possibility of capture via power games, and on the other side, the inherent chaos characteristic of "leaderless," decentralized organizations.

In a holacracy, all the top-down supervisory and managerial positions are essentially torn down and replaced by accountability to the self and to the "team holon" (named Circle). Roles identify the activities and services necessary to achieve organizational / group objectives. As a "holonic organizational design technology," holacracy achieves adaptive governance through regulations that foster collaboration via flexible policymaking adjustments with a focus on disempowering ego-based competition, destructive tendencies and other forms of ineffectiveness. Such outcomes are assured by spelling out personal accountability functions for each role and by hosting a democratic process that assigns Key Roles endowed with higher authority. For example, a designated "Facilitator" ensures that the constitutional rules are followed.

Every participant in a holacracy is a sensor for what is going on, and each plays a role in identifying the tensions in a timely way while taking active steps to resolve them. Effectiveness and resistance to capture are achieved by enhancing the power of collective decision locally via procedures such as: "After taking Individual Action, a Partner should tell any affected Role about it, and, on their request, initiate actions to resolve any Tension created by the Individual Action or refrain from taking this Individual Action again in the future."

Self-organization and flexibility are ensured via policies such as: "A Circle can remove a Sub-Circle through governance by (a) removing the Sub-Circle entirely, including all Roles within it, (b) collapsing the Sub-Circle into a single Role, thus removing all Roles within it, or (c) dissolving the Sub-Circle's boundary, so that all Roles within it are absorbed by the Circle." The only valid "Governance" acts of a Circle are to create or amend Roles, Policies or Sub-Circles, or to hold elections. For a proposed Governance change to be processed and accepted, it must meet some criteria: A Proposal is generally valid for processing only if it helps one of the *Proposer's* roles, unless the Proposer has permission to process tensions for another Role. However, evolving the Governance to better reflect what's already happening is always allowed, even if unrelated to the Proposer's roles, as is calling for an election.

As a mode of governance for *purposeful organization*, holacracy works by a generative distributed authority structure designed to always sense tensions with clarity and to resolve them promptly through governance meetings. This results in healthy communion that drives group integration and "team spirit." In tactical meetings, this process results in clarifying individual accountability as it affects synchronization. As a governance system based on the rules of holonic interdependence, holacracy optimizes creative flows through a flexible organizational structure that radically changes how decisions are made and how power is distributed.

Holonic Software:
Infrastructures for Open Networks as Catalysts for Change

Since networked computing and the Internet stand at the center of societal transformation right now, it is worth asking how software design might be used to advance holonic principles. Holonics opens the perspective of designing participatory software platforms for catalyzing social networks that help people step out of hierarchies and avoid pathological organizations. Holonic-based platforms can be a tool for people to reshape society and the world by cultivating harmonious, enlivening relationships with natural ecosystems through better managing the commons. To harness the power of large-scale

social ecosystems, one can conceptualize their social dynamics using holonic logic and embed holonic design rules in the network protocols and software coordinating their interactions.[11] (See Fig. 4.)

Holonics-based software can also be used to design smart infrastructures for self-stabilizing energy grids, self-deploying emergency task forces and self-reconfiguring manufacturing plants that all rely on a myriad of mobile devices, software agents and human users who use local rules and peer-to-peer communication to build their own resilient "governance" (workflow coordination) network.[12]

An intrinsic challenge in such holarchies is the "cohabitation" or integration of two ontological levels: the physical one (humans and artifacts cooperating) and the logical one (software). The logical/software ontology must emulate the physical ontology through software entities (agents) that enable the coordination of cooperative tasks. (See Fig. 4.)

This enables the deployment of a living, self-directed "digital ecology" in which humans are not just "consumers" of data and computing applications. Actors in this social network operating environment are much more: They are producers, "players" and "inputs" in a new "socio-technical combinatorics" ecosystem. Their interactions, mediated by digitally animated artifacts (mobile phones, tablets, laptops, and Google Glass-like devices and more futuristic brain implants), can be coordinated and synergistically orchestrated to steer complex, interdependent global-scale systems.

Thus holonics offers a powerful "design toolbox" of methods and techniques with which to construct the architecture of such digital ecologies. Holonics can be the basis for a host of "smart infrastructures" for a sustainable world that include production, agriculture, defense, finance and the economy as a whole. In this sense, holonic institutions aspire to invent new notions of sovereignty beyond the nation-state. Yet the most important new vector of holonic sovereignty is surely the sovereignty of individual humans to protect fundamental human rights and self-organize new types of collective institutions in transnational ways.[13]

Professor Mihaela Ulieru works with many governments and organizations seeking to make ICT an integral component of policy making for a healthier, safer, more sustainable and innovation-driven world. She founded two research labs leading several large-scale projects which tackle the management of complex situations through more organic ways of governance, such as IT Revolutions, Industrial Informatics, Future of Medicine, Socio-Technical Combinatorics, Adaptive Risk Management, Living Technologies and Emulating the Mind. For her scholarship on holonics applied to mitigate global challenges in an interdependent world she was awarded, among many others, the "Industrial Research Chair in Intelligent Systems" and the "Canada Research Chair in e-Society" to explore organizational and societal transformation in the digital economy and the emergence of participatory platforms.

Notes

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