Collective Intelligence,
The Invisible Revolution

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Abstract

The main stakes for humanity are not hunger, poverty, sustainability, peace, healthcare, education, economy, natural resources or a host of other issues but our capability to build new social organizations that are able to provide solutions. Our main stake is Collective Intelligence.

This is a key issue in the corporate world as well. Today most large companies encounter insurmountable difficulties when dealing with the complexity and the unexpectedness of the world when operating against a global backdrop. They undergo conflicts of interest in many areas – between profitability and sustainability, secrecy and transparency, values and value, individual and collective dynamics, and knowledge fertilizing – that opens – and competition – that closes.

What most medium and large organizations have in common is an infrastructure based on pyramidal hard-coded social maps, command and control, labor division, and a monetary system stimulated by scarcity. Until recently, this social architecture was the only information system at our disposal to pilot and organize complex human edifices. We call it *pyramidal intelligence*. It remains efficient as long as the environment remains stable, but it becomes vulnerable and inefficient in fluctuating contexts, namely when markets, knowledge, culture, technology, external interactions, economy or politics keep changing faster than the capability of the group to respond.

Evolution has provided mankind with specific social skills based on collaboration and mutual support. These skills reach their maximum effectiveness within small groups of 10 to 20 people, but no more, where the individual and collective benefit is higher than what would have been obtained if everyone remained alone. We call it *original collective intelligence*. As individuals, we all know what it is because it is very likely that we have experienced it at some degree in our lives.

Well-trained, small teams have interesting dynamic properties. These include transparency, a gift economy, a collective awareness, a polymorphic social structure, a high learning capacity, a convergence of interest between the individual and collective levels, interactions characterized by human warmth, and, above all, an excellent capability to handle complexity and the unexpected.

Is it possible for large organizations to benefit from the same properties? Can they become as reactive, flexible, transparent, responsive, and innovative as small teams? Can they evolve even further, toward a global Collective Intelligence? Can they conjugate their interests with overriding concerns of humanity such as ethics, sustainability, etc…? The answer today is a resounding yes. It is not only possible, but absolutely necessary for not just the efficiency of these organizations but above all for the well-being of human society.

The aim of this paper is to provide the key concepts underlying collective intelligence and to explore how modern organizations and individuals can concretely learn how to increase their collective intelligence, i.e. their **capability to collectively invent the future and reach it in complex contexts**. This will draw the guidelines of a universal governance, provide an outline of the next democracies and help us forecast an economy in which competition and collaboration as well as values and value are reconciled.

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Are we condemned to individual intelligence and collective incapability?

The problems that exist in the world today cannot be solved by the level of thinking that created them.
Albert Einstein

Why do so many human organizations such as companies, governments, administrations, associations, etc…, that are composed of smart and sensible individuals, act in silly and even destructive ways at the collective level, often against the very will of their own participants?

Why don't large organizations[1] have the same flexibility and adaptability as small groups of people? Is the fact they are *big* the real cause of this dysfunction?

Are operational effectiveness as defined by parameters including objectives reaching, project management, etc… and democracy at odds with each other? If the answer is yes, then we must also admit to the startling conclusion that a democratic country is not manageable. If we reply no, then why are companies and organizations in general not democratic spaces?

Why has the free software community, without any hierarchy and decisional center, begun to make products that have higher performance than those of the private industry?

When writing "*What interests me is not the happiness of all men; it's the happiness of each man*", Boris Vian declared individual and collective stakes as irreconcilable. But if we postulate that individual happiness is desirable, what gives us the assurance that the happiness of one person will not be harmful to the happiness of another? Is acting for the collective good possible only at the price of individual alienation? Is acting for oneself systematically harmful for the community? Are individual and collective interests reconcilable?

Whether the problem is global warming, the decline in biodiversity, world peace, education, healthcare, commerce, employment, technology breakthrough or any other, none of these can be described and understood in their wholeness by organizations as we know them today. They cannot be solved because we are not sufficiently intelligent at the collective level. Who, in daily life, doesn't suffer from the *lack* of collective intelligence? Are we condemned to individual intelligence and collective incapability?

Is it possible today, with potent information technologies (ITs) and communication capabilities of cyberspace, to organize individual intelligences into new social organizations that are able to catalyze a true **global collective intelligence** that could embrace and then transform the complexity of the world into a manageable landscape?

There is no doubt that Collective Intelligence is now lurking and being expressed just beneath the surface of the questions we are raising. **Humanity's stakes rely less in the nature of the issues than its capacity to invent social structures able to solve them, which makes Collective Intelligence a survival stake for humankind**.

This is the reason why in the last few years Collective Intelligence is becoming a full discipline, with a theoretical frame, a practical know-how, defined research domains, methodologies, and heuristics. Its aim is to maximize the range of action and the potential for freedom of human communities in a context where most challenges we meet appear too complex to be solved, at least with our present organizations. Collective Intelligence develops the levers of universal governance and aids in acquiring the ability to pilot in the capricious weather of complexity. Isn't it worth investing efforts and means? Wouldn't states, enterprises, institutes, universities and countless others find some advantage in investing their money to offer themselves the means of

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[1] We will use 'organizations' as a generic term to refer to companies, administrations, societies, institutions… in other words a whole organized as such.

their own evolution, not to say their own *survival*?

The aim of this article is to present a quick tour outlining the stakes involved and the development of such a Collective Intelligence. Note that the capitalized term Collective Intelligence is used when referring to its emergent and global level. This will be studied in more detail below.

After a review of the different forms of collective intelligences, we then will explore the state of the art of this discipline. What are its stakes? Who are the players?

We conclude with how such concepts affect our daily life. How can we, in our present social and professional life, *concretely* augment our collective intelligence? What training is required to accomplish this? What individual actions are necessary? What should be expected?

Of course one can obtain only a general view of this topic in the limited space of this article. This is an invitation to a fascinating journey. If this practical guide – which raises more unanswered questions than solutions – arouses your curiosity and gives you the desire to participate in this beautiful adventure, then it will have achieved its goal here.

Collective intelligence is neither a new concept nor a discovery. It is what shapes social organizations – groups, tribes, companies, teams, governments, nations, societies, guilds, etc… – where individuals gather together to share and collaborate, and find an individual and collective advantage that is higher than if each participant had remained alone. Collective intelligence is what we term a positive-sum economy.

On a strictly behavioral level and if we exclude the symbolic layer of culture, collective intelligence communities are not exclusively a human prerogative, these are observed within many social animal species, from the ant-hill to the wolf pack and the fish shoal, when the emerging level is manifestly smarter than its individual components.

In human societies, different forms of collective intelligence coexist and mainly coordinate and express themselves in the symbolic space. Let's review them so that we are able to understand the mutation and evolution towards a Collective Intelligence (with capital letters) at the planetary level.

The Original Collective Intelligence

Original collective intelligence, endowed to us by evolution*,* is merely the intelligence practiced in small groups. We all have a direct experience of it, whether in our work, our community life, in team sports, in reflection groups, etc… Each of these contexts involves a small number of people placed in sensorial – i.e. spatial – proximity with one another.

This 'optimal' group formation also shows up among some social mammals, like wolves, dolphins, elephants, some big cats, or monkeys. All have in common the fact they coordinate around an object: the prey, a threat, a toy (stick, stone, water, baby prey, etc…). Thus, with coordinated encircling techniques and attacks, the pack of wolves can catch a prey that is bigger, faster and stronger than any individual wolf.

Such types of organized communities are numerous in humankind. Apart from sports and games where players are coordinated around material objects, most communities in daily life use objects from the symbolic and cultural space. But the dynamics remains fundamentally the same since our senses and our spatial engagement are solicited in a very similar way. Let's review a few examples that we are all familiar with, they will ultimately serve as references that will facilitate our thinking:

In a sports team, each player is an expert who knows what must be done in real time in relation to the perceived global situation. The team acts as a homogeneous and coordinated entity without a structure of hierarchical that directs how information is followed. Objectives such as scores are reached in an extremely complex context. In the same sport, each team is different from one another and has its own personality. Each is a *whole* that cannot be reduced to only the sum of its parts.

In a jazz band, each player perceives the global melody in real time and, upon which, accordingly adapts his or her musical play, sometimes in an improvised way, sometimes in a predetermined manner. The way the piece is played defines what is considered as the *style* of the group, these traits that make it recognizable among all the others.

As for **the meeting room**, it is structured to place each participant in a spatial and temporal proximity that allows all to perceive everything that happens: talk, gesture, mood, mimics, writings, etc… It is the established place where the feeling of belonging to *something*, even temporary, is generated. It is where the tight, friendly, studious, or whatever *spirit and mood* of the community can exist. The aim of the meeting room is to steward collective intelligence via its spatial architecture.

Characteristics of original collective intelligence

What are the observable phenomena in the previous examples? They are too numerous for an exhaustive exploration, but let's list seven of the most significant ones. They give us enough grain to grind in order to understand some of the big theoretical and practical principles of original collective intelligence.

1. **An emerging whole:** each jazz band, sports team, working team has its own *personality*, a *style*, a *spirit* to which we refer as if they were an individuality. When we emphasize the success, the quality and the unity of a group, it is another way to express the fact that this *Whole* appears so obviously.

2. **A 'holoptical' space:** the spatial proximity gives each participant a complete and ever updated perception of this Whole. Each player, thanks to his/her experience and expertise, refers to it to anticipate his/her actions, adjust them and coordinates them with the actions of the others. Therefore there is an unceasing round trip, a feedback loop that works like a mirror between the individual level and the collective one. We define **holopticism** as this set of properties, that is the 'horizontal' transparency (perception of the other participants), and the 'vertical' communication with the emerging Whole. In the examples above, the conditions of holopticism are given by physical 3D space; our natural organic senses then serve as interfaces. The role of a coach, or an external observer, consists in encouraging the conditions for holopticism.

3. **A social contract:** whether it is musical harmony, game rules, or work legislation, the group is shaped around a social contract, tacit or explicit, objective or subjective, that is accepted and staged by each participant. The social contract is not only about values and rules of the group, but also the means of its self-perpetuation.

4. **A polymorphic architecture:** the mapping of relationships is continuously updated depending on circumstances, proficiency, perceptions, tasks to accomplish, or relational rules based on the social contract. It gets strongly magnetized around talents or expertise. Then each expert, as recognized by the group, takes the lead one after the other to act according to needs. In a sport team for instance, the right-winger becomes the leader when the ball comes into his space, but it can happen that he becomes the goalkeeper when the situation requires it.

5. **A circulating object-link:** as Pierre Lévy explains so well in a paper called *Collective Intelligence and its objects* (1994), "*The players use the ball simultaneously as an index that turns between individual subjects, as a vector that allows everyone to design everyone, and as the main object, the dynamic link of the collective subject. We shall consider the ball as a prototype of the linking-object, the collective intelligence catalyzing object*". Melody, ball, objective, or 'objective' of the meeting, no doubt that original collective intelligence gets built upon convergence of individualities toward a collectively pursued object, whether or not the object is a physical or symbolic one (a project for instance). When they belong in symbolic space, it is an absolute necessity that these objects must be clearly identified and united in their number and quality by each participant of the group, otherwise this leads to some of those fuzzy situations that all of us have already painfully experienced.

6. **A learning organization:** the learning process not only operates at the individual level, but it also involves the existence of a social process that takes charge of mistakes, and integrates and transforms them into shared cognitive objects. It enhances the development of the relational intelligence, what we learn for ourselves is useful for others.

7. **A gift economy:** in the competition-economy, the one we know today, we pick something for ourselves in exchange for compensation, most often money. In the gift economy, we give first, then we receive once the community has increased its wealth. Raising our children, taking care of the elderly, giving our sweat to a sports team, being involved in an NGO, or helping each other in the neighborhood are examples that demonstrate that the gift economy is the absolute

base of social life. This is so obvious that we are generally unaware of it. Could any community be sustainable in the long run if it relied on the dynamics of individual sacrifice? In the gift economy, each participant finds a strong individual advantage that motivates him to give the best of himself. The gift economy organizes the convergence between individual and collective levels.

Emerging whole, holopticism, social contract, polymorphic social architecture, circulating objects-link, learning organization, or gift economy, here are the main qualities that we will find in all communities in which original collective intelligence is at work. Each characteristic is all at once the cause and the consequence of the other characteristics. None can be taken separately. The more they are developed and coordinated, the more the community is able to evolve and create the future in complex, unexpected and uncertain contexts.

The natural limits of original collective intelligence

If we stick to the definition we have adopted, original collective intelligence meets **two natural limits**:

- **In number:** only a limited number of participants can interact efficiently otherwise a too-high level of complexity is quickly reached that generates more noise than effective results. This then strongly limits the capacity of the group;

- **In space:** participants need to be physically together in close range so that their natural interfaces (organic senses) can interact. This way they can apprehend the global picture of what happens (holopticism) and adjust their behavior accordingly.

This is the reason why we never see any sport played with eighty players. This limitation is also true for jazz groups, corporate meetings, etc… When the number of participants and the intervening distance become too large, a division generally occurs. However, other strategies, other organizations have been developed along evolutionary lines. We are now going to review them.

'Civilization', and pyramidal intelligence

How can the two limits of original collective intelligence – the number of participants and distance separating them – be bypassed? What social machinery could be implemented in order to coordinate and maximize the power of the masses? How could communities of communities be harmonized and synchronized? For tasks such as building, planning, cultivating, transporting or manufacturing and creating such as erecting temples at the glory of the Gods, human works required more and more muscular strength as well as specialization, namely a large number of participants. This was a situation that characterized the beginning of history (defined as the birth of writing) and the early days of large civilizations.

This mutation is absolutely original since it was accompanied by almost no perceptible change in our physical constitution. It has not been duplicated in the animal world. Our brain, our body and our genetic code are the same as they were a few tens of thousand years ago, yet all has changed. The drama is also played out on another stage, the *noosphere* – the mind – on which the 'invisible' ecology of symbols, myths, knowledge, beliefs, and data, is what organizes the social life that is visible to our organic senses (*biosphere*).

With the invention of writing, man entered the era of the territory. Signs engraved on physical supports were first used for counting, managing, norming, laying down the outlines and the surface of a territory, list, defining belongings and exclusions as well as permissions and restrictions.

For the first time, a message was able to circulate without being physically attached to its issuer. The qualifier, the fact, the counting, the law, the description, etc… were objectivized in the circulating object bearing symbols. This sealed the object-signifier-signified trio.

This symbolic labeling of the world was also applied to humans themselves. Thus name, profession, qualification, wealth, facts, misdemeanors, caste and lineage became important attributes that positioned an individual in the social geography. Writing is, in essence, the core technology of the State.

Equipped with this extraordinary capacity to send signifiers over long distances toward a virtually unlimited number of recipients, *pyramidal intelligence* was launched and gave birth to civilizations and their States.

By **civilization** we mean a human settlement with the following criteria:

- urban concentrations
- work specialization
- writing as an accounting and memorizing technology
- commerce, sustained by a fiduciary technology
- an extended geographical area
- centralized powers
- a culture

This is where pyramidal intelligence is launched.

There are heated debates about additional criteria such as expansion and hegemonic will as another remarkable characteristic of civilizations. Let's keep with this minimal shortlist on which most specialists seem to agree.

As for the **State** term, we will refer to its archaic forms (undifferentiated executive, legislative and religious powers) as well as its contemporary ones (separation of powers). Here again, there are many contradictory definitions regarding the dynamics and ultimate finalities of the State.

The four dynamic principles of pyramidal intelligence

Four fundamental principles constitute the universal signature of these human edifices, no matter whether these are companies, administrations, governments, armies, religious organizations or empires. These are:

1. **Labor division:** everyone has to cast himself in a predefined role in order to make people interchangeable. An immediate corollary is the division of access to information, which establishes a context opposed to holopticism, i.e. *panopticism* – controlled and partitioned information – that we will detail later;

2. **Authority:** from divine right, by filiation, by merit, by expertise, by law, by diplomas, etc… No matter the legitimating principle, authority institutes a pawl effect, a dissymmetry in the information transmission between the emitter and the receiver, and sets up a *command and control*[2] dynamics (C^2). Authority determines the rules, assigns rights and prerogatives, organizes the territories (and thus labor division), and distributes wealth by means of money;

3. **A scarce currency:** money is historically a social convention and an information system made to allow the market to function. It serves as a medium of exchange and a store of value. Unlike what many people believe, scarcity is not an inherent quality of money, but an artificially maintained property. Scarcity generates channels of allegiance from those who need toward those who have. It naturally catalyzes the hierarchies of pyramidal intelligence. This phenomenon of hierarchization is strongly accelerated by the *Pareto effect* (the more we have, the more we earn) that we will explore later;

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[2] It is necessary here to make a distinction between *authority* and *leadership*. *Authority* is a dominating and controlling position that is generally institutionalized (a General, a faculty dean, a CEO, a patriarch, a State President, etc…), whereas *leadership* is a recognized quality within the community, it doesn't necessarily involves a determined social status and can be questioned at any moment (the term *natural authority* is also used).

4. **Standards and norms:** they allow the objectivizing as well as the circulation and the interoperability of knowledge within the community. Language is itself a standard. As for circulating artifacts (electronic components, pieces of machinery, materials, etc…) they all have a 'jointing pattern' made to chain their added value and build more complex functional sets[3].

The strength and the stability of organizations built on pyramidal intelligence largely stem from the fact its four founding principles mutually reinforce and legitimize themselves. Wealth is distributed by those in authority, hierarchies are catalyzed by scarce money, inclusion-exclusion rules are established by standards and norms, and so on.

Today pyramidal intelligence still drives most aspects of human organizations. From the point where the number of participants and the intervening distances exceed that inherent in original collective intelligence, this basic form of such intelligence is no longer possible. By organizing and synchronizing communities based on original collective intelligence, pyramidal intelligence has permitted creating and governing of cities and countries, invention of aircraft, launch of satellites into space, establishment of gigantic armies, conducting musical symphonies, discovery of vaccines, etc…. Furthermore, during the past 120 years, the rapid growth of telecommunications has significantly increased the growth in and power of this form of collective intelligence.

As a master in the science of economies of scale, pyramidal intelligence excels in piloting repetitive processes of transforming power applied to a given raw 'mass' such as matter, population, data, etc… in order to generate added value. Assembly lines, teacher training, administrations, armies, marketing, commerce, politics, mass medias, computers, etc…, all these domains are structured around these universals about economies of scale. Even the most abstract consulting company today, whose mission statement is to produce knowledge from its social capital, is structured in such a way that these economies of scale and repetitive pattern principles can be applied. These are the foundations – often raised to the level of a dogma – of our present economic paradigm.

Limits of pyramidal intelligence

Of course pyramidal intelligence has also its limits: unlike original collective intelligence, it shows a structural incapability to adapt to the unsteady, unpredictable and disruptive grounds of complexity.

Cross-out qualities, which are strengths in more simple environments, underlie its inherent weaknesses:

- **Work division:** the social architecture (organization charts, job descriptions, information access levels, etc…) is hardcoded. There is no way this structure can self-modify when confronted with changing circumstances, for example as in the case of a sports team. Whatever the efforts made to improve and optimize the flow of information, the intrinsic limits of hierarchized structures will always show up, with their pawl effects and their dynamics made of territories and prerogatives;

- **Authority:** top management, nearly always reduced to ruling minorities are by nature unable to perceive and process the tremendous flow of information that pours into the large body of the organization they are supposed to manage. This generates reductionist visions that become a source of conflict between the 'head' and the base;

- **Scarce money:** scarcity breeds competition which minimizes collaboration, an aspect of the capacity to self-adapt;

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[3] We are not going to detail the difference between 'norms' and 'standards' here. We could also talk about 'culture', a larger and more evocative universe, but this concept remains too approximate and subject to contradictory interpretation in which we don't want to enter for now.

- **Standards and norms:** most of the time they are subordinated to a logic of competition. They serve a strategy of territorial occupation and monopolistic control by means of artificially rarefying knowledge (patents, intellectual property, etc…), rather than maximizing the permeability and the interoperability with the external environment. The most obvious example in the computer world is Microsoft Corporation's Windows operating system, the core of most microcomputers. The end user is dependent on the future evolutions of this code, must struggle to evolve into other environments, and must pay for any extra desired services such as licenses, labels, trainings, etc.

ORGANIZATION SCHEMES

TRADITIONAL   RUSSIA   POLAND

WOMAN'S ORGANIZATION   ARABIAN COUNTRIES   LATIN AMERICA

SOUTH AFRICA   VATICAN   U.S.A.

CHINA   FRANCE   TURKEY

Source: internet
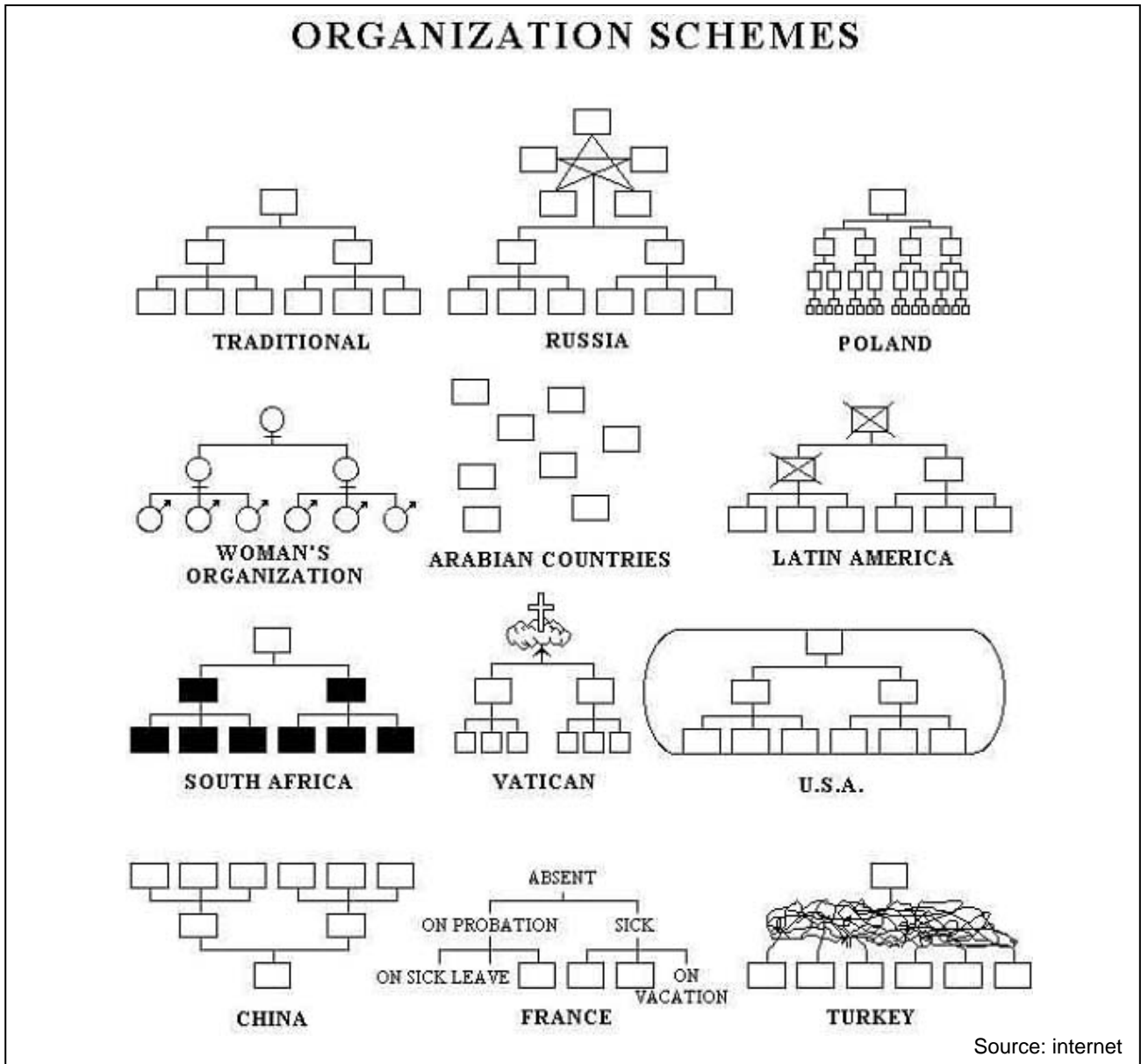
Indeed today's organizations are larded with infrastructural and human 'cabling' that are made to counterbalance the weaknesses of strict hierarchical architecture: information systems, intranets, KM, project oriented organization, works councils (that shuffle human relationships), ERP, HR management, etc. But the fundamental structure remains, based on the industrial dynamics of mass transformation via the principle of economies of scale.

Today we suffer cruelly from the limits of organizations based on pyramidal intelligence. Their deficiency in face of systemic complexity is expressed by a common symptom: the fact they

wander into directions that can be opposite to the will of their own participants, either because internal coordination is virtually impossible, or because leaders use *de facto* opacity – even cultivate and legitimate it – to take advantage of their power.

Swarm intelligence

Insect societies have a working model that is very different from the human one: a decentralized model, based on the cooperation of autonomous units with a relatively simple and probabilistic behavior that are distributed in the environment and are provided only with local information (I mean they don't have any representation or explicit knowledge of the global structure they are supposed to produce or in which they evolve, that is they have no plan at all).

Insects possess sensory equipment that allows them to respond to stimulations: those that are emitted by their peers and those emanating from their environment. Obviously these stimulations are not the same as words or signs with a symbolic value. Their meaning depend on their intensity and on the context in which they are produced; they are simply attractive or repulsive, inhibiting or activating.

In insect societies, the global 'project' is not explicitly programmed within individuals, but emerges after the succession of a high number of elementary interactions between individuals, or between individuals and the environment. Their collective intelligence gets built from a multitude of individual simplicities.

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Insect societies (ants, bees, termites…) have become particularly observed models these past two decades. How can just the interaction of a high number of individually 'stupid' creatures cause the emergence of an intelligent, reactive, adaptable and in symbiosis with the environment? This is known as *swarm intelligence*. It has inspired many computer simulations (swarm computing and cellular automata), all providing fertile discoveries and teachings.

Swarm intelligence is blind because of its lack of holopticism. None of the individuals have the slightest idea of what the emerging entity is. What 'stabilizes' and manages social insects societies comes mainly from external conditions (temperature, weather, dangers, food, etc…) that work like a natural 'container' and provide behavioral guidelines and boundary conditions. Millions of years of evolution were necessary to refine their genetic programming so that large numbers of individuals working in unison could create societies having the stability and robustness we know.

It seems that, in mankind, a certain form of swarm intelligence shows up in the economic domain as well. Each time we make a payment, we make a gesture that is rather similar, in its simplicity and its dynamics, to an exchange between social insects. From the multitude of one-to-one simple probabilistic transactions, a very elaborated collective system emerges, with responsiveness and adaptive properties. This is the way human society manages and balances its resources at the macroscopic level (even though at the local level of organizations, it is pyramidal intelligence that organizes the circulation, as previously stated).

Limits of swarm intelligence

The success of swarm intelligence is subject to the condition that its agents are uniform and disindividualized. The latter, namely anonymous agents among the crowd of other anonymous agents, has a consequence. Individuals are easily sacrificed – even in large scale – in the name of the global balance of the system. Although this fact might seem acceptable for social insects in which each individual is undifferentiated, it is of course not acceptable for animal species whose health and balance depends on individual differentiation. Mankind is a particular poignant example.

Yet this fundamental distinction seems to be ignored by the numerous economic theories that build their models and doctrines on the interaction of undifferentiated agents such as the consumer, the citizen, etc…. The liberal approach postulates that the system should reach its balance at the

macroscopic level by itself, thanks to the action of internal and external constraints (some people will refer here to the famous Adam Smith's expression of the *invisible hand*). Modeling human society as a sum of undifferentiated agents – even with random behavioral variations – constitutes an epistemological mistake at the best, a very dangerous doctrine at the worst. Let's add that the human economic system is a very recent evolutionary spark and that no historical or biological facts can back up the thesis of a so-called natural equilibrium.

For this reason, it seems that the swarm organization is only a transitory stage. It leads to the construction of a new level of complexity that transcends and includes the previous levels. Swarm intelligence that still characterizes our current economic system, will either collapse or evolve toward the next superior level, that of Collective Intelligence.

From collective intelligences toward a (global) Collective Intelligence

> Beyond the range of the media, the subtle machinery of Collective Intelligence will make us hear the voice of the diversity of mankind. Still indiscernible, softened by the hazes of the future, flooding another humanity with its murmur, we have an appointment with the 'surlanguage,' the rapidly maturing yet still infant language of the new intelligence.
>
> Pierre Lévy – Collective Intelligence

The human, by nature, is always in search of a higher level of consciousness that allows him to guide and understand his present condition. This quest happens at the individual level and throughout all humanity.

Original collective intelligence *transcends* and *includes* the individual. It t*ranscends* as a differentiated *emerging entity* appears; it *includes* the individual in a harmonious relationship that fosters his/her evolution and provides him/her meaning.

It seems that neither pyramidal intelligence nor swarm intelligence have proved to be able to *transcend* and *include* original collective intelligence. However, these two forms of large-scale organizations appear like transitory and necessary steps in evolution. Today, everything seems to show that THE transition toward a new level of consciousness at the humanity scale – and not only in small groups – is at work.

Let's note first that the two limitations of original collective intelligence are fading quite quickly. Communities with a very high number of people at a large distance between one another are now beginning to possess, with slight differences, a good part of the properties of original collective intelligence.

What should be added to the seven constituent characteristics of original collective intelligence so that we can shift to a global Collective Intelligence that might include tens to millions of people that *transcends* and *includes*?

These are:

8. **A sufficient currency:** the gift economy does not need to be regulated by accounting processes at the scale of small groups. When it comes to large groups of people, a monetary information system becomes necessary. 'Monetary' here is defined in the way it acts as a medium of exchange and store of value. Thus we are exploring the role of circulating currencies, not scarce, but *sufficient* and available in real time. This point will be detailed later.

9. **Standards and norms:** just like with pyramidal intelligence, standards and norms remain indispensable to organize the cohesion and the degree of permeability and interoperability of large communities. But in the case of global Collective Intelligence, they are issued from ascending emergence processes. Their function aims at maximizing the interoperability and the capability to build functional, ever more complex sets rather than seeking hegemonies in competition contexts.

10. **An information system:** by playing a role in all the properties listed here, it is used to organize and optimize the symbolic space shared by the community. It interconnects our senses via more and more powerful and extended interfaces, it builds and presents digestible synthesis, it processes complex calculus, simulations and anticipations that neither our senses nor our intelligence are able to achieve, it organizes and indexes the collective memory, it counts monetary transactions, it applies the social contract, and it rebuilds artificial holoptical spaces where being in proximity is not sufficient anymore, it puts people in relation with one another according to polymorphism's needs, and it connects us to cyberspace.

11. **A permanent interpenetration with cyberspace:** no community today can pretend to be smart if no exchange dynamics is at work within cyberspace. There we find the most advanced knowledge, the most fulfilling experiences, and the best practices. Then it is our turn to deliver our experience, to link with others, etc… and doing so we give resonance to this echo chamber of humanity.

12. **Personal development:** the mutation toward Collective Intelligence at a large scale cannot happen without a profound individual and societal transformation. We enter into the inner sphere, into the spiritual work linked with our very own existence. We don't have the space to cover this immense topic here which, in any case, leads back to each person's individual journey.

But now the question needs to be asked: who is *me*, and what happens to *us* in this process?

Who is Me?

Social category, culture, nationality, language, identity, professional field, study level and diplomas, religion, political color, 'look', etc… these attributes demonstrate our belonging – or our potential belonging – to the communities upon which the large scale social thermodynamics of our modern societies are built. In this chemistry of pyramidal intelligence, the individual is less considered for his intrinsic qualities, his 'interiority' and singularity, than for his belonging or non-belonging to these functional territorial sets.

In cyberspace there are thousands of ways to exist, to behave, and as a consequence to get into a relationship with the infinite lighting effects of our inner mirrors, via the meaning conveyed by the sign. Publications, presentations, messages, discussions, jokes, shouting sessions, custom profiles made to match needs and wants (buy&sell, employment, social networks, dating, etc…), images, avatars, virtual artifacts, 3D universes, weblogs, wikis, projects, source code (programming), etc… are among the many *semiotic pheromones* that we drop here and there along our journey.

Our relationship to our Self, our interiority, our identity are no longer made by the inclusion/exclusion mold of predetermined territorial sets as defined by a pyramidal structure, but are elaborated within the singularities of semiotic encounters and original communities that emerge from them. Former attributes that positioned us in geographical and socio-professional spaces suddenly become useless and obsolete. We suddenly find ourselves released from the chains of the mass economy.

We can bet that our *image*, this façade of our self that we constantly polish to fulfill social requirements, will fade in exchange for an *interiority* that will attain a social and relational value once it is expressed in the semiotics of networks. It is the very characteristics of our interiority that will reveal to be integrative and the foundation of tomorrow's communities.

The next communities

Still today, for an immense majority of people, the world is seen as a complex game set of nations, companies, and institutions among which alliances, treaties, wars, partnerships, support, commerce, collaboration or competition are played. On this institutional, entrepreneurial and political chessboard, pieces are pyramidal intelligence structures managed by leading elites.
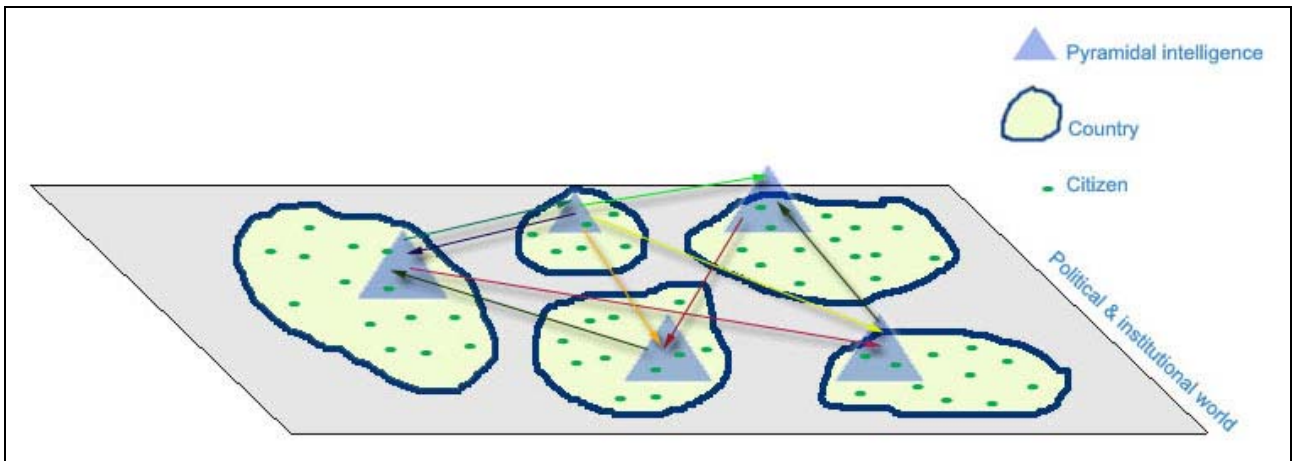
Whether this is by force, democracy, talent, or strategy, acting in this world consists in taking over the controls in a pyramidal hierarchy (political, administrative, entrepreneurial, institutional or media). The seats of power and levers of action are scarce and concentrated.

Incapable of global, decompartmentalized and holistic vision, pyramidal intelligence organizations soon die by making their own accompanying 'pollution' issues in which they suffocate. Getting out of this impasse needs a collective effort that masters the principles of its own emerging process and of its collective consciousness. Thus life invents new more complex forms to solve the deadlocks of its preceding forms.

This new coordination space for human communities is cyberspace.
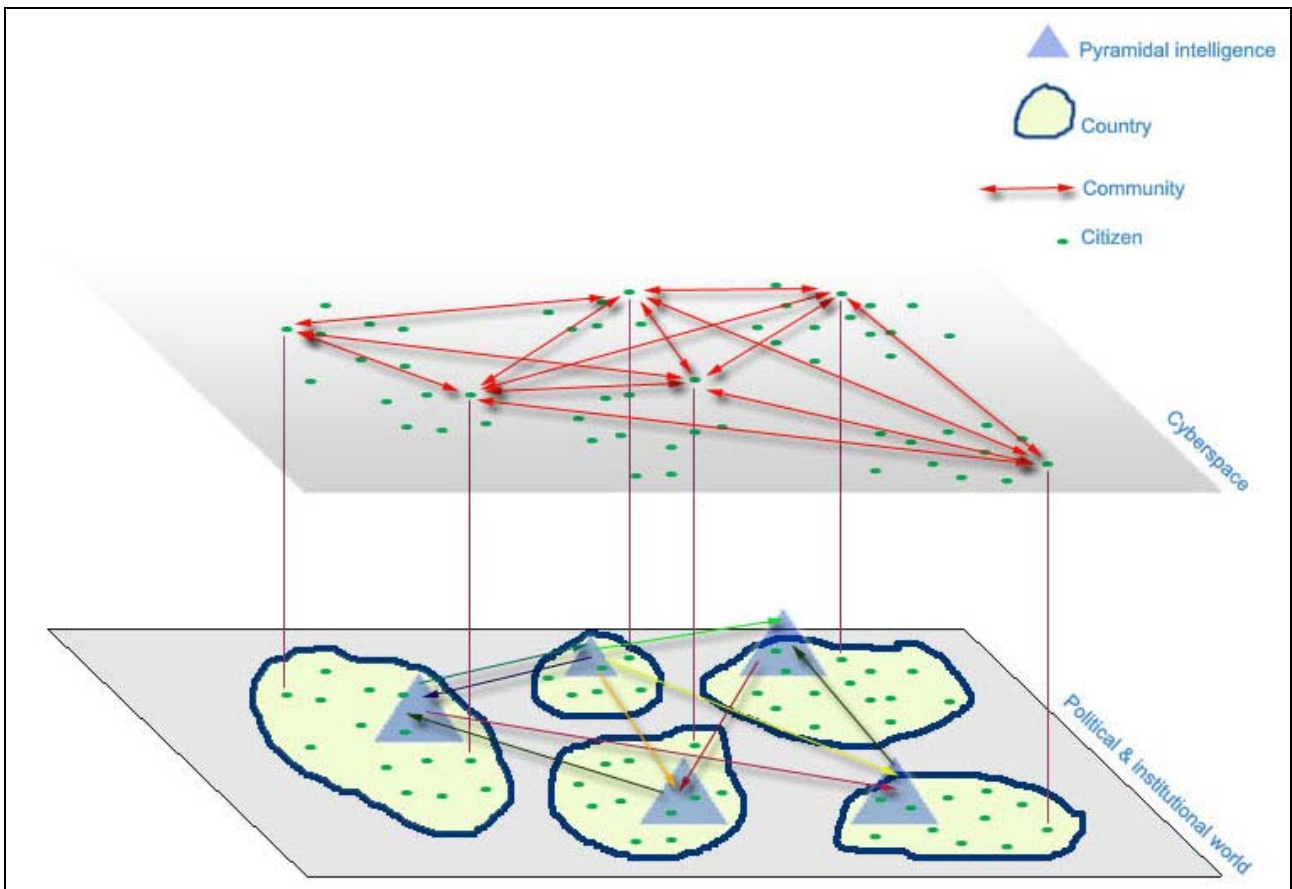
As we have previously seen, there we begin with projecting our interiorities. Our social attributes are not relevant here anymore. Once the individuals are in relation, social software takes over. Its

function consists in working as a catalyst for emerging communities and as a structuring agent. It is through social software that we discuss, exchange individual knowledge, build collective memories and knowledge, share best practices, coordinate actions, etc....

Within just a few years free software communities have reached an operational maturity that makes them capable of creating products equal to and competitive with those of the classic pyramidal industry. It is not only about Linux operating system versus Microsoft, but about most indispensable software for the knowledge economy including office suites, web browsers, communication tools, programming, and standards. Last but not least, free software communities constantly invent powerful 'social software' that allow any cyber-community to shape and coordinate itself in a very efficient manner.

The dynamics of free, concerted and shared action doesn't confine itself anymore to the software world. It is widening to many other sectors, in particular those of clean energy, sustainable development, fair trade, peace, healthcare, and consuming. The concrete achievements of many of these cyber-communities already widely exceed those of classical industrial and pyramidal organizations. On an historical scale, this evolution is lightning quick since it has been happening for just a few years.

It seems that during human evolution communities that stemmed from swarm and pyramidal intelligences have played a role of *transitional transformation* and *regulation* of the original environment in order to produce the energetic substances and the complex bricks of life that allow an evolution toward superior levels of complexity – and consciousness. Today we live in a world that possesses almost everything necessary for this evolution to occur. Ultimately, there will be no more need for competition and conquest to obtain natural resources, energy, manufactured objects, services, knowledge, interconnections, etc… Shortage, ignorance, and poverty are exclusively human and political issues of a humanity that still needs to know and understand itself. Today the stakes are organizational. Our communities potentially possess everything necessary to continue their self-elaboration in a complex environment. This is a new fact in History. (Is this what you are trying to say?

Of course the holoptical spaces shared by modern cyber-communities are still limited and succinct because only two of our senses are involved – sight and hearing. But these gaps are partly compensated by the power of intellectual technologies that assimilate complex data and produce an understandable synthesis at individual and collective levels.

What forms will these communities take tomorrow? No one can predict. But it seems certain that they will be more and more abundant, incredibly diverse, ubiquitous, and interoperable. They are already taking over our pyramidal and centralized organizational forms to which we are still accustomed. In the table below a synthesis of the main differences with pyramidal intelligence is illustrated.

	Pyramidal intelligence	Global Collective Intelligence
Types of communities	Companies, institutions, states, administrations	Cyber-communities (names still to be invented)
Information architecture	Panopticism	Holopticism
Dynamics	Top down	Emerging
Power distribution	Centralized	Distributed
Types of power	Authority	Leadership
Core technology	Writing / printing	Software / Internet
Regulation mode	Static (printed rules)	Dynamic (software)
Economic dynamic	Scarcity	Abundance
Transactional tool	Scarce currency	Sufficient currencies
Capital	Material assets and knowledge	People (i.e. in all their dimensions)

> The issue of collective intelligence is to discover or invent a hereafter of the written word, a hereafter of language so that information processing is distributed and coordinated everywhere. It shouldn't be the prerogative of separated social organs, but, on the contrary, it should naturally integrate with all human activities and return to everyone's hands.
>
> Pierre Lévy – *Collective Intelligence*

At a time when governments and companies invest in costly research programs in physics, genetics, space programs and nanotechnologies, we might almost forget what lies right in front of our eyes: our universal need for a Collective Intelligence.

Definition

It is time now to present a short definition of collective intelligence as a phenomenon, whether this is the original form or the global scale version (Collective Intelligence):

Collective intelligence is the capability for a group of people to collaborate in order to decide upon its own future and reach it in a complex context.

Certainly Collective Intelligence deserves to become a full discipline, with its formal framework, its empirical approach, its tools, its measuring instruments, its practical applications, and its ethical field? This topic is discussed here.

Field of Collective Intelligence as a discipline

The Cartesian mechanistic thought process has fractioned the universe into three territories that are impervious but not antagonistic to one another: matter, life and mind. Each could only belong to one fief or kingdom, otherwise it would risk contradictions and schizophrenia. Physics doesn't explain poetry; neither does psychoanalysis explain cellular division. If we stay enclosed within this discontinuous space, research into and application of Collective Intelligence is a potpourri composed of mostly social and human sciences including arts, mathematics, theology, spiritual development, metaphysics, etc…

Actually the discipline of Collective Intelligence is fundamentally in keeping with the vast decompartmentalization process that animates the thought of this new millennium. Matter, life, and mind – physiosphere, biosphere and noosphere – are part of the huge evolutionary strides the universe is taking toward ever more complexity and higher consciousness. In this world everything is connected to everything, each thing possesses at the same time an inner dimension (that has to be *interpreted*), an outer dimension (that we *perceive*), an individual dimension (the *agent*) and a social dimension (the *population*, the *society*)[4].

So **the science of Collective Intelligence has for its object the study and the optimization of the inner-subjective and outer-objective emerging properties of communities. Its aim is to augment their being, evolution and fullness capacities. By doing so, it invents the tools for a universal governance (global, local, transversal, transcultural, etc…) while developing practical and immediate know-how for today's organizations, through an ethics of collaboration.**

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[4] See Ken Wilber

Creation and stakes of Collective Intelligence

We cannot of course list in an exhaustive manner via this short exploratory essay all the avenues opened by Collective Intelligence as a new discipline. The eleven characteristics previously listed give us an overflowing research agenda. Let's review just some of these areas.

Emergence

The emergence principle might be one of the most fundamental aspects of the Universe. It happens when a higher level of complexity *emerges* and gives birth to a new coherent, differentiated, autonomous, and autopoietic system. It comes provided with an entirely new set of properties and it transcends and includes the subsystems in the inferior level of complexity[5] without alienating them. Molecules, for instance, represent a new level of complexity superior to the atoms because molecules have a set of properties and a 'logic' that are totally different. For example, taken individually, an atom of hydrogen and an atom of oxygen do not possess any properties that let us anticipate the nature of water. A similar process occurs with living beings: the 'civilization' of their cells provides a new differentiated level with its own logic, i.e. awareness, yet all inferior levels (cells, molecules, atoms, particles, etc…) still continue to work with their same laws as before.

A population of 'systems' put together does not necessarily produce a level of higher complexity. A pile of sand remains a pile of sand, that is a basic sum of grains; and a crowd of people going to work in the morning do not generate an autonomous, differentiated and coherent whole. When the constituents of the system do not produce a differentiated Whole, we get partial emerging phenomena that are nothing but the fruit of complex interactions. There is simply no jump to a more complex level.

When we mention the success of a given team or a jazz band, we say that they are like 'the fingers on a hand'. In other words it happens when a new superior level of complexity, that surpasses the sum of the parts, has emerged. This Whole 'transcends' the individual parts while serving and offering him/her more meaning, for his/her greater satisfaction. If relationships do not work well within the group, or if the group is not learning or is rooted in a static structure, we certainly witness some emerging properties but these are not accompanied with the formation of a new unity in a novel superior complexity level. So the creation of a superior emerging level – the one of a harmonious and autonomous group – should be considered as an indicator of success. This is true at both the individual as well as the collective level.

This is only possible under specific conditions. We know quite well the conditions of an emerging Whole in small groups (gifted with original collective intelligence), but how this could be achieved on a large scale?

This opens a wide new field relating to those complex communities that are emerging today via cyberspace. Holopticism, whose function is to offer the individual a representation of the Whole, is of course an essential condition underlying their emergence on a large scale.

Holopticism

Holopticism, as we briefly mentioned in the case of original collective intelligence, is the means by which any participant perceives, in real time, the manifestation of other members of the group (horizontal axis) as well as the superior emerging organization (vertical axis).

Thus a sports team works in a holoptical situation because:

- each player perceives what the other players are doing
- each player perceives the emerging figure of the team

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[5] The terms like 'inferior' and 'superior' used here are not judgments of value, they simply refer to a positioning in a scale of complexity.

Each player then reacts accordingly, which in itself modifies the global pattern, and so on. In this case, the holoptical architecture is organically defined by the 3D space in which our basic organic senses communicate.

The opposite of holopticism is *panopticism*. It consists of a spatial architecture organized so that all information converges toward a central point, while it is partially – and even totally – inaccessible to the others. Video surveillance systems, banks, intelligence services, and jails are examples of panoptical-based environments. This type of organization occurs sometimes in physical space, and sometimes as a result of the way information is distributed. In most companies information systems are a hybrid mix of panoptical and holoptical. While these may offer a certain level of transparency, it is still true that access rights diminish at lower levels in the hierarchy. Information systems in most companies still very much reflect such hierarchies.

Absolute holopticism is a necessary but not sufficient condition for emergence of original collective intelligence. This is also the case for global Collective Intelligence environments. From a technical perspective such artificial spaces can be built for communities having many participants by inventing knowledge and exchange spaces that:

- are accessible and available to everyone in real time,
- do not overwhelm people with too much information, but provide each one with 'angled' artificially synthesized information (offering an angle, a pertinent point of view that fits with the individual user's situation, and not generalist views),
- allow materialization (as a perceptible object for our senses, even if virtual), namely the visualization and circulation of objects-link destined to organize the convergence and the synchronization of the community.

This is the direction in which most tools called *social software* are evolving today in the forges of the free software (open source code) movement.

Object-links of Collective Intelligence

Communities – whatever is their structure — *always* self-organize around circulating objects, whether these objects are real or symbolic. These include items such as balls, objectives, ideals, enemies, prey, melodies, art, or symbols.

In our sport team this mechanism is very simple: the position of the ball and the global configuration of the group on the field provide each player with a sufficient, rich, and angled information (according to his or her position in the playing field). Then the experience and expertise of each player can be used to interpret and exploit this information in the most optimal way. In social and professional communities, these objects are often hazy, (too) numerous, fluctuating, and even undetermined, so much so that they often become as numerous as the participants. This is usually is accompanied with desynchronizing and dissolution issues that each of us has already experienced.

Objects-link can be separated in three big categories:

- **Yum-yum objects:** all for one. These are the prey-objects that we need to catch for ourselves and incorporate. We cooperate in order to reduce their scarcity from the individual perspective (only a pack of wolves can catch the deer). Money, notoriety, power, time, attention, gold, and oil are all yum-yum objects.

- **Monster-objects:** all against one. Threats, enemies, diseases are easy-to-objectivize monster-objects which makes them strong community catalysts. History – that stutters and repeats itself as we all know – shows that monster-objects have always been the ideal tool for belligerent leaders and other war lovers. Every person will recognize them. Whether these objects are the

barbarian, the witch, the Jew, the communist, the spy, the woman, the homosexual, the alien or the terrorist, the principle remains the same: it is easier to unite the population *against* something than to help them build unity and create *for* something.

- **Art-objects**: their existence comes from a creative impulse and from a pact of Quality signed with the Universe. This is the very essence of Art. Art-objects are projections of our desires within time that we create as a natural outcome of living a full and vibrant life. As if we are unfolding a carpet in front as we walk, we orient our steps on soils that we manifest. Projects, other than just surviving, that include works of art, music, supporting human rights, or the enhancing our happiness belong to this category. While, yum-yum and monster objects are created by people in *reaction* to our world, Art-objects are offered by *creation*. Holoptical architectures – natural or reconstructed via technology – facilitate their existence (see MMOGs below). Some are static and defined *a priori* (project, strategic plan, model, melody, etc…), others are *emerging*, i.e. produced *a posteriori* as a constantly updated collective representation tool produced by the sum of individual interactions – they are the new object-Arts of holopticism. *Knowledge trees,* also explored below, are one of the first examples of such art-objects.

Attraction and repulsion objects (yum-yum and monster) are indisputably the most archaic variety, which probably originated in the first positive sum economies in the animal and human worlds.

Made to *create the world*, Art-objects are permanently reinvented, nourished by their own creative nature. They are updated, destroyed, replaced, and reincarnated in much the same manner as Tibetan sand mandalas. They are 'Whole for All' where interiorities are connected with one another. They build the world in which they will live. For these reasons, Art-objects are not rational: what rationality could explain human rights or entice us with a vision of an ideal world?

Collective Intelligence as a discipline needs to provide a framework about how to objectivize, play and represent each of these objects-link within its artificial and virtual spaces.

Social networks, small worlds and tipping points

No more than 'six degrees' (actually 5.5) separate us on average from any person on the planet. The 'friends of our friends' are 2 degrees away from us, the 'friends of our friends of our friends' are 3 degrees away, and so on. The structure of human social networks must be very peculiar in some way so that six billion individuals are at least separated by so few degrees from one another. When we say that we live in a small world, we don't realize how true this is.

Why do some rumors gain ground and not others? What principles make and destroy fashions? Why do certain books become best sellers and not others? Why do some diseases become epidemics and not others? Why do some ideas emerge everywhere almost at the same time? It is precisely due to the direct consequence of ours being a 'small world.' Under certain conditions some 'agents' such as viruses, ideas, signals, fashion, behaviors, etc… can spread like wildfire after they have reached what is called a *tipping point*. When the 'viral agents' are concepts and ideas they are called *memes* by analogy with the genes that are transmitted by filiation or contamination in the living world (R. Dawkins). The songs we hum, the fashion, slogans and our vision of the world in general are as many *memes* that are transmitted by 'mental contagion'.

Humanity is not the only structure to possess such properties of proximity. The brain, the world wide web, the food chain in the ecosystem, trading networks, or epidemics exhibit similar patterns. Many networks having specific yet similar topologies whereby all agents are in close proximity with all others have an extraordinary potential for synchronicity and a capacity to work in unison when subject to slight differences in the underlying variables.

The study of such particular yet universal networks fall into a category that can be called the 'theory of small worlds'. This science of 'memes, also known as memetics, is a mix of graphic theories and sciences of complexity.

The modeling and the optimizing of all these elements is clearly yet another stake of Collective Intelligence.

Language

Earlier we evoked the attributes that indicate our belonging – or potential belonging – to the big territorial sets that shape the pyramidal intelligence society. These include nationality, language, identity, profession, diplomas, look, religion, political color, etc…

This social power is well rooted mainly due to the fact it is even embedded in our language. Our inner being is nourished by social life, which is built upon the interaction of our interiorities. In fact, the very role of language is to serve as a bridge between our *inner self* and the *outer someone/something* such as a person, object, etc…). It is quite interesting and revealing to analyze and understand the interpenetration between *individual inner* and *social outer* selves, one that is actually maintained by grammar of the spoken language.

For example, an enormous confusion exists between the verb *to be* (and other derived verbs that express a subjective state related to the *subject*, the interiority, the inner world that can be expressed but not named as objects), and the verb *to have* (and its derivative verbs), that is related to the *object*, the exteriority, i.e. what can be named but not expressed (we don't 'narrate' a thing, we content ourselves with designating it) [6]. We use those shortcuts to say "he/she is a taxi driver" rather than saying "his/her job is taxi driver", "he/she is handicapped" rather than "he/she has an handicap", and "he/she is Indian" rather than "he/she has Indian nationality". The attribute is confused with the essence. The person *is* what the social order is designating. These shortcuts, paced up and down by the civilization of the territories, show that a large part of our inner space is abandoned to the environmental navigation aid of the masses and to the architects of social pyramids. By environmental navigation aids we refer here to a whole set of coherent symbols, colors, signs, forms that help one navigate in a given environment, be they on roads, in an internet site, in a building, or any other 'space'. This grammar penetrates our very beings since it shapes our minds from birth.

Grammar – and language in general – is the water of the aquarium in which we swim. An important mental effort is necessary in order to extract ourselves and understand its impact on our mental structure and level of consciousness. The evolution of our grammar can be left to an unconscious state or made conscious and active. The discipline of Collective Intelligence aims not only to establish this awakening and clarify the underlying evolutionary processes but also to transcend simple verbal forms in order to liberate our minds and allow us to enter the new forms of expression that await .

Semantic Web, meaning and mental representation

How can we optimally and successfully navigate within these communities of knowledge? We all have had the disconcerting experience of being flooded with mountains of information when searching the Internet. But even when this information is managed with an ability to prospect and navigate the results are still approximate. What sort of sifter is needed in order to extract those nuggets that resonate with and possibly meet our expectations?

The climatic diversity and the widely variable relief of our planet has not prevented us from inventing a world map that allows cities, mountains, seas and roads to be positioned on a universal

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[6] **What can be expressed but not designated (to be – subject – self):** we can express ourselves about our self by evoking our inner life, but unlike with objects it has no precise name or designation. **What can be designated but not expressed (to have – object – the other):** we can designate, name, qualify an object or another person, but is says nothing about its inner nature. The only possible relationship between the subject (self-expression) and the world as an object exterior to us (not expressible) is given by the *direct experience*. The *direct experience* is a practice that avoids the trap of the dualism of the words. This is the raison d'être of Zen and meditation in general.

cartographic system that can be universally understood. Is there, under the infinitely rich relief of concepts and languages, a common matrix? Can a *universal tongue map* be invented?

The meaning of a document in Cyberspace is given by its content as well as the (hyper)links that connect it to other objects. These links are what precisely provide the context. Content and links can be labeled with meta-data, information on information, whose organization is based on the rules of formal logics[7]. Such definable and quantifiable entities are what constitute the specifications of the *semantic web*, a term that currently holds the place of honor.

The stakes here are much wider than they seem. At a time when humanity is looking for a universal tongue to pass its survival exam and is searching for a way to understand itself in its wide diversity, the universal tongue map would represent an extraordinary governance tool by making knowledge spaces universally navigable. Just as world maps did not flatten our landscape, neither would a universal tongue map would eliminate diversity. But such a tool would take a large step toward providing all humans a tool for mutual understanding.

Pareto principle and social justice

The Pareto principle, often called the '80-20 rule', was stated by the Italian economist and sociologist Vilfredo Pareto (1848-1923) who discovered that wealth distribution always follows a 'condensation rule' that "20% of the population possesses 80% of the money". He found that each time the amount of wealth is doubled, the number of people who possess this wealth falls by a constant factor. For instance, if this factor is 2.5, there are 2.5 less people that have $100,000 in their bank accounts than those who have $50,000... and so on.

Conventional economic theory has never managed to explain the origin of Pareto's distribution law, but physics has. French physicists Jean-Philippe Bouchaud and Marc Mézard have demonstrated that this law shows up almost everywhere in nature.

It happens when 'granular' objects self-aggregate and condensate because of the nature of the network in which they interact. Examples of condensed systems are numerous: matter and particles (most of the universe is concentrated – probably in black holes), waterways (most water ends up in a minority of big rivers), traffic in the World Wide Web (most goes through a few sensitive hubs), our professional life (e.g. 80% of the work is done by 20% of the staff), commerce (e.g. 10% of customers generate 70% of sales in a given company), demography (80% of population lives on 2% of the land surface i.e. mainly in cities), popularity (a few people – politicians, stars, corporate leaders – receive most of the attention), and of course money. The more money one has, the more can be invested, the more revenues can be generated, and so on. As a result "the rich get richer and the poor get poorer", unless some re-circulation rules are applied. The practice of usury (paying interest) dramatically skews this effect.

This is the reason why social justice is strongly intertwined with Paretian hoarding effects that are evident in areas such as money, power, goods, resources, information, popularity, and social networks. Accepting that social injustice is a result of natural law is a conclusion that some liberal ideologies accept without hesitation.

In human communities, Pareto effects generally emerge without the awareness of participants since the end result occurs as an "a posteriori" process resulting from individual interactions that get iterated a large number of times.

The Bouchaud-Mézard model confirms that increasing the number of monetary transactions is what lessens the condensation effect. Income taxes contribute by reducing differences in wealth only if such taxes are equally redistributed. If so the final result is then similar to an artificial increase of transactions and connections in the system. But sales taxes lead to fewer sales, i.e. diminish the number of transactions and therefore accentuate the condensation effect. The model

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[7] For a deeper understanding of the topic: http://www.w3.org/2001/sw/

also shows that free trade is a good thing, but implemented with the condition that wealth circulates in both ways, namely that is not being blocked by unilateral protectionism. The protectionism applied by northern countries to southern hemisphere nations has transformed free trade into an asymmetrical mechanism and has aggravated disparities.

The good news is that Paretian dynamics are now much better understood -- thanks to the Bouchaud-Mézard model and recent breakthroughs of research into complex systems -- so that their regulation and control can be seriously envisaged and undertaken. Combined with holoptical architecture, computational economics can become one of the best allies for communities in order to help them anticipate the emerging results of their multiple inner-transactions. Then they can apply correcting actions in order to attenuate or amplify the Paretian effects upon their needs since such effects are not necessarily harmful.

Of course this is another full-fledged development within the new discipline of Collective Intelligence.

Money

Although the money we know today has moved into the numeric world, it is still part of the industrial archaisms of the Victorian era because it is issued in a massive, centralized and private manner.

In order to more concretely understand this situation, we can regard money just as if it were water (from where the word *liquidity* gets all its meaning). The value of water comes both from its quantitative presence and its circulation. If it is too scarce or if it doesn't circulate (which essentially amounts to the same thing), then desertification occurs. If it's too abundant the end result is 'drowning'. So water needs to exist *sufficiently* (i.e. not too much and not too little) and be correctly distributed in order to maximize life potential, namely the proliferation and creative capacity, of an ecosystem.

In the human society, liquid-money doesn't rain, but like water in an ecosystem money has to circulate – otherwise it is valueless – and its mass has to be adapted to societal needs. Too high a volume of currency swamps the economy because it doesn't fit with the real needs of exchange; not enough currency dries the economy because it limits exchanges and fosters fierce competition to appropriate it.

What determines the optimal monetary mass that should circulate within a community, nation, region, city, company, NGO, or network is a matter of a 'science of irrigation'. This responsibility – and this power – are today concentrated in the hands of powerful pyramidal institutions, the banks[8].

At the dawn of a civilization based on knowledge and with the global boom in exchange of knowledge, commodities and services, the consequences of a centralized and private system are as numerous as tragic:

- As a result of this massive and centralized process, the necessary monetary mass and its repartition are very crudely and poorly optimized.

- The famous 'invisible hand' as well as private interests of financial players are to blame for monetary desertification of entire zones of the globe (countries, regions, population categories, and economic sectors) in spite of the fact that this transactional tool is crucial for social ecology. As a result supply and demand are both present, in full view of each other, but are not able to be properly fulfilled. Thus, **pauperization happens even in a context of abundant resources** such as a trained work force, natural and manufactured

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[8] In western countries the monetary mass is 85% private because it is created by the banks in the form of charged credit. Only 15% of the monetary mass issued by the state circulates in a free form.

resources, ample know-how, etc...

- Scarcity that is artificially maintained and accentuated by Paretian laws still accentuates the desertification process and still critically augments dependency. As children and guardians of a society based on pyramidal intelligence, banks have a strong interest to maintain the status quo.

A collective intelligence will be unable to thrive as long as its participants are obliged to compete with one another in attaining this scarce resource called money. This impasse demands a new type of currency, one that is: free, open, collective, democratic, decentralized, sufficient, distributed, has ample volume and is based on a real-time, self-regulated repartition in keeping with true needs of supply and demand. Such currencies are in a gestation period in the forges of free software. Soon they will expand into cyberspace as well as within business extranets and intranets. The transition might be as unexpected as brutal, and it might seriously impact national currencies.

The question of consensus, vote and action

The same pragmatic question always reappears: how can we make decisions and act when we are somewhat disjointed individuals, especially when we are very numerous?

Do we need a boss who lays down the law? Should we vote? How can we then avoid falling into the trap of the notorious dictatorship of the majority? Is the consensus preferable? Is the majority necessarily right? What principle(s) can help weigh our decision between 'popular' choice and that of the expert?

To make matters even more complex, the theory of social choice charged with studying and modeling the building of collective choices from individual values clearly summons up the mirage of the *vox populi*. It is demonstrated, with the support of mathematical models and theorems, that collective choices that are established by aggregation of individual choices are far from being in conformity with the democratic ideal of the 'will of the people as one', as political philosophy aspires.

What new light can Collective Intelligence, in its theoretical as well as practical dimensions, shed on this debate, one that arises in many arenas from corporate life to the universal and timeless life of the city? Whatever number of upstream ideas, we ultimately must converge downstream toward an action. The chaotic cloud of ideas must converge into a uniquely directed stream of action. Collective intelligence, multiple and undetermined, converges to a collegial action, that is singular and well determined.

Let us again use our sports team example in its original collective intelligence context. Here the question of *who decides what* is solved by itself. It is a space in which ambivalences raised by the theories of social choice are resolved. Why? It is because of the presence of holopticism, i.e. the permanent relationship between the individual and the emerging level of the group.

What are the details about how the path from idea to action gets organized, in the light of action by Collective Intelligence.

A simple sequence can be used of the basis of this analysis:

1. Reflection
2. Options formulation
3. Final option selection
4. Action

In very authoritarian structures, steps 1-2-3 are lead by a small group of decision makers and step 4 is executed by executants. In more flexible but still pyramidal structures, steps 2 and 3 are

realized in a more collegial manner while most strategic organizational thinking, namely step 1, is the prerogative just of top decision makers.

In a Collective Intelligence structure, each step is performed by the entire community:

1. At the reflection level: Collective Intelligence mobilizes and cross-fertilizes available knowledge via a refined dialogue, either synchronous or asynchronous, and either in face-to-face contact or remotely. Dialogues draw new horizons, allow the anticipation of conflicts, and prepare all players for consensus. They link objects with a predilection for art-objects that support building vision, multiplying scenarios and establishing a climate of abundance.

2. The options formulation obviously owes its quality to upstream thinking. This sensitive step requires as much objectivizing object-links (i.e. projects, threats, needs, etc…) as with elimination processes that require strong knowledge mobilization. It usually leads to two final option typologies:

- Typology #1: stated options that express the cognitive limits of the community. They are presented as a set of possibilities endowed with strengths and weaknesses among which the best or the worst is uncertain. The choice can only be irrational. Let's remind ourselves that when rationality is present, there is no need to make choices because it rationality arbitrates. So the ultimate choice is exclusively founded on intuition from *terra incognita* and supported by values weighting.

- Typology #2: identified options that rather than showing conflicts of interest between different parties, allow each party to defend its own option versus all others. This outcome means that step 1, reflection, was not achieved under optimal Collective Intelligence conditions. Namely a holoptical context, emerging whole, gift economy, etc… was lacking.

Most often the outcome is a mix between both typologies. Let's imagine for instance a community that has succeeded in isolating a certain number of typology #1 choices. As we must end up by a making a choice, this is the moment when participants can decide that "*since there is no rational way to know the final correct choice, I might as well pick the option that best serves my own interests.*" So typology #2 thus permeates typology #1. The points to a method via which a holistic view facilitated by a holoptical context can help resolve disputes.

3. Selection of the final option: if steps 1 and 2 are managed with Collective Intelligence then the selection of the final option is much easier. This is the case whether the process is resolved by a designated expert, a vote, a consensus or the events themselves. Candidate options are of better quality, richer, more detailed, more holistic, more flexible, and ultimately more representative.

4. **The action** engages new processes of collective intelligence, again knowledge interaction and operational coordination between players.

Lastly, let's not forget that the cycle from steps 1 to 4 is permanent, redundant, and self-inclusive. It works like an endless spiral. Step 4 (action) involves for instance many readjusting 'mini-cycles' that generate again the reflection-options-choice-action sequence.

Democracy

Are our democratic countries really *democratic*? What should we say about the professional world in which we spend so much of our time? Is it democratic? What should we think of the impunity of corporations that make products or act in an occult manner without the consent of the People? Who voted for polluted rivers, antipersonnel mines, factories or nuclear plants that explode (Bhopal, AZF, Chernobyl, etc…), insalubrious oil tankers, industrial monopoles, or financial intrigues (Enron, Crédit Lyonnais…)? Who voted that money, a very public tool by nature, becomes the monopoly of private banks that support its very high price? Do we have democratic

spaces here?

Let's bet that History will call these institutions pre-democratic or will find an expression that underlines their unfinished aspect and their intermediate state. As demonstrated by sciences of social thermodynamics, our democracies are massive in the way they oppose masses of voters against masses of other voters gathered under the banner of parties, ideologies and charismatic political figures who have an incredible concentration of power at their disposal during their mandate. Our democracies are structured around pyramidal intelligence. Their powers are exercised at the top of these hierarchies, often far removed from the base, with a strong culture of opacity and secrecy.

The limits of our democracies are technical and these technical limits have a tendency to assume that this pre-democracy is an invincible and natural state of affairs.

To be convinced that other options exist, let's imagine some scenarios that are already within reach of modern technology. For example all decisions, small or big, could be made by citizens via electronic voting with no intermediaries, no exclusions, and during any selected time.

Each vote in this process could be delegated to the persons of our choice[9]. If the elector lacks some expertise and knowledge about complex topics, he/she can entrust his vote to the people of his/her choice, those he considers as more advised, more specialized or simply more available. This set would include perhaps a friend, a parent, an expert, a society, an NGO, a company, or a party. This delegation could last as long as the voter wants on whatever topic or topics he chooses. The voter can, for instance, entrust his vote on healthcare related issues to his physician, leave the arbitrage on ecology to Greenpeace, delegate a militant union for work issues, and vote himself/herself on economic questions. Via a simple click he/she can take over his/her authority and vote himself/herself, or appoint someone else in the network to represent him/her, or not vote at all.

Therefore:

- This democracy is direct and in real time
- It is not in contradiction with immediate operational deadlines. On the contrary it involves a high quality level in the debates, a high number of experts and participants that make this collective thinking process richer and a better opportunity generator.
- It avoids arriving at insane decisions usually issued from over-concentrated and overwhelmed powers
- All questions, whatever they are, are submitted to the people at the time they are raised
- Each person can be represented or become a representative for other people

By studying our available technical options we see it is possible to design a non-massive democracy, one that is real-time distributed, and available at all steps and stages in any decisions.

The written word has been a technology of the centralized State. The technologies of collective intelligence will be the ones of the emerging governance, a direct democracy that is distributed, at both local as well as global levels. Such a democracy has become possible.

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[9] See www.vivarto.org and '*Democracy 2.0*' from Mikael Nordfors (2003)

For or against direct democracy?

Three arguments are generally raised by opponents of direct democracy:

- **Absence of safeguards:** nothing prevents us from impulsive excesses and actions and from excesses of populism since the electors can react in real time. What would the American people have done if, for instance, right after September 11 they had the means to make immediate decisions via their computers?

- **Absence of expertise:** should questions that are a matter of experts' choices be submitted to the people? This would probably lead to disastrous questions!

- **Absence of motivation:** abstention rates are already so high that if the citizen were asked to vote on everything and anything, this would be a catastrophe.

None of these arguments stand up for very long:

- **On the absence of safeguards:** everyday the news show us how our decision makers and elected representatives are not the last ones to react in an excessive, heated and partial manner, doing so by following processes that remain often occult and covered by the State secret. How many wars could have been avoided if the people – those who will shed their blood on the battlefields – were able to decide for themselves? In a direct democracy it is on the contrary much easier to establish safeguards and periods of latency, to fix dates that give the time for reflecting.

- **On the absence of expertise:** today elected representatives are experts in politics, namely the art of wining positions of power and visibility. The struggle to establish *who* is going to decide mobilizes more energy than knowing *what* to decide. True experts are not elected representatives but mostly unknown professionals. They are requested by politicians to help with their thought processes so they can finalize their decisions. In this case, why wouldn't the citizens have too the right to appeal to experts and even give them their voices? Let's add that the lack of expertise from the citizens on many domains is widely due to the fact that their advice is rarely requested, at such a point that they are often obliged to make their claim in the streets.

- **On the absence of motivation:** abstention is neither due to a disinterest in politics nor a disinvestment in individual responsibility. It is nothing else but the separation between the head and the body, one of the many symptoms of pyramidal intelligence. To be convinced, let us simply observe the explosion in the number of NGOs and humanitarian organizations in which so many people invest their time and hearts. It is for them a direct, efficient and real access to the life of the city on issues that seem very real, this within structures that are closer to Collective Intelligence than pyramidal intelligence.

The term ICT – Information and Communication Technologies – to which many of us now refer reveals the paradigm in which we are still enclosed: information and communication. Is that all? Where are the *Technologies of Collective Intelligence*?

Today's tools have considerably improved in their capacity for cooperation and collaboration. Can we also say they extend the properties of original collective intelligence as a better tool for society as a whole? Until pyramidal intelligence has evolved toward a global Collective Intelligence the answer is a resounding no.

Let's give it a thought… Most intranets, ERPs (Enterprise Resource Planning units?) and knowledge management tools are designed and conceived of to alleviate the weaknesses of pyramidal intelligence by making it more 'horizontal'. Such software tools are very greedy in their need for data. They primarily rely on the sum of individual duties ("*the knowledge base must be filled*") rather than the sum of individual motivations ("*I have a direct and immediate benefit to do it*"). It is too often forgotten that internal collaboration/competition ambivalences so typical in pyramidal structures induces individualistic behaviors that generate scarcity. For instance, from the collective point of view, the company wins when knowledge is abundantly shared. It goes quite differently from the individual perspective: it's better to share the knowledge sparingly in order to maximize benefits to oneself (i.e. gratitude, monetary benefit, professional evolution, power, etc…). When we have given everything, what remains negotiable for ourselves? Abandoning knowledge freely to collective memory can put oneself in the dangerous situation of being less indispensable. In other words, the technologies of pyramidal intelligence are maintaining ambiguous individual and collective dynamics that are often conflicting. They do not fit the specifications of Collective Intelligence.

The movement of free software, and Internet related technologies in general, do not have these restrictive hierarchical and territorial constraints. Therefore it is mainly in the cyberspace world that most of the technologies of Collective Intelligence are designed today.

Some current examples

Search engines: the experience of the Oracle

Any advanced practitioner of the Internet will confirm it. There is not one aspect of our thinking, experiences, interrogations, fantasies, or know-how that has not shown up already somewhere on the web, in the past or now, and in a much more profound manner than we imagine. This experience reveals human knowledge to us in its prodigious dimension. It gives us the impression that we are questioning the Oracle who has the answer to everything. Having at our disposal the sum total of human knowledge a few clicks away is not meaningless… we just need to realize that it is possible. This experience is just fascinating for anyone who makes it.

We initially saw ourselves as knowledge *possessors*, a little like individual reservoirs? Interactivity within cyberspace metamorphoses us into *smugglers* and *transformers*. Such a role might seem very modest to some people, but therein resides the most beautiful opportunity for evolving, available to every individual. Our individual intelligence is no longer exclusively located in our own brain.

Weblogs

From an individual point of view, a weblog (or blog) is an easy-to-use publishing tool on the Net.

Without the need to be an expert in technology, the user can edit a text, insert pictures and hyperlinks, and then see the content appear directly on the Internet. Navigation menus are updated by themselves and the content is automatically indexed, thus eliminating the need for fastidious site maintenance. Most weblogs are used as diaries. Individuals or groups of people record their thoughts and experiences learned during the day. The net result is a fertile repertoire of experience available to everyone. Being familiar with the experience of the Oracle, as outlined above, and well-versed in cyberculture, the blogger writes his diary in a very interactive manner with the content and experiences displayed in other weblogs.

It is at the collective level that the magic of weblogs can be understood: the plentiful muddle of individual experiences connected between them by the *meaning* constitutes an extraordinary aggregate of collective experience. Exploring a topic in the weblogs means entering each time into a mini-knowledge galaxy.

Wikis

As weblogs constitute an *aggregation* of individual knowledge, wikis are an *integration* of knowledge. Just like weblogs they work via a very simple online editing shared interface. The difference is that wiki pages are editable and changeable by anyone who wants to bring his/her contribution. The accumulation of interactions on a page leads either to a maximal consensual optimization of the collective knowledge, or to debates that can give birth to contradictory – but complementary – content as new fertile branches. Each former version of a wiki page is maintained in memory. It is then very easy to explore its history and roll back a few iterations if the new content generates disapprobation. Individual destructive action is powerless in face of the constructive force of the majority.

As convergence technologies, wikis are often compared to paperboards used during meetings on which dynamic interaction is capitalized. If they are open to everyone, they can become wisdom collectors.

This principle is so powerful that today the most important encyclopedia worldwide is a wiki named Wikipedia[10]. Any visitor can instantly edit the pages. The entries converge gradually toward an 'optimum state' where the expertise and the voice of the many get self-balanced.

Syndication (RSS)

How can we be kept informed about the latest articles, news, or publications that are published here and there on the web (press, personal sites, weblogs, wikis, etc…)? Do we have to make a daily visit to all websites registered in our browser's 'favorites' list? This would certainly be difficult as well as time consuming. Welcome then to the *syndication*. The principle here is to detect and incorporate the novelties of our favorite sites and converge this information into a single, unique interface.

Beyond its practical aspect, syndication is a step forward. It allows everyone to adapt to his/her own needs the stream and the nature of the information he/she needs to receive, with a very high degree of subtlety. It allows the adjustment of our permeability on the Web.

Knowledge trees

Each of us possesses competencies and know-how that go far beyond the scope of diplomas and the nomenclature of professions.

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[10] http://en.wikipedia.org, 380 000 articles in October 2004

Context plays an important role in what defines a competency. Pottery is appreciated differently in the hightech and in the craft industries, and a knowledge of financial markets interests the gardeners world in a very relative manner. It is the context and the complementarity with respect to a community that *define* the level of competency. Expressing and positioning them in a collective and dynamic cartography of knowledge and needs – a knowledge tree – is the challenge that Pierre Lévy and Michel Authier took up in the early nineties.

Knowledge trees precisely constitute an Art-object, a dynamic and live integration of collective knowledge transformed into a visual form made accessible to individual understanding. Knowledge trees are part of the new generation of Art-objects whose aim is to build a representation of the emerging level of the community in a holoptical context.

And tomorrow?

We are at a turning point. More and more emerging technologies are social. Produced by the fertile inventiveness of visionary activists and by vividly imaginative creators of a 'play universe', those technologies are emerging both from the forges of open source free software and from avant-garde companies. Such technologies allow us to produce sign and meaning that are closer and closer to our singularity, our interiority, while enrolling us in the designing of a new relational and societal ecosystem.

Only a few of these technologies today are accompanied with holoptical tools. Only a few allow the creation and circulation of synthetic Art-objects that offer real time representations of the emerging collective level, except in the virtual multiplayer universes that we are briefly going to review. Holopticism and Art-objects will arrive in a second wave, prompted by the need of collective consciousness.

MMOGs, persistent universes and holoptical technologies

It is quite probable that behind virtual community projects, whether these communities are considered as games or not, a new paradigm of communication is taking shape. It is a sort of complex space, totally systemic, persistent, that allows future generations to make diverse but still very traditional and universal experiences. […] At the individual level it is important to avoid preconceptions. When *gamers* shoot at monsters they are not basically killing only monsters. Players are going through a learning process towards technical and symbolic interfaces that might strive tomorrow to replace the creatures by significant symbols in the so called classical culture, and will allow them, as argues video and role play games producer and author Frédéric Weil, "*to travel in a painting, to explore the forest of symbols*". Thus players and users of persistent universes are not only exchanging, they learn how to read and write in what could become the prototypes of systemic cultural interfaces of tomorrow. Their tactical science, their execution speed, their knowledge on game-play rules, their ability to venture into complex systems, their network culture and their interactive interfaces culture might allow them to have on culture the same advantage that computer engineers have today on the average internet or PC user.

Franck Beau – article '*The net surfer, co-producer of worlds?*'[11]

It is certainly in the massively multiplayer online games (MMOGs) that a part of the future social ecology spaces of tomorrow is being formed. New realities, universes, characters, entities, processes, artifacts, physical laws, social codes, concepts, and arts are created. They intermix and make new worlds. Ever more extended holopticisms are designed and they are scoured by ever more vivid object-links (yum-yum, monster and Art). We are at the era of stone-less cathedrals, the one of persistent universes in ever larger naves, ever dizzier, hold by their software abutment piers, inhabited by gargoyles, saints, grotesque figures, magicians, monsters, dragons, elves, trolls and other phantasmagorical characters. There the architectural know-how is developed in the empirism of open source guilds.

Yet new ecosystems and economies are growing there and testing themselves, like in an

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[11] Original article in French at http://www.fing.org/universite/article.php3?id_article=55

accelerated movie of evolution. Most of these universes are still very masculine: competition, alliances, massacres, domination, power capture, strategies, law of the fittest, and allegiance rule… but more feminine creations are coming into view. They are more oriented toward empathy, meeting, dialogue, preservation and transmission of life.

We shall all be Cyborg

In passing, we earlier mentioned only two of our senses are currently involved in our new cyber-social existence, namely sight and hearing.

Progress made in human-machine interfaces will, little by little, allow our other senses to join in the dance. Smells, flavors, touch, maybe even our whole corporality (the global feeling we have of our own body) will penetrate within the holoptical spaces of tomorrow. The wedding of genetics, nanotechnologies and computers will miniaturize these interfaces and will make them alive in our bodies. Then we will become *Cyborg*.

What are cyborgs? Let us not be too impressed by the rough and barbarian image that recalls more the worlds of Terminator and Matrix than the one of a tropical paradise. Many of the examples of this new technology appear to be harsh. Intra-auricular hearing aids are a perfect example of intrusive technology. No doubt that future mobile phones will look like these hearing aids and that lozenge-sized miniature video cameras will be placed on our ear lobes. A pair of glasses – or even contact lenses – will be able to project pixels to the back of our retina and allow us to 'see' what we today see on our computer screens, or provide us with 'augmented reality'. With these micro-technologies, placed in our clothes, our everyday objects or our body, we will wear and control them without thinking. Always connected, we will be interlinked anywhere anytime. These interfaces will be our tools for social life, just like today with the telephone or the car. To a 19th century human perhaps this would have seemed just as scary.

Let's finally bet that future generations will know total immersion in synthetic spaces. A new balance will be established between the objective world that we experience and the intersubjective virtual worlds.

Virtual ambassadors and quantum personality

Multimedia opened the door to knowledge modeling in a common digital form that is returned on demand or in the form of precise scripts such as database consulting, games, hypertext navigation, etc... It was naively believed that multimedia would open the golden way to C.A.L. (Computer Aided Learning), but it was forgotten that the act of learning follows a social and relational dynamic that cannot be reduced to content consultation however interactive and seducing may be.

Therefore the modeling of knowledge in interactive dialogues that solicit – and also model – our emotional and social intelligence is the next step. This is a stage that has already been widely reached by certain technologies like Extempo[12].

Nevertheless. it is already possible to get complete courses (that actually work!) by dialoguing in natural language with fictitious characters who, rather than following preformatted scenarios, track the improvement and psychological profile of the student via an interactive, sensible, dynamic and play process.

Once spread throughout the general public these same technologies will allow us to create our own *virtual ambassadors*, i.e. characters that we will train. These will be either based upon our own personality or will be totally invented and will represent us and dialogue with others (characters or real persons) in an ubiquitous manner, just like if they were our secretary or our private

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[12] Extempo (www.extempo.com) is probably one of the most advanced today in this domain

representative. Thus dialogue, as the human exchange function itself, will continue to be played in an asynchronous and ubiquitous manner while we are invested in other tasks in parallel.

Let's not mislead ourselves. It is not artificial intelligence but *interactive modeling* of our knowledge that is inscribed in the human relational dynamic. Right now machines are mainly exchanging data and information, but they will become capable of exchanging our own *concepts* and *semiotic pheromones* for us on demand. It is about a superior level of complexity – meaning a new realization and capacity for creation – in the information technologies.

Our presence to others will then be simultaneously played out in these numerous spaces of exchange, in a superposed and ubiquitous manner, just like particles studied in quantum physics that can show up in several places at the same time and possess several simultaneous states. Then our personality will become 'quantum'.

The economics of Collective Intelligence

Once holoptical visualization tools are more refined, it will become easier for the individual to know how to make his interests converge with those of the community. This evolution will have a strong impact on our economy since we will move from a swarm intelligence context (everyone does the same actions without knowing where it leads) toward a Collective Intelligence (everyone builds his advantages according to information returned from the community level).

A question remains: what allows us to know whether an action is beneficial or not for oneself as well as for the community? Apart from extreme and evident cases, and despite our best intentions, forecasting the outcome remains an act of faith to say the least, a form of research into equilibriums.

But one thing seems certain. We make better predictions when:

1. collective experience is solicited
2. precise holistic evaluation methodologies are implemented (including qualitative and quantitative metrics)
3. actions are clearly accepted and supported by the community

Today actions undertaken in public life that go through a preliminary evaluation based on these three steps are rare. Products are launched on the market, companies with specific mission statements are built, politics are conducted, and social actions are initiated without the moral and ethical consent of the public and the citizens and without application of any methodologies that evaluate advantages for and threats to the community.

Let's anticipate that collective information and evaluation systems will one day be at the disposal of all who wish to weigh, support and invest in projects that are estimated to be beneficial for the community. From the entrepreneurial point of view, this will not only be a guarantee of sustainability but also a source of enhanced *upstream* support from the marketplace. For the public, this is a guarantee of more safety. For investors, it is a way to bet in an ethical and social dimension on sustainable development, the very foundation of the economy. These financial bets on the future can be rewarded in proportion of the precision of the estimates and of the time-scale of the risk. (It is certainly less risky to make a bet on a prediction of events with a 3 months horizon than one having a 5 year horizon).

> When you ask people about what it is like being part of a great team, what is most striking is the meaningfulness of the experience. People talk about being part of something larger than themselves, of being connected, of being generative. It become quite clear that, for many, their experiences as part of truly great teams stand out as singular periods of life lived to the fullest. Some spend the rest of their lives looking for ways to recapture that spirit.
>
> Peter Senge – '*The Fifth Discipline*'[13]

The 'society of the spectacle'[14] (sports events, fashion or other cultural distractions), current linear school programs, scarce money, and competition as the only economic alternative do not contribute to heighten public awareness about Collective Intelligence. When subjected to global collective threats – by nature *complex* ones – it become necessary to learn, in an empirical, approximate and often painful way, the ropes of collaboration, the way to have clever relationship with *the other*. But between cooperation and building a global intelligent community, there is a gulf that only a few have crossed.

Let's first review what are the minimal conditions within which a given community that can build Collective Intelligence. Then we will analyze the situation in the professional world in general and conclude with a look at our educational systems.

Developing Collective Intelligence via individual action

One of the first steps in the process of developing collective intelligence via individual action consists of using again everything that contributes to a wealthy dynamic of a 'great team,' as Peter Senge explores in his landmark work '*The Learning Organization*'. A permanent learning on an individual as well as on a collective basis is the keystone of this whole process.

But of course this is not all that is necessary. Collective Intelligence is not an *a priori* condition but an *a posteriori* stage, it is the fruit of permanent training and learning. It is also a reflection of the humility of little steps: Individual progress benefits to the group, and the group becomes more favorable to new individual progress, and so on. One cannot master Collective Intelligence alone.

Finally let's not forget that individual and collective levels work in the same way. A community, no matter its size, will go through the same phases – in a more complex fashion – than those of an individual: childhood, adolescence, adult phase, ups and downs, as well as crises and victories. This understanding is an important guideline.

We already have listed 12 characteristics of Collective Intelligence. What talents, practice, and knowledge should be developed at the individual level? Here is a shortlist that should be part of any training:

- Behavioral and relational intelligence (listening attention, compassion, non-judgment, etc…), all parts of the art of dialogue (David Bohm)
- Mental models (that bring objects-link into play) such as projects, and creative will
- Practice of an Art (discipline, expertise, science, know-how, critical sense, art, etc…)
- Being, in turns, learner and trainer (principle of learning communities)
- Gift economy (whatever you take or give, it is always done with an awareness of the collective level)
- Personal development: meditation, breathing techniques, yoga, etc…
- Ethics, values

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[13] A excellent summary of his works is at http://www.infed.org/thinkers/senge.htm
[14] This refers to the situationist movement and the most known book of Guy Debord '*Society of the Spectacle*' (http://www.huzzam.com/etext/debgsociespec/)

- Mental models, systemic thinking
- Deep knowledge of dynamic principles of Collective Intelligence
- Mastering and harmonizing of those technologies that serve these objectives

In administrations, institutions and companies

A hammer, a chisel and a plane are not what makes a good joiner. Why would ICTs make organizations clever only because of their presence? Yet this naivety is very current. Doesn't the very term ICT enclose us in a technical paradigm while shadowing the most fundamental stake, the individual human being? Do we hear today companies say "*We are going to increase our Collective Intelligence*"?   No, they simply and only talk about ICT, about fragmented and reductionist approaches (change conduct, human resources management, knowledge management, etc…).

Of course we always do more with tools than with nothing. But the poor outlines that are produced soon eat substantial budgets, and are deceiving and quickly erode everyone's will.

Strongly hierarchized organizations are clearly those that offer the most vigorous resistance to the *philosophy* of Collective Intelligence since they are attached to their corporality based on territories and control. The only question of 'participation' (consultation, collegiality, consensus, transversality, communities of practice, etc…) induces a feeling of loss of power for those who have it, and a questioning of their legitimacy as experts. This often leads to missed actions when ambitious policies for more Collective Intelligence are written on paper.

As a consequence: **the inner IT capabilities and collective brain capacity of more and more organizations are less important than those outside.** This resistance can be fatal when the outer social chemistry produces more adaptable, efficient, clever, and attractive communities.

Forms of resistance against the implementation of Collective Intelligence – even more basic collaborative and consultative processes – are not lacking. Let's list the most common ones:

- **No time:** *there are too many emergencies now, no time to think about these things*.
- **Utopian:** *that's nice, but bosses and hierarchies will always be necessary because people need them*; *mess is useless when we need to reach objectives,* etc…
- **Causal belief:** *Collective Intelligence is not possible **because** the organization is too big*.
- **Conservatism:** things have always worked this way, so there is no reason why it should change…
- **Pessimism:** *people are required to change but human nature is selfish and childish*; or *people are too scared to change*…
- **Paradigmatic:** *but, if no one decides… **who** is going to decide?*

Nevertheless things evolve here and there. Communities of Practice (CoP) for instance are developed intensively. They are horizontal informal communities, inter- or trans-corporations, that rely on knowledge sharing, practice improvement, learning, mutual help, expertise, and coaching. They are structured around the criteria of Collective Intelligence and they often use free software as a technological lever rather than an internal information systems, which are too closed and proprietary, as well as controlled and vertical. Some large multinational companies are now aware that CoPs look like what the whole company might become tomorrow and are encouraging this mutation. But this does not occur without certain conflicts.

We can only but encourage organizations to develop their CoPs, it is one the best opportunities they can take at the present[15]. There is a whole proven know-how that allows forward movement

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[15] Two famous specialists have studied this question : George Pór in Europe (www.community-intelligence.com/who/george.htm) and Etienne Wenger (www.ewenger.com). George Pór has built his approach around four architectures that compose the nervous system of the organization : communication, coordination, memory (including knowledge management), learning.

without painful ruptures being encountered.

In education and training

As we have seen earlier, the idea of planned and standardized school programs (often at the national level), featuring classes with 30-40 students or lecture halls with 500 students with their sight focused on one unique teacher (rather than making learning communities disposed in circle), or exams and diplomas as a ritual of belonging to a given territory, all appear as many signatures of the same industrial paradigm. They are unsuitable to the stakes of our century, to say the least. What university, what training organization is today ready to install and deliver a collective diploma that is given to a whole team rather than just individuals?

For now, learning Collective Intelligence occurs mainly via practice in cyberspace: in the belligerent foaming of the persistent game universes, in the fertile spaces of wikis and weblogs, in the guilds of free software and hacking[16], in these new worlds where tomorrow's communities and cultures are growing.

If we want school, university, or continuous training to remain meaningful, we need to now create collective intelligence trainings. A courageous -- but not impossible -- internal transformation will be required.

What exactly would these trainings be like? How can we train these future artisans of tomorrow's communities, these future experts in social engineering?

Let's first see what their mission would consist of within concrete contexts of today:

- In companies and organizations: accompany change and transformation
- In communities: build and drive projects that require the assembly of different and complex cultures
- In public and political life: install new governance and individual participatory systems
- In education systems: serve as learning communities catalysts

By inserting the main characteristics of Collective Intelligence, we obtain the following training description:

- Servant leadership: literally train leaders at the service of others as self-empowerment facilitators
- Personal development: a wide inner space is required to develop relational and coaching capacities
- Relational intelligence: art of mediation, dialogue, and public expression
- Ethics, and values
- Methodologies (project management, management, specifications, audit and evaluation, management control data, business planning, holistic approaches, etc…)
- Practice of an art (accounting, medicine, music, pedagogy, law, etc)
- ICT and Internet
- Classic corporate platforms (HR, KM, CRM, ERP, etc)
- Quality and e-quality
- Watch and prospective
- Sociology of organizations
- Emceeing of communities (of practice, of learning, of knowledge, etc)

Personal and relational development, tools, methodologies, and practice would certainly be an ambitious project (Art-object) to train future artisans of Collective Intelligence. It is not very far from

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[16] The original word *hacker* means a skilled programmer that is not necessarily ill-disposed

that of the *honest man* advocated by Montaigne. "*It is truly said that an honest man is a mixed man*", as he wrote in one of his Essays.

The good news is that none of the listed points above, taken separately, are a novelty per se. The innovation resides in their subtle assembly and in their incorporating a new perspective for a universal ethics of governance. Nations, companies, administrations, communities, NGOs, education… everyone will win by accepting the experts' catalysts of Collective Intelligence.

In NGOs

Contrary to what most people may believe, the distinctive feature of NGOs is not the fact they are non-profit organizations. Their raison d'être is connected to the laws of the living. They succeed where pyramidal intelligence and pre-democratic forms reach their limits. By doing so they unleash a global vision on human economy and a global governance.

Most NGOs have an executive nucleus of pyramidal nature. The reason is simple: in order to raise scarce money (sponsors, public financing, etc…), to legitimately negotiate in a politico-institutional fabric still mainly constituted of pyramidal intelligence, it is necessary to have a similar genetic code, structure and culture.

As for the militant base of these NGOs is, most of the time they are horizontal and distributed. Transparency, democracy, best practice, solidarity, and gift economy are the standards, but too often at the cost of operational efficiency. This is because no one wants to be undemocratic or fall backwards into the shortcomings of autoritarism. Debates can be endless. Therefore NGOs are hybrid structures, halfway between pyramidal and Collective Intelligence.

Basically NGOs clamor for global Collective Intelligence. It is the direction they will take in the years to come. Just like in the corporate world we evoked earlier, many of them believe that, by using ICTs, telephones, faxes and planes for face-to-face meetings they are at the top of their efficiency. They are wide off the mark.

This handicap is probably due to the fact that many social activists and militants don't particularly feel concerned about ICTs and technical innovation in general. On one hand they very rightly denounce planetary stakes and social injustice and they call for a global governance and a holistic vision; on the other they don't give themselves the means to acquire the related technologies, methodologies and vision.

Let's recall that the meaningful social progress has been possible only after the People have taken possession of the technologies of knowledge, i.e. writing and printing. Moreover, don't all those who fight against poverty and exclusion militate in unison for the alphabetisation? Isn't it the only and unique way to exist and legitimately evolve in the Nation-States and the pre-democracies of pyramidal intelligence? **In the same manner, it is a duty and an absolute condition of success for today's social activists to master the technologies of Collective Intelligence and of its Governance. Only when this condition is met will they will be capable to build communities that are more efficient and more competitive than pyramidal intelligences whose deficiencies that are attempting to alleviate.**

Bureaucratic hierarchies (based on static forms of writing), media monarchies (surfing the television and media systems), and international economic networks only partially mobilize and coordinate the intelligence, experience, skills, wisdom, and imagination of humanity. For this reason the development of new ways of thinking and negotiating engendered by the growth of genuine forms of collective intelligence become particularly urgent. Intellectual technologies are not just another branch of contemporary anthropological change, they are a potential critical zone, its political nexus. There is no reason to belabor this point, however, for we can't reinvent the instruments of communication and collective thought without reinventing democracy, a distributed, active, molecular democracy. At this tipping point or hazardous sealing off, humanity could regain control on its destiny. Not by putting its fate into some allegedly intelligent mechanism, but by systematically producing the tools that allow humanity to built itself into smart communities, able to navigate on the stormy oceans of this mutation.

Pierre Lévy, '*Collective intelligence*'

The magic thought, then the mythic thought, then the rational thought became, in their respective epochs, the successive vehicles of human mind (noosphere) with which human society organized, synchronized and enlarged itself, from the tribal levels to modern Nation-States. The interactive, dynamic and ubiquitous objects of cyberspace already allow us to overcome present limits of dualistic rationality to transcend and include them into a post-rational thought, a 'glocal', holistic, transpersonal, non-dualistic, systemic. It is in these new noospheric spaces, mediated within cyberspace, that humanity will be able to direct itself, to negotiate itself, to self-evaluate, to doubt itself, and to navigate in these complex waters.

Communities based on original collective intelligence were not able to build cathedrals nor invent vaccines, and communities of pyramidal intelligence cannot manage the systemic complexity of the world today. No governments, political parties, ideologies, large institutions (such as the World Bank, ODCE, UNESCO, UN, WTO…) or companies in their current form are suited to this task.

Cyberspace, still in its infancy, has only just begun to build, via a catalyzing process, communities that will gradually supplant the old guard of pyramidal intelligence organizations. It is only a question of time. Each day, millions of new interpersonal links are woven and new communities emerge. Global Collective Intelligence is emerging. It must now grow. Our planet is pregnant with a new humanity.

Our individual choice consists in deciding whether we want to enroll in this evolution or to refuse it.

The resistance to change often proves to be a stronger force than life, as History has shown us many times at the scale of the individual, companies and civilizations. However the practical know-how of collective intelligence is within everyone's reach. We now possess the bricks and mortar. For many people, the consciousness of the absolute necessity to assemble these materials into a new edifice everyday becomes increasingly more pressing.

Acquiring and developing this knowledge is a matter of a deep individual commitment combined with a spiritual dimension that gets very concretely expressed through a *practice* engaged in our professional spaces, in our daily life, in the education of our children, in the relationship with the *other*, this neighbor by which we do exist.

All of this has already begun.

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About the author

Jean-François Noubel was born in 1964 in France near Paris. Quite early in his childhood he became interested in human development through scientific, philosophical, artistic and spiritual approaches. As an insatiable explorer of life, traveler and adventurer for fifteen years, he feels strong acquaintance with the character *Candid* from Voltaire, who finally finds serenity and happiness in *cultivating his garden* after numerous and tumultuous adventures around the world. Jean-François' garden is Collective Intelligence, the next stage in humanity's journey.

A visionary, he was one of the founders of AOL France in the early days and then participated in the growth of other hightech companies. Today he assembles his spiritual, scientific, corporal, and artistic life experience so that Collective Intelligence becomes understandable and usable by everyone, and considered by organizations as an ineluctable evolution.

Another important part of his work focuses on the evolution of our monetary systems. Money is not neutral but has an architecture that gives a shape to communities. Today the world needs to move from a currency system based on scarcity to a monetary system based on 'sufficiency'. These new currencies are called 'free currencies' or 'open money'.

Jean-François Noubel prepares a book, gives conferences and workshops, organizes research and training programs, and provides strategic consulting services to companies. He also has founded an international think tank called TheTransitioner.org.