

A social architecture to scale trust

Steps toward a social ecosystem

Gael Van Weyenbergh¹, Ben Werner²

Abstract: Social technologies have allowed anyone to connect with almost everyone else on the globe, eliminating geographical location as a strong barrier to interaction and cooperation. Yet, trust - or lack thereof - remains an issue. Indeed, trusting others is a fragile experience that is - by necessity - restricted to a limited set of peers. In contrast to the “many-to-many” networks that provide limited tools for users to build trust and confidence among themselves, our “few-to-few” architecture aims to bring those qualitative relationships observed in cohesive social clusters to scale. Inspired by the dynamics of complex adaptive systems, this social architecture would be defined by the subjective and direct experience of trust, emotional resonance, and reciprocity. Such a new set of online relational dynamics is expected to be more conducive to social trust and can provide the first steps toward a social ecosystem that is more responsive to adapt in a dynamic environment where change is the only constant.

Introduction

Social technologies have allowed anyone to reach out to almost everyone else on the globe, eliminating geographical location as a strong barrier to interaction and cooperation. Yet, trust - or lack thereof - remains an issue. Despite the fact that social trust is essential in all human affairs, social technologies provide few tools for users to build trust and confidence among themselves. The paradox is that while social technologies have enabled collective intelligence³ at unprecedented levels, they remain poorly wired for cooperation, especially at scale. Without trust to support social interactions - cooperation levels are sparse and social impact remains well below its potential (Deutsch 1949, Johnson and Johnson 1989). Instead of favoring ubiquitous connectivity, we believe that “the best way to unlock enormous stores of value on networks is to develop a network architecture and software systems that can enable people to build trust and social capital in user-centric, scalable ways” [1]. It is our intent to lay down some theoretical propositions to initiate the discussion on a social architecture that would enable trust to scale from the local to the global level, thus paving the way for a global social ecosystem.

¹ Coordinator, Meoh, Brussels, Belgium.

² Electrical Engineer & Researcher, Meoh, Santa Barbara, CA.

³ We define collective intelligence as the knowledge and capacity of a group which goes beyond that of any individual.

A social architecture more conducive to trust

Trusting others is a fragile experience that can have consequences for those involved such as being deceived, abused or betrayed. We define trust as a firm belief in the integrity, capability, and benevolence of other people; enacted through an expression and willingness to take a risk and to put oneself in a position of vulnerability in order to meet a positive outcome. Indeed, “trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” [2]. The act of trusting others - for certain qualities and capabilities they may have - amounts to putting one’s faith in the hands of others. As such, it underscores the ultimate nature of our social relationships - an irreducible interdependence. “Trust”, in the sense that we are using it, is an intrinsic property of any given relationship. There is very little grey area between fundamentally trusting someone and fundamentally not trusting someone. Trusting others prompts responsible behavior and the risk is - by virtue and by necessity - only shared with a restricted set of peers. Since the peculiarity of trust is that it must be earned as well as given, reciprocal behaviors anchored in words and in deeds are paramount to building trusted relationships. Trusting others also implies some level of emotional attunement, and emotional dissonance acts as a strong social signal that a breach in confidence is somewhere in sight. Furthermore, while building trust is a time consuming process, a breach in confidence can ruin relationships instantly. This is of special significance in the context of social networks where the distributed memory of interactions can have long lasting effects. As such, reliable peers are a social asset that is indeed very valuable and sometimes priceless. Therefore, though trusting others can be a fragile experience, it is the basis of strong relationships.

With insights from complexity theory, we propose to develop a network architecture that would enable trusted relationships to scale from the local to the global level. Taking the structure of biological systems as a cue, we can see that in order for a large number of cells to function as an organism - or for a large number of organisms to function as an ecosystem - the connections are not "many-to-many" as we are currently connected via the internet. Instead, they are “few-to-few”, in a fractal⁴ and heterarchical⁵ network that encompasses the entire organism. “The heterarchy concept is not new, but its full potential has not yet been realised. It promises to unify hierarchy theory and network analysis by bringing together top-down, bottom-up, and peer-to-peer dynamics” [3]. Such a model would require cooperation without central control and this field of inquiry is the domain of complexity theory since complex adaptive systems evolve and thrive without central coordination.

"Complex adaptive systems consist of a large number of interacting agents. Agents are goal-directed, cognitive individuals capable of perception, information processing and action. However, agents are intrinsically “bounded” in their rational understanding of the system they belong to, and its global organization tends to emerge from local interactions, resulting in a

⁴ Fractals are here understood as infinitely complex patterns that are self-similar across different scales.

⁵ “Heterarchies are systems of organization where the elements of the organization are unranked or where they possess the potential to be ranked a number of different ways”. [Wikipedia.org/wiki/Heterarchy](https://en.wikipedia.org/wiki/Heterarchy)

coordination of the agents and their actions. This coordination minimizes conflict or friction, while facilitating cooperation or synergy. The basic mechanism is the reinforcement of synergetic interactions and the suppression of conflictual ones. As a result, the system as a whole starts to behave like an integrated cognitive superagent” (Heylighen 2013).

This theoretical framework with roots in physics and biochemistry has often been proposed as having relevance to change in social systems. "Specifically, the processes and design features associated with dissipative self-organization have been used to describe the dynamics of social groups and organizations, especially in cases where highly turbulent and/or near-chaos conditions are present" (Smith, Comer 1994). Learning from the dynamics of complex adaptive systems such as ecosystems, we investigate how complexity theory could help to bring an emerging coherent structure within human society. Yet, though human society is a complex system in and of itself, “[...] there is a seeming impossibility or at least an extreme difficulty in utilizing the logic of complex adaptive systems to aid in restructuring social systems capable of embodying authentic values of individuation and navigating the dynamics of the information age” [4]. Without much surprise, we identify our main challenge as overcoming the well-known “tragedy of the commons”⁶. At first sight, aligning personal and collective interests with equipotent individuals who can be irrational at times and who can be pursuing different agendas seems to be wishful thinking if not an impossible task. Adam Smith, the “Father of Economics”, aptly depicted the dual nature of human motivation [5]:

“It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest.” — *Wealth of Nations*, 1776.

“How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it.” — *The Theory of Moral Sentiments*, 1759.

Indeed, without central coordination and control, can we reach self-organization in the face of individualistic actions that erode the whole? Central to the science of complexity is the concept of self-organization. Thus, complexity theory is a natural candidate to inform the design of new social dynamics that could self-regulate without the need for central control. Beyond this theoretical framework, we do have evidence of self-organizing patterns in small human groups. Alexis de Tocqueville noted that: “The village or township is the only association that is so perfectly natural that, wherever a number of men are collected, it seems to constitute itself” [6]. Though our attempt is inceptive, we can find further inspiration in “neural networks, heterarchies, fractals, swarms⁷ and stigmergy [which] are all examples of biomimetics that relate to the effort to cope with new governance processes in the network age” (Schatten, Žugaj,

⁶ “The tragedy of the commons is a term used in social science to describe a situation in a shared resource system where individual users acting independently according to their own self-interest behave contrary to the common good of all users by depleting or spoiling that resource through their collective action.” [Wikipedia.org/wiki/Tragedy_of_the_commons](https://en.wikipedia.org/wiki/Tragedy_of_the_commons)

⁷ Swarms enable “*large groups of networked users to work in synchrony.*” [7].

2011). The challenge is therefore to create a self-organized and organic social system that can scale up without the supervision of fixed hierarchies.

Structure is an emergent property of complex systems since those are made of " [...] diverse parts (elements) capable of connecting (relating) in higher coherent wholes. These 'wholes' in turn exhibit structural forms with novel properties, from macromolecular chemical communities to the technological global human community" (Last 2018). In other words, complex systems are driven by micro-macro dynamics where the multitude of local interactions at the micro level give rise to an emergent and coherent structure at the macro level. Within human society, we understand these micro-macro dynamics as being the relationships between the individual and the collective. The challenge is to find how the macro level or group dynamics can inform the micro level or individual behaviors so that the pursuit of individual fitness at the micro level is balanced by the pursuit of collective fitness at the macro level. Since trusting others is a fragile experience that has emotional consequences, we propose to add to the contemporary literature by supplementing the basic principles of complex adaptive systems with the logic of human emotional drives in order to define an emergent dynamical and robust trust architecture stabilized by emotional resonance and reciprocity. In other words, we aim to provide the network architecture and a new type of relational dynamics between the individual and the collective to attain and maintain trust outside the traditional chains of command and control. As a means to scale the township model through a fractal pattern, a few-to-few architecture would interconnect human-sized networks to maintain a continuum of trust from the local to the global level thus following the dynamics of ecosystems.

1. Trust and the shape of the system

Since risk is part of trusting others, these strong relationships built on fragile experiences are usually restricted to a limited set of peers. Anthropologist Robin Dunbar determined a theoretical limit known as the Dunbar number to the number of people with whom any individual is able to sustain stable or meaningful social relationships [8]. These are the social clusters in which an individual knows who each person is and how each person relates to every other person. This limit is known to be around 150 individuals. Cohesive communities, from special forces to religious congregations naturally stay under this boundary as it allows them to enjoy the affinities of trust and reciprocity. "Businesses with fewer than 150-200 people can be organized entirely on informal lines, relying on personal contacts between employees to ensure the proper exchange of information" (Dunbar 1996). Furthermore, the number of online relationships that any individual has that are stable has been shown to fall within the Dunbar number (Gonçalves, Perra, Vespignani, 2011) [9]. The trusted social fabric one has access to is understood as a social cluster that can be easily mobilized. Due to the nature of their privileged relationships, the real value of this social asset comes from the ability of individuals to engage with each other. If social trust is limited to small and cohesive communities, how can we bring social trust to scale while preserving those qualitative relationships that make the experience of trust possible in the first place? Since social trust is pervasive in all human affairs, social technologies "could largely mold the ways in which individuals meet and interact" (Porter 2012). We argue that it is time to

rethink the fundamentals of online relationships for - if we want to better translate collective intelligence into social impact - we need to provide better online tools for users to actualize trust and confidence among themselves.

Boundaries as interfaces

Clear boundaries are needed to keep trusted relationships safe within any given social cluster. Yet, "[...] one of the main problems of trusting agents in an open and massive multi-agent world is the necessity of exploiting the cumulated trust by other trustees (who we trust) for trusting agents that they know and we do not" (Falcone, Castelfranchi, 2012). As such, we need to open boundaries to opportunities that lie outside the trusted social horizon in a way that preserves the relationships at play within cohesive social clusters. Indeed, accessing new opportunities often requires one to reach out beyond the usual trusted landscape as strong social ties become self-limiting over time and as they tend to behave as a bubble. Weak social ties are therefore the gates from where it becomes possible to access new opportunities⁸ [10]. Rather than thinking of a boundary as something that separates, we think of a boundary as something that *constitutes that which is bounded*. In other words, we understand boundaries as interfaces that enable. Going back to our ecosystem analogy, "all social systems, and thus all living systems, create, maintain, and degrade their own boundaries. These boundaries do not separate but intimately connect the system with its environment. They do not have to be just physical or topological, but are primarily functional, behavioral, and communicational. They are not perimeters but functional constitutive components of a given system" (Cilliers 2001) [11]. In our model, trusted peers are seen as those who constitute the boundaries of one's trusted social landscape.

A continuum of trust

To bring these dynamics to scale, we rely on *the transitivity of trust* [12]. Transitivity is defined as a relation between three elements such that if it holds between A and B and it also holds between the B and C it must necessarily hold between the A and C. Since people have a foot in various communities, everyone could theoretically act as a local bridge and as a potential catalyst between different social clusters. And from the *triadic closure* theory, this local bridge might even have an incentive to bring A and C together to decrease the latent stress in two separate relationships [13]. As in real life, *knowing that those we trust, trust other people we do not know yet*, trusted peers are the doorways to a wider array of people and resources beyond what one usually has access to. Given this quality of trust, can we build a system in which trust scales to an arbitrarily large number of people? The only shape in nature that keep its properties at any scale is called a fractal. Fractals are simple shapes creating infinitely complex patterns that are self-similar across different scales (*see fig. 1*). Similarly, people are at the center of their own micro social world and at the verge of many others (*see fig. 2*). We envision a user-centric

⁸ Opportunity comes from the Latin root *Ab Portum* meaning "toward the port" where sailors catch a favorable wind that allows them to steer the ship to safe harbor.

approach where individuals navigate the network through relationships that are always grounded in the direct experience of trusting others. Trusted peers are meant to act both as responsible membranes or safe keepers of the social asset and as enablers or catalysts who have the ability to introduce new opportunities through their own trusted peers. Those who are recognized as being capable and trustworthy will likely expand the field of available resources for themselves and those they interact with, thus increasing the collective capacity for additional resources to flow in. Since social clusters have a fixed size and are entangled with each other, we would see a continual fractal network of close personal circles characterized by the trust, emotional resonance, and reciprocity that has always defined close, bonded relationships. In real life, such relationships already exist across the entire social fabric, though people lack the means to visualize them.

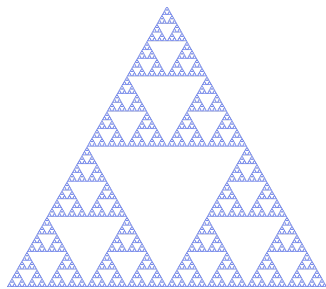


Fig. 1. Sierpinski fractal triangle⁹.

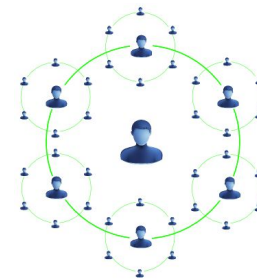


Fig. 2. User-centric networks.

2. Emotional resonance and the structure of the system

We understand emotional resonance as being the emotional attunement between people that connects their subjective worlds. Because of the fractal - or self-similar shape - of the system, there is by definition no central place that can assume the role of coordinating the network or social architecture. With the idea that trusted social clusters actualize a social asset i.e., the ability to mobilize human resources that are reliable, emotional resonance is seen to act as a “social glue” by providing systematic behavioral incentives that align the multitude of individual interests toward common purposes, shared meaning, and direction. For example, social psychologists regard empathy as a proximate factor motivating prosocial behavior (Batson, 1991; Davis, 1994) [14]. Thus, the main function of emotional resonance is to give the system an emergent structure by resolving the conflict between the pursuit of individual and collective interests. In other words, the function of emotional resonance is to inhibit free-riding by rendering the pursuit of narrow advantages less desirable than the pursuit of interests that benefit the group as a whole. In this proposed architecture, a “group” is composed of social clusters which are defined as an individual’s immediate (1st degree trusted connections) and connections-of-connections (2nd degree trusted connections). Therefore the “benefit of the group” is not a static objective, but rather a state that reflects a high level of emotional

⁹ Fractals are scale independent shapes that keep their properties regardless of the scale taken into account meaning that zooming in and out won’t change the overall pattern.

resonance within and between social clusters. Through modes of communication and action that maximize trust within social clusters, behavior at the individual level is expected to form coherent patterns reflecting trust and emotional resonance at the macro level.

This envisioned social architecture incentivizes both cooperation and competition. Cooperation is expressed by social behaviors that increase trust, emotional resonance, and reciprocity. Since social clusters are of limited capacity - and because “[everything] derives its value from its scarcity in relation to its usefulness” [15] - competition is here seen as the willingness for individuals to keep access to social clusters that are perceived to have high potential. Yet, competition is here better understood as emulation because - bonded by closely intertwined interests - the strength of one always contributes to the strength of others. “Creating competition and fostering cooperation are two alternative ways of creating incentives. [...] The question we tackle here is: when should incentives be provided collectively, on a team basis, or relatively, thereby creating competition among the agents? Most of the mechanisms identified in the agency literature either favor pure competitive or collective schemes. But real-life examples abound in which the provision of incentives is mixed” (Fleckinger, Roux 2012). Furthermore, empirical research shows that “cooperation” models enhance both the quantity and the quality of a crowd’s creative performance (Elmoukhli et al. 2016). Since being surrounded by trusted peers can be extremely valuable, the specific place of reward is neither reached by purely selfish or altruistic behavior but by the experience of trust, emotional resonance, and reciprocity with others.

Thus, structuring a social architecture based on emotional resonance will require developing the ecosystem within which synergies can be developed and maintained with the minimum of friction or conflict that leads to the erosion of trust. In constructing such a social architecture of trust, evaluation of the success of the network can be studied on the basis of the collective subjective perceptions of the individuals in the network. Because objective measurements are absent from interactions, subjectivity makes emotional resonance necessary if one wants to stay in the loop. Indeed, being compelled *to put oneself in the shoes of the other* favors the process of collective attunement since emphasis is not put on individuals but on relationships themselves: “Social networks are therefore not meaningfully measured simply in terms of the sheer number of links separating individuals - their “degrees of separation” - but rather, it is how people are linked and in what contexts they are linked that affects the quality of the network” (Clippinger 2007). Accordingly, the proposed social ecosystem shifts from the rating of individuals to the subjective appreciation of the qualitative nature of their relationships. In contrast to the predominant many-to-many social architectures, it is expected that in the proposed social ecosystem, emotional resonance would structure the parts that have greater coherence into stable relationships while emotional dissonance would lead to destructive interferences and to the dissolution of interactions.

Within this context, emotional resonance is translated into implicit statements rather than into explicit ones such as reputational claims. Indeed, “good or bad reputation does not need to be explicitly expressed as actions themselves are a stronger form of reputational statement”

(Farmer, Glass 2010). Because actions speak louder than words, implicit statements mean that individuals would simply reorient their preferential attachment toward peers who are perceived as being more capable and emotionally aligned with them. Positive emotions would represent emergent synergies caused by trust, resonance, and reciprocity; and negative emotions would represent emergent friction caused by distrust, dissonance, and self-centered behaviour. Long-term stable relationships are primarily held together by emotional bonds, and secondarily by reason. In times of conflict the emotional bond may seem irrational, though its coherence with reason becomes clear eventually [16]. Similar to beneficial neuro pathways that are strengthened over time, parts of the network with strong emotional resonance are expected to lead toward self-stabilization because they are felt as being safer. On the contrary, a breach in confidence would challenge the stability of the network. Indeed, social emotions indicate what is dangerous and emotional dissonance would signal a risk of default. While emotional resonance helps facilitate the rewards of reciprocity, affinity and trust, emotional dissonance is expected to prompt individuals to resolve issues within their personal network through better communication. Failing that, individuals would realign themselves with those with whom they more naturally resonate, and hence reconfigure their network. This capacity of the network to reconfigure itself reflects a perspective that we naturally resonate with some people more than others, and that there is a place for everyone in the social ecosystem that maximizes the collective emotional resonance of the network as a whole.

Since in Complex Adaptive Systems the macro level is responsible for maintaining balance¹⁰, stability and functionality, group dynamics would therefore provide systematic incentives for individuals to reach and maintain credibility with their peers as it would help them to increase their opportunities and collective momentum. In other words, the global incentive communicated throughout this social ecosystem would be to act responsibly and with integrity by taking the collective interest into account. “The biological reality of self-preservation leads to virtue because in our inalienable need to maintain ourselves we must, of necessity, help preserve others” [17]. In that scheme, prosperity does not come from taking narrow advantage of others; it comes from a broader capacity to recognize and embrace mutual self-interest. A technological property of the network would be to continuously reflect the state of emotional resonance in the community of users. Network visualization could act as a strong form of trust assessment between oneself and the larger social ecosystem. Taking acoustic resonance as an analogy to emotional resonance, we consider cymatics¹¹ to be a potential visualization methodology of an emergent social ecosystem (*see fig. 3*).

¹⁰ “One characteristic typical of complex adaptive systems is circular causality, or the macro-micro feedback loop (Solé and Goodwin 150), which refers to the fact that the large-scale order of the system is created by interaction of its parts, but that the interaction of the parts is governed in turn by the large-scale order.” [17].

¹¹ Cymatics, from Ancient Greek: κύμα, meaning "wave", is a subset of modal vibrational phenomena. [Wikipedia.org/wiki/Cymatics](https://en.wikipedia.org/wiki/Cymatics),

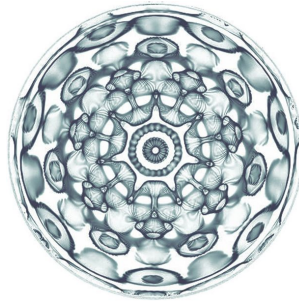


Fig. 3. Cymatics image showing standing waves created by using a signal generator to excite water molecules with sound frequencies. Cymatic images would represent simultaneously the structure of the network and the pattern of communication of the network, from a user-centric perspective.

3. Reciprocity and the dynamics of the system

Reciprocity is here understood as “behaviors in which people give each other help and advantages”.¹² Reciprocal behaviors anchored in words and in deeds are paramount to building trusted relationships. Indeed, “trust has a reverse side: it must be earned as well as given” [18]. The peculiarity of reciprocal behaviors is that they are about a feeling of equivalence that escape the squaring of accounts. In fact, the purpose of reciprocity is to assume a perpetual social debt that is constantly holding the social field in a mutual interdependence. Reciprocity has a direct impact on the social dynamics of the system and especially in what determines exchange, engagement, and influence.

A. Reciprocity as a means of exchange

Exchange can be either symmetric or asymmetric. The purpose of a symmetric exchange is to extinguish any liability between the parties once the exchange is complete. Such is the case with an economic transaction where goods are exchanged against money. The purpose of an asymmetric exchange is to perpetuate liabilities between the parties so that the transaction can never be complete. Such is the case when friends reciprocate favors to each other. These complementary approaches to exchange are chosen depending upon the existence or not of a personal relationship between those who interact.

"Exchange can't be reduced to an economic transaction only. It is a good in itself in the form of a personal relationship that can be acknowledged in many ways. [...] Prices facilitate exchange when information is scarce and coordination difficult, conversely, reciprocal exchange has been preferred when trade involves a personal interaction, and when goods or services are unique, [...] or have many dimensions of quality" (Offer 1997) [19].

Thus, while "reciprocal relations structure all process of social interaction, including those organized by the state or the market" (Kowalski 2011), reciprocity usually replaces currencies

¹² <https://dictionary.cambridge.org/dictionary/english/reciprocity>

when parties are bound by a personal relationship. Because the *unit of account* is a defining attribute of currencies - so that we know how much we have to pay - making use of currencies implies to make recourse to strict accounting.¹³ We believe that strict accounting is not the most optimal way to foster exchange when personal and therefore when emotional relationships are involved. Indeed, with informal relationships, favors are never recorded in their details so that they can never be objectively compared against each other. Therefore, strict accounting between *pears and apples* is poised - sooner or later - to induce mistrust within the interacting parties and negatively affect the future of their relationship. Since reciprocity is based on a feeling of equivalence that is built over time, reciprocity is fundamentally a collection of asymmetric transactions whose main purpose are to create and maintain social liabilities. In fact, reciprocal behaviors underline the "recognition of our ultimate interdependence that is the ultimate substance of social peace" [20]. In other words, reciprocity does provide additional leverage when strict accounting would erode trust within the social fabric because it would feel awkward or even offensive. And from a systemic perspective, by adding to the diversity of means of exchange, reciprocity would further help to bring resilience to the system [21].

B. Reciprocity as a means of engagement

Reciprocity is based on the belief that "they would do the same in return, not necessarily that they will" (Graeber 2011). Therefore, the prospect of reciprocity for a given favor remains uncertain and cannot be forced onto others. As such, we intend to anchor interactions in intrinsic motivations where individuals can deploy their talents and where they can freely engage in activities that are aligned with their core motivations. When individuals have the chance to embrace activities that are internally rewarding, they are more prone to act from their highest place with the lowest reliance possible on external rewards and future potential outcomes. The model would further ground interactions in group dynamics where individuals can freely team up with like minded peers to tackle challenges that matter to them. The pleasure to belong, to share, to teach, to learn, to discover, to impact together and to build up a collective capacity that is greater than what is possible individually, are a set of positive emotions that are grounded in intrinsic motivations and in group participation. This well-being effect has the potential to satisfy basic psychological needs for competence, autonomy, and relatedness (Przybylski 2010).

Positive emotions associated with group dynamics have the potential to spark social engagement through internal reward. Intrinsic motivations are usually recognized as being a better predictor of social engagement than external rewards such as financial incentives. For instance, game design identifies positive emotions as powerful drivers that foster participation [22]. Also, neuro-imagery shows that our brains neurologically compute positive emotions as being as valuable as money [23]. Additionally, positive psychology claims that the state of flow or "the mental state of operation in which a person performing an activity is fully immersed in a

¹³ Currency comes from the Latin root *Currere* meaning *to run, to flow* as in "current" or as in "cash flow". We understand reciprocity as a type of "currency" which doesn't have the "unit of account" attribute and therefore more accurately as a type of "current" which creates a "field" that attracts resources.

feeling of energized focus, full involvement, and enjoyment in the process of the activity” is the optimal strategy to stimulate engagement [24]. Since financial incentives are a compensation for a work that would probably not have been done otherwise, when the financial reward stops, so does the participation. On the contrary, intrinsic motivations help social participation when financial rewards are in limited supply and moreover, reciprocity always leave the door open for favors to be returned at a later time.

C. Reciprocity as a means of influence

As an experience of equivalence that involves mutual expectations and responsibilities, reciprocity is a demand for commitment as an end in itself. By perpetuating relationships of social indebtedness, reciprocity helps to reinforce the affinities of trust that cement communities. Indeed, “people engage in uncalculating cooperation to signal that they can be relied upon to cooperate in the future” (Jordan et al 2016) [25]. This essentially resembles the principles of the evolutionary approach, namely, “whatever is successful, is likely to appear more often in the future” (Axelrod 1984) [26]. Since - within reciprocal interactions - favors are always “returned”, reciprocity is by definition anchored in social recognition. Therefore, we believe that reciprocal behaviors can inform new social dynamics that foster resonant leadership. Resonant leaders are those “who exhibit attributes of emotional and social intelligence, are better able to connect with others most effectively, and so lead well” (Goleman 2007). Social clusters being limited in size, it is expected that individuals will primarily chose to team up with peers who represent the greatest perceived potential. Therefore, to build up influence beyond nominal status, leaders will need to be attractive enough to retain peers in their sphere of influence (*see fig. 4.*). Increased social recognition would mean that higher levels of trust, emotional resonance and reciprocity have been achieved. In other words, recognition comes first and influence comes second so leaders would need to reach uncommon levels of social recognition in order for them to propagate their influence across the network.

Being comprised of radially-connected personal social circles, the network itself must be fractal and the dynamic of communication within the network that is meaningful must be two-way or reciprocal. Trusting others being a fragile experience that is restricted to a limited set of peers, i.e., a social cluster, when personal networks become saturated with trusted peers, users cannot enter more social clusters themselves. Therefore, for influence to propagate across the social landscape, people need to find “harmonic resonance” beyond their own trusted horizon.¹⁴ Our working assumption is that if reciprocal communication on a given subject crosses a threshold change in scale of the fractal network, then this communication must reflect trust and emotional resonance among the individuals involved. Confined to small networks and tied by shared responsibilities, influence and leadership are more likely to shift to those who positively impact their communities, to those who lead by example, and to those who reciprocate with fairness. In other words, influencers learn to be attractive because “the visibility of feedback

¹⁴ Fractal comes from the Latin root *frangere* meaning “to break” and fractals are essentially collections of boundaries. As such - and like tuning forks vibrating with each other - entering in resonance is the only way for influence to propagate beyond its original boundaries.

profiles to others creates its own rewards and punishments” (Lampe 2011). It is now largely accepted that, in the forthcoming relational-aware economy, it is not about one’s credit score anymore but about one’s level of credibility [27].

In summary, viewed as a means of exchange, reciprocity has the potential to create an additional capacity for resources to flow between individuals. Viewed as means of engagement, reciprocity has the potential to increase social participation. And viewed as a means of influence, reciprocity has the potential to anchor leadership in social recognition.

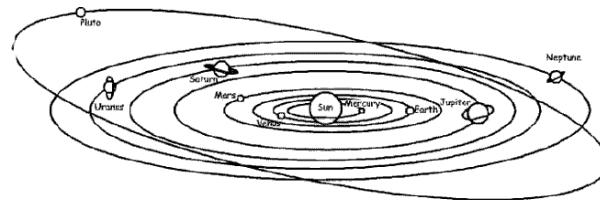


Fig. 4. Solar system analogy where the sun casts its influence upon planets and planets upon moons. Likewise, reciprocity creates a gravitational pull for peers and those behind them.

Conclusion and future research

In contrast to the many-to-many social networks where the lack of trusted relationships remains an underlying impediment, this proposal for a few-to-few architecture points toward a new set of relational dynamics that would be more conducive to social trust. It is expected that qualitative relationships based on trust, emotional resonance, and reciprocity such as those experienced within cohesive communities could be brought to scale as a dynamic complex system. “What is really changing in the world is not technology, or the globalization of capital, but the relationships between people, relationships that were once hierarchical and based on the force of authority. This has been radically flattened. What matters most now are the connections between people, the interdependencies and networks that can be formed and the unimpeded flow of information” (Green 2010). At the systemic level, this model focuses on adaptability with ecosystem dynamics that would make the social architecture natively more flexible, robust and resilient toward change. As such, this model offers a middle ground between organizational models based on rigid order such as those represented by fixed hierarchies, and totally distributed systems such as blockchain. Both the rigid and distributed systems could benefit from social trust. Indeed, fixed hierarchies struggle to adapt to the ever changing societal environment and therefore lose social support (2018 Edelman Trust Barometer), while blockchain initiatives need social support when the “law in the code” fails (e.g. DAO hack 2016) because they are explicitly aiming at conducting interactions without social trust (Nakamoto 2009).

Thus, the many-to-many trustless protocols of distributed ledgers could be complemented by a few-to-few trustful social architecture. Such a human-computer interaction could support the development of a robust distributed governance model. At the micro or personal level, this social architecture would promote engagement rooted in intrinsic motivations. Yet, in contrast to the current emphasis made on self-empowerment and self-reliance, this proposed architecture underlines our quintessential vulnerability as isolated beings and validates our ultimate interdependence. At the macro or collective level, the model can generalize the sharing of interests - including the build up of commons - and therefore would promote a sense of responsibility while helping to forge new collective identities. And with new dynamics between the micro and the macro levels - or between the individual and the collective - this model would help stabilize trust outside of traditional chains of command and control. Freed from vertical accountabilities, and incentivized to attain and maintain viable thresholds of cooperation, we might better be able to tackle exponential challenges with exponential participation, thus better translating collective intelligence into social impact. “[..] The real disruption taking place is not technology; it’s a trust shift that will open the doors to new and sometimes counterintuitive — ways of designing systems that will change human behavior on a large scale” (Botsman 2016).

Additional research and development is required to realize the potential the proposed social architecture. A means to visualize emotional resonance based on communication patterns within the proposed network is hypothesized and still needs to be developed. The application of the proposed architecture as a social layer to blockchain-based technology is an open area of research. The integration of decision-making protocols into the proposed architecture would yield new forms of distributed governance that should be more responsive and adaptable than static hierarchies. By engaging with pilot communities and established organizations in this emergent social ecosystem we aim to test a proof of concept of this social architecture and define an adequate impact measurement framework.

Acknowledgments

This paper benefited from conversations and comments by Cadell Last, Forrest Rosenblum, Daniel Schimmelpfennig, Mehdi Elmoukhli, Marco Sachy, and Anique Yael Vered.

Note

MEOH is an acronym for “Many Embers One Heat” and comes from Dante’s Divine Comedy, Paradise, Canto XIX: *“from many embers one heat is felt...”*

References

- [1] Clippinger, J.H., Bollier, D. (2014). *The Next Great Internet Disruption: Authority and Governance, in From Bitcoin to Burning Man and Beyond*, ID3.
- [2] Rousseau, D.M., et al. (1998). "Not So Different After All: A Cross-Discipline View of Trust." *Academy of Management Review*, vol. 23, no 3, pp. 393-404.
- [3] Cumming, Graeme S. (2016) "Heterarchies: reconciling networks and hierarchies." *Trends in ecology & evolution* 31.8, pp. 622-632.
- [4] Last, C., Van Weyenbergh, G., Werner, B. (2018). "Transformative Social Ecosystem Dynamics: A Psychological Architecture of Emotional Trust" (Working Paper), Meoh ASBL, Brussels.
- [5] McCabe, K. A. (2003). *Reciprocity and Social Order: What do experiments tell us about the failure of economic growth?* George Mason University, Washington D.C.
- [6] de Tocqueville, A., *Democracy in America*, 1831.
- [7] Rosenberg, L. (2016). Artificial Swarm Intelligence, a Human-in-the-Loop Approach to A.I. Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence.
- [8] Dunbar, R. I. M. (1992). "Neocortex size as a constraint on group size in primates." *Journal of Human Evolution*. 22 (6). pp. 469–493.
- [9] Gonçalves B, Perra N, Vespignani A. (2011). "Modeling Users' Activity on Twitter Networks: Validation of Dunbar's Number." *PLOS ONE* 6(8): e22656.
- [10] Granovetter, Mark S. (1973). "The Strength of Weak Ties." *American Journal of Sociology*. Vol. 78, no. 6, pp. 1360-380.
- [11] Cilliers, P. (2001). "Boundaries Hierarchies and Networks in Complex Systems". *International Journal of Innovation Management*. Vol. 5, No. 2 (June 2001), pp. 135–147.
- [12] Bhuiyan, T., Josang A. (2010). "Analysing Trust Transitivity and The Effects of Unknown Dependence." *International Journal of Engineering Business Management*, Vol. 2, No. 1, pp. 023-028.
- [13] Easley, D, & Kleinberg, J. (2010). *Networks, crowds, and markets: reasoning about a highly connected world*. Cornell, NY: Cambridge Univ Press.
- [14] Decety, J., Meyer, M. (2008). "From Emotion Resonance to Empathic Understanding: A Social Developmental Neuroscience Account." *Development and psychopathology*, vol. 20, pp. 1053-80.
- [15] Nichols, D. M. (1992). *Modern Money Mechanics*, Federal Reserve Bank of Chicago.
- [16] Levine, E. E., Barasch, A., Rand, D., Berman, J. Z., & Small, D. A. (2018). "Signaling emotion and reason in cooperation." *Journal of Experimental Psychology: General*, 147(5), 702.
- [17] Damasio, A. (2003). *Looking for Spinoza: Joy, Sorrow and the Feeling Brain*. Orlando, FL: Harcourt, p. 160.
- [18] Command and Control, *U.S. Marines Corp manual*, PCN 142 0000100, p. 114.
- [19] Offer, A. (1997). "Between the Gift and the Market: The Economy of Regard." *Economic History Review*, vol. 50, 3 (Aug. 1997), pp. 450-476.
- [20] Graeber, D. (2011). *Debt, The First 5,000 Years, The Moral Grounds of Economic Relations*, Melville House Publishing.
- [21] Lietaer, B., Ansperger, C., Goerner, S., Brunnhuber, S. (2012). *Money and Sustainability: The Missing Link*, A Report of The Club of Rome, EU Chapter, Triarchy Press.
- [22] Dickey, M. D. (2005). "Engaging by design: How engagement strategies in popular computer and video games can inform instructional design". *Educational Technology Research and Development*, Volume 53, Number 2.
- [23] Thut, G., Schultz, W., Roelcke, U., Nienhusmeier, M., Missimer, J., Maguire, R. P., Leenders, K. L. (1997). "Activation of the Human Brain by Monetary Reward." *Neuroreport* 8, Paul Scherrer Institute, University of Fribourg, Switzerland, pp. 1225- 1228.

- [24] Csikszentmihalyi, M. (2014). *Towards a psychology of optimal experience. Flow and the Foundations of Positive Psychology*. Springer Netherlands. pp. 209-226.
- [25] Jordan, J. J., Hoffman, M., Nowak, M. A., Rand, D. G. (2016). "Uncalculating Cooperation Is Used to Signal Trustworthiness." *Proceedings of the National Academy of Sciences* 113 (31) (July 2016). pp. 8658–8663.
- [26] Axelrod, R. M., & Hamilton, W. D. (1984). *The evolution of cooperation*. New York: Basic Books.
- [27] King, M. A., Former Governor of the Bank of England (2012). "Welcome to the New Reputation Economy", *Wired Magazine*, September 2012.