# RESILIENT SYSTEMS & SUSTAINABLE QUALITIES

## SMALL, LOCAL, OPEN, CONNECTED: AN EMERGING SCENARIO

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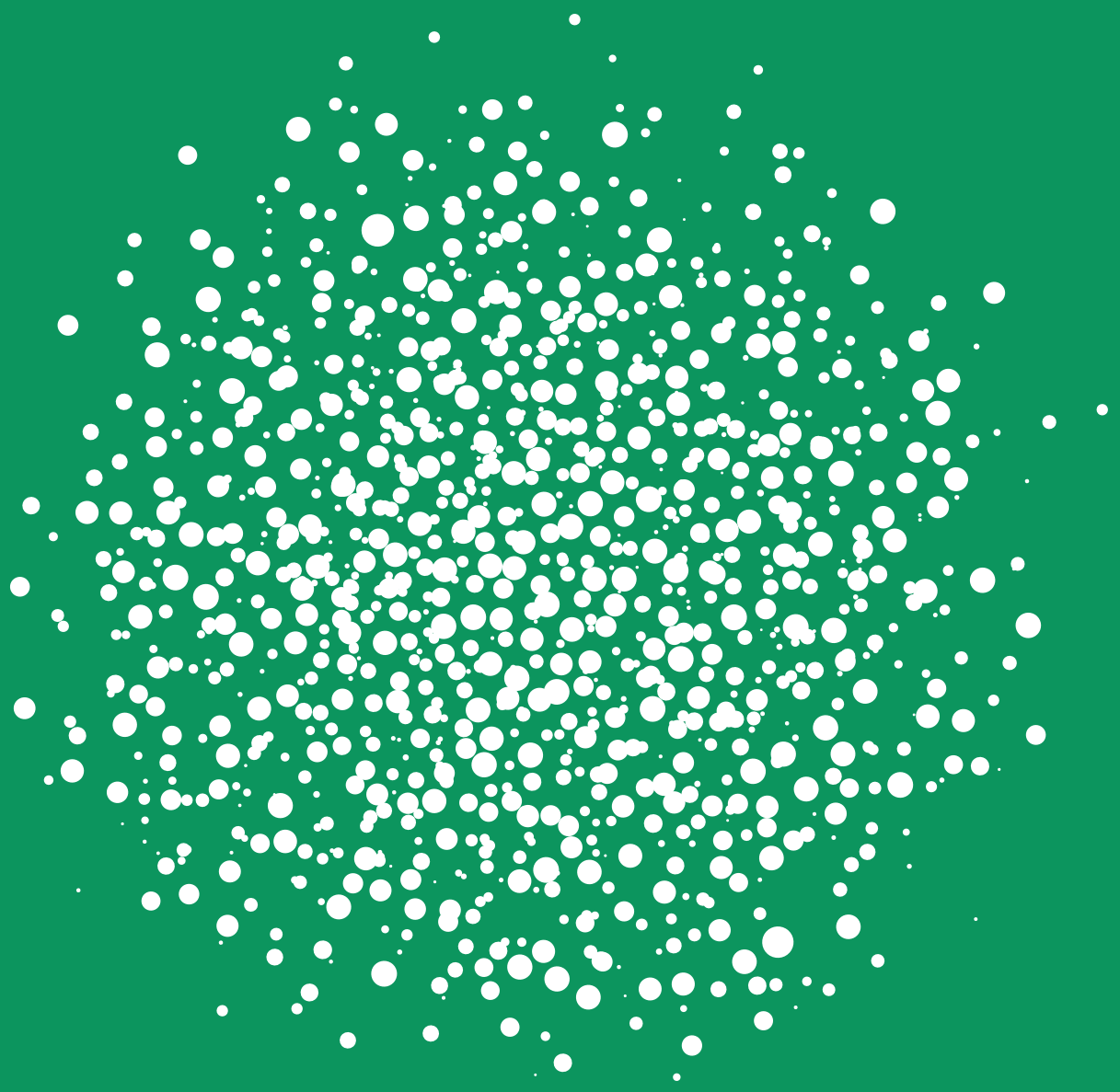


**For a long time, we have known that, whatever our future society will be, it will be a "risk society" [2] — a society likely to be affected by different kinds of traumatic events (from natural catastrophes, to war and terrorism, to financial and economic crisis). We have known for a long time, therefore, that the precondition for every possible sustainable society is its resilience — its capability of overcoming the risks it will be exposed to and the stresses and breakdowns that, inevitably, will take place. [24] Today, the implications of this risk society are no longer only projected. They are becoming evident worldwide in our daily life experiences; the notion of resilience is moving into the vocabulary of more and more people. It would be wise to accelerate its entrance into policy makers' agendas and into the design community's aims and practical actions.**

## RESILIENT SYSTEMS

But how do we design a resilient socio-technical system? Let's look to natural systems; their tolerance of breakdowns and their adaptation capacity (that is, their capability of sustaining over time) may give us direction. [6,13] As a matter of fact, it is easy to observe that lasting natural systems result from a multiplicity of largely independent systems and are based on a variety of living strategies. In short, they are diverse and complex. These diversities and complexities are the basis of their resilience — that is, of their adaptability to changes in their contexts.

Given that, it should be reasonable to conceive and realize something similar for man-made systems. The socio-technical systems that, integrated with natural ones, constitute our living environment should be made of a variety of interconnected, but (largely) self-standing elements. This mesh of distributed systems, similarly to natural ones, would be intrinsically capable of adapting and lasting through time because even if one of its components breaks, given its multiplicity and diversity, the whole system doesn't collapse. [9]

How far are we from this complex, and therefore resilient, man-made environment? In my view, this question has no single and simple answer; contemporary society demonstrates a contradictory dynamism that forces us, on this point as on many others, to describe what is happening as a double trend: the mainstream, unsustainable trend, enduring from the last century, and a new, emerging trend. In our case, we have the clash between the big dinosaurs of the XX Century, and the new, interconnected small creatures of the emerging new world.

Considering this metaphor, we can see that the mainstream processes of modernization, held over from the last century, are moving in the "wrong direction", trying to kill (what remains of) traditional agriculture and craftsmanship and pushing toward global agro-industrial and industrial production. In other words, we can see powerful interests at work promoting large plants, hierarchical system architectures, and process simplifications and standardizations. These interests are therefore, consciously or not, using their power to reduce biodiversity and socio-technical diversity and, consequently, to increase the overall fragility of the system.

Luckily, at the same time, something else happened and is happening; new generations of distributed systems emerged and are emerging. This emergence is driven by different factors: the power of technological networks and a growing number of enthusiasts (who, wherever these distributed systems become possible, tend to adopt them enthusiastically). [3] This complex trend towards distributed systems can be described as having three main waves of innovation.

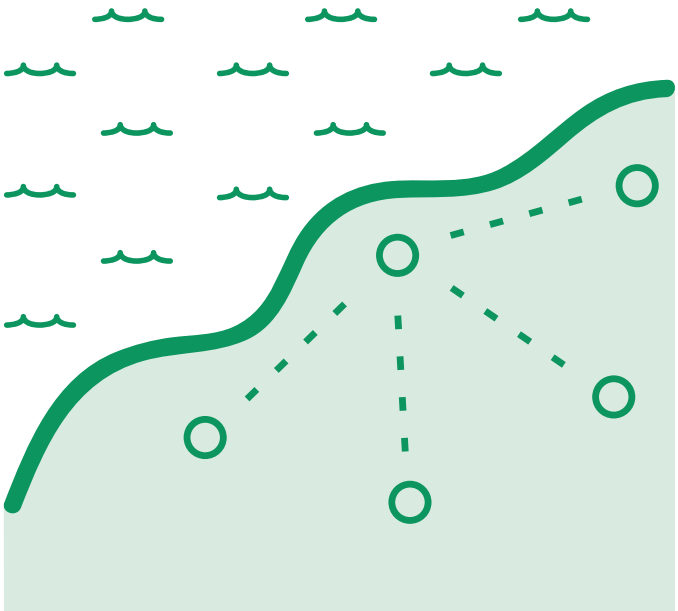
The first evolution occurred when the architecture of information systems shifted from the old hierarchical systems to new, networked structures (distributed intelligence). This change started with the diffusion of distributed intelligence and the radical changes in our systems of organization it made viable. The result is that rigid, vertical organizational models that were dominant in industrialized society are melting into fluid and horizontal ones as new distributed forms of knowledge and decision-making become more common. [23,1] The success of this innovation is such that, today, networked architecture is considered an obvious "quasi-natural" state. But of course this is not the case; before laptops and the Internet, information systems, concurrent with the mainstream model at the time, were based on large mainframe computers and their consequently hierarchical (and therefore fragile) architecture.

The second wave of innovation has altered energy systems. These shifts are driven by a cluster of dynamic fields, including those producing small, highly efficient power plants, renewable energy plants and "smart" grids that intelligently connect them (distributed power generation). Today, these new but already viable solutions are challenging the (still) mainstream systems, which are based on large power plants and hierarchical (stupid and fragile) grids. Distributed power generation is one of the main components of the ongoing and powerful "green technology" trend. It is reasonable to think that energy systems will follow the trajectory of information systems, moving increasingly toward distributed system architectures. [18]

The third wave of innovations toward distributed systems challenges mainstream globalised production and consumption systems. These production systems include initiatives ranging from the rediscovery of traditional craftsmanship and local farming, to the search for hyper-light and lean production, to the hypothesis of networked production systems based on the potentialities of new forms of micro-factories such as fab labs ("small-scale workshop[s] offering personal digital fabrication" ) [5] and by the makers movement ("[a] subculture…representing a technology-based extension of DIY culture.) [10] While this trend is still in its initial phase, the whole production and use system must be re-shaped following a new localization principle; products must be designed so that their production can be as near as possible to where they will be used (point of use production). This principle can be implemented by mixing traditional technology, craftsmanship and high-tech solutions.

These three waves of innovation have one factor in common: they refer to a globalisation aimed at using local resources and reducing distances between both production and use, and producers and users. A range of very different motivations has driven this result.

One of them is the search for efficiency in dealing with information, energy and production in the quest for lean production, with products specifically created not only for whoever needs them when he or she needs, but also in the same place (or at least, as near as possible to the place) where it will be used or consumed. The second strong motivation is the desire to use local and minimal resources. A third motivation is an interest in "quality of proximity": a perceived quality deriving from the direct experience of the place where a product comes from and of the people who produce it, as with the creation of new local food networks in which citizens and farmers are linked at the local level. [19,20] Last but not least, there is a growing demand for self-sufficiency (in food, energy, water, and products), in order to promote community resilience to external threats and problems. [22,7]



**STRENGTHENING SYSTEMS.** Focusing on local resources and reducing distances between production and use can result in stronger systems and more resilient communities.

## SUSTAINABLE QUALITIES

Distributed systems are the result of complex, innovative processes in which technological components cannot be separated from social ones. While centralised systems can be developed without considering the social fabric in which they will be implemented, this imposition is impossible when the technological solution in question is a distributed one; the more a system is networked, the larger is its interface with society and the more the social side of innovation has to be considered. In other words, with regards to our discussion here, we can say that no resilient systems can exist without social innovation.

Considered all that, the good news is that social innovation is spreading worldwide. [16,17] And that the emerging ways of living and producing these innovations generate are largely convergent with the trend toward resilient distributed systems.

In fact, in its complexity and with all its contradictions, contemporary society is developing a growing number of interesting cases in which people have invented new and more sustainable ways of living. [15] We are increasingly seeing, for example, groups of families sharing services to reduce economic and environmental costs, while also improving their neighborhoods; new forms of social interchange and mutual help, such as time banks; systems of mobility that present alternatives to individual ownership and use of cars, such as car sharing, car pooling, and the rediscovery of bicycles; and the development of productive activities based on local resources and skills that are linked to wider global networks (e.g., certain products typical of a specific place, or the fair and direct trade networks between producers and consumers established around the globe). Further examples touch on every area of daily life and are emerging all over the world. (To read more about them, see: DESIS.) [4]

Being localized, small, connected and open (to others' ideas, culture and physical presence), these promising social innovations actively contribute to the realization of resilient, distributed socio-technical systems. And vice versa: distributed socio-technical systems may become the enabling infrastructure of a society where these kinds of social innovations can flourish and spread. [12]

Behind each of these promising social innovations there are groups of people who have generated them — groups of creative and entrepreneurial people who invented, enhanced and managed innovative solutions, recombining what already exists without waiting for larger changes in the system (in the economy, in institutions, in large infrastructures). Creative communities that challenge traditional ways of doing things introduce behaviours that, often, present unprecedented capacities for bringing individual interests into line with social and environmental ones (for example, they often incidentally reinforce the social fabric). In doing so, these communities generate ideas about a more sustainable wellbeing — a wellbeing where greater value is given to a new set of qualities. [8]

People involved in these innovations compensate for their reduction in consumption of goods and space with an increase in something else that they consider more valuable. This "something else" is qualities of their physical and social environments that, for them, substitute for the unsustainable qualities that have been predominant in industrial societies until now. The most evident newly valued qualities are the recognition of complexity as a value; the search for dense, deep, and lasting relationships; the redefinition of work and collaboration as central human expressions; and the human scale of the socio-technical systems and its positive role in the definition of a democratic, human-centered, sustainable society. The qualities that these frameworks generate radically diverge from the ones that mainstream models have spread worldwide in the last century. For this reason, we can refer to them, as a whole, as "disruptive qualities" — qualities that clash with mainstream ways of thinking and doing.

In this battle between cultural and behavioral models, several different social actors play a role. Among them designers (who are, or should be, the most influential players when the topic at stake is daily life experience and its quality) are doing their part, on both the sides of the front. In the past, they did a lot to promote the past century's unsustainable qualities. Today, many of them are continuing in this same old direction. But others are starting to play a different role (and a potentially very important one) in promoting the new, sustainable, disruptive qualities. This battle is still at its beginning. It is, and will be, a dramatic, fascinating confrontation.

"DISTRIBUTED SYSTEMS ARE THE RESULT OF COMPLEX, INNOVATIVE PROCESSES IN WHICH TECHNOLOGICAL COMPONENTS CANNOT BE SEPARATED FROM SOCIAL ONES."


## EMERGING SCENARIO

Resilient systems and sustainable qualities are two elements of an emerging scenario characterized by four adjectives that appeared several times in the previous paragraphs: small, local, open, and connected. Considered together, these four adjectives outline the emerging scenario's main characteristics. Individually, they are comprehensible (since everybody can easily understand their meanings and implications) but, considered as a whole, they generate a totally new vision of how a sustainable, networked society could manifest. In my view, this SLOC Scenario (where SLOC stands for small, local, open, connected) could become a powerful social attractor, capable of triggering, catalysing and orienting a variety of social actors, innovative processes and design activities. [11,12]

More precisely, the SLOC Scenario is neither a dream nor a forecast of what the future will be. It is a motivating vision of what the future could be if a large number of social actors move in the direction that it indicates as viable and desirable. [14] To be implemented, therefore, the SLOC Scenario requires a large number of converging design programs to focalize and develop an array of themes that, as a whole, outline a possible (and in my view necessary) design research program. These themes include collaborative solutions (systems of products, services, and communication capable of empowering people and communities to collaboratively solve everyday life problems); updated craftsmanship (the development of traditional and high-tech craftsmanship within the framework of the network society); territorial ecology (the sustainable valorisation of the physical and social resources of a given place or region); and sustainable qualities (the widening and deepening of emerging qualities that are driving people's choices toward more sustainable ways of being and doing).

To conclude, to make the SLOC Scenario meaning, motivations and implications clearer (and to underline its novelty), let's take a step back in time. Some forty years ago, E.F. Schumacher wrote his famous book *Small is Beautiful*. [21] At the time, he made a choice in favour of the small and local on cultural and ethical grounds as a reaction to the prevailing trend toward the large scale, standardization and loss of sense of place he saw around him. Today, we follow Schumacher for these and other new and compelling reasons. But at the same time, we have to recognize that in these four decades things have deeply changed. What at Schumacher's time was only a utopia is today a concrete possibility.

Forty years ago, the "small" that Schumacher referred to was really small. In fact, it was so small it had little chance of influencing things on a large scale. The same can be said for his concept of "local" — it was truly local as it was (quasi) isolated from other locals. In contrast, at the time, technological and economic ideas were largely driven by ideas of economy of scale and "the bigger the better." Prevailing trends discounted any possibility that the small could be beautiful if economy and effectiveness were taken into account.

Today, as we have seen, the context is extremely different. Today, the small can be influential on a large scale, as it acts as a node in a global network. The local can break its isolation by being open to the global flow of people, ideas and information. In other words, we can say that today, in the networked society, the small is no longer small and the local is no longer local. The small and the local, when they are open and connected, can therefore become a design guideline for creating resilient systems and sustainable qualities, and a positive feedback loop between these systems.



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