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Innovation, sustainability and ICT

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Abstract

Is the Innovation Society sustainable? We argue that the way in which our society organizes its innovation processes generates endogenous crises, and the ideology that sustains this organization makes it difficult to confront this meta-crisis economically or politically. We claim that the key to constructing a socially sustainable future is the mobilization of civil society, with respect to two new forms of innovation policy. ICT will play a crucial role in the process of mobilization and the implementation of these new policy forms.
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Our society is increasingly beset by what it interprets as global *crises*, of which the financial crisis, the energy crisis, and the global warming crisis are leading examples. We argue that all these crises share a common origin in what may be described as a social *meta*-crisis, induced by the way in which our society organizes its processes of innovation. We contend that this meta-crisis (and hence also the component crises it spawns) will be extremely difficult to resolve via the economic and political processes our society has come to rely on to confront challenges. To describe the meta-crisis, we begin by introducing some ideas on innovation dynamics, which will allow us to formulate the nature of the meta-crisis and the reason for which we need to develop new processes to deal with it. These ideas were initially developed in the FET-sponsored ISCOM (Innovation Society as a Complex System) project and are currently the focus of the FET Coordination Action INSITE (Innovation, Sustainability and ICT). [1]

By *innovation*, we refer to the processes through which new artifacts are conceived, designed, produced and integrated into patterns of use. These processes necessarily involve the construction of new patterns of interaction among agents, and hence transformations in the organization of what we may call agent space. Thus there is an inextricable linkage between the dynamics of change in the space of artifacts and in the space of agents ([2]). These dynamics are mediated by the way in which the relevant agents represent the contexts in which they act: in particular, their attributions about the identity of the other agents with whom they interact and the functionality of the artifacts around which

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[1] The principal results of ISCOM research are presented in [1].

their interactions are organized. The incorporation of artifacts instantiating these new attributions of functionality into patterns of use by agents can lead to new *values* and, eventually, new *needs* on the part of these agents.

Innovations occur in *cascades,* which link the generation of new artifact types, organizational transformations and new attributions of functionality. Moreover, these cascades are frequently driven by a positive feedback dynamic, which works like this ([3]): (1) new artifact types are designed to achieve some particular attribution of functionality; (2) organizational transformations are constructed to proliferate the use of tokens of the new type; (3) novel patterns of human interaction emerge around these artifacts in use; (4) new attributions of functionality are generated to describe that the participants in these interactions are obtaining or might obtain from them; (5 = 1) new artifacts are designed to instantiate the new attributed functionality. The cascades that result from this positive feedback dynamic, characterized as they are by the generation of new attributions and the emergence of new patterns of agent interaction, are anything but linear and predictable..

Over the last century, positive feedback innovation dynamics have become ever more important in the organization and collective imagination of Western society. New organizational forms have emerged, whose principal functionality is to implement each step in the exaptive bootstrapping dynamic. For example, over the past 140 years, a plethora of engineering professions have arisen that support the training of, provide collective memory for, and establish communication networks among, people whose work consists of designing artifacts to deliver a specified functionality (step 1 above). Many of these engineers are employed in industrial and state-sponsored R&D laboratories, a 20th century organizational innovation; over the past half-century, and in particular the last two decades, their work is increasingly enabled by research that derives from new forms of formal and informal industrial-university partnership. Passing to step 2, the advertising industry over the last century has played a key role in translating new attributions of functionality into new needs, which over the last several decades are increasingly centered not on physical or biological requirements for sustenance, shelter or comfort, but on artifact-mediated attributions of individual and social identity. And the marketing profession over the last 50 years or so has developed increasingly sensitive instruments for uncovering new uses for existing artifacts (step 3), converting them into new attributions of functionality, and discovering agents who might conceivably come to engage in patterns of interaction with artifacts and other agents in which these new functionalities will provide them with the satisfaction of new needs (step 4). By providing an organizational scaffolding for the component processes of the positive feedback dynamic, these innovations force the rate at which its cycles are enacted, generating innovation cascades that move with ever-increasing velocity. Moreover, the successive waves of innovation in transportation and communication technologies that have taken place over the last two centuries, and the transformations in economic and political organization to which they have in large measure contributed, have generated a corresponding expansion in the spatial scale over which innovation cascades operate.

Our society's dependence on innovation cascades is expressed in, and sustained by, an increasingly widespread way of thinking, which we will term the Innovation Society ideology. This ideology underlies almost all current discourse about business strategy and governmental policy. The following four propositions form its central core: (1) the principal aim of policy is *sustained economic growth*, interpreted as a steady increase in GDP; (2) the engine of this growth is *innovation*, interpreted as the creation of new kinds of artifacts; (3) Which new kinds of artifacts have value is decided by the *market*; (4) the price to pay for not innovating, or for subordinating innovation to other values, like cultural enrichment or social justice is prohibitively high: competition, at the level of firms and of national economies, dooms dawdlers to failure, which translates into economic decline and social chaos.

Any particular way of thinking about a complex phenomenon will illuminate some of its aspects, while it will obscure others. The Innovation Society ideology focuses on only three outcomes for innovation processes: new artifacts, jobs and economic growth. In contrast, our account of innovation cascades highlights the emergent transformations in social organization and attributions, which we see as inextricably linked to the processes through which new artifacts enter into patterns of social interaction. From our point of view, some of the most difficult and unsettling societal challenges we currently face stand revealed as emergent outcomes of the very innovation processes that the Innovation Society interprets as the key to constructing our collective future: from the financial crisis and its devastating aftermath, to overburdened and increasingly costly health care systems, through the specters of climate change, environmental pollution and natural resource depletion. These crises – and many more – are, we claim, *endogenous* to the way our society organizes it innovation processes.

How can the Innovation Society responds to these crises? Its ideology offers space for two kinds of response, one primarily economic and the other political. The economic response is via market-driven innovation: the market responds to opportunities to remediate the adverse consequences that innovation cascades may generate. But it is

becoming increasingly obvious that, despite its undeniable creativity in generating novelty, the market is not quick in detecting the negative consequences of innovation cascades, nor is it efficient in responding to them when it does detect them. If the lesson of the climate change crisis is not sufficient to drive this point home, consider the current obesity epidemic in the U.S., which many in the public health community identify as the principal public health challenge of the 21st century. This epidemic arose from cascading innovations in agriculture (producing a huge surplus in cheap available calories), processed foods and new distribution channels for them (providing higher returns to producers and distributers from the cheap calory surplus), and changing patterns of consumption that emerged in response to these innovations. The "market" indeed responded to this innovation with another cascade of innovations, in the diet and pharmaceutical industries, among others; all of which have produced huge market successes, with no discernible effect in decreasing the epidemic.

The Innovation Society ideology guarantees that innovation policy is a high priority for governments at all levels, from the local to the European. For the most part, such policies are designed to prime the pump of invention: that is, create a favorable environment for firms to bring new artifact types to market, leaving to the market itself the task of sorting out which of these have value and which not. The political response to crises, once detected, is to try to support the processes that will bias the pump-priming towards the invention of new artifacts whose functionality will ameliorate in some way the crisis' negative consequences. There are in general many possible pathways by which such a strategy could be implemented (think of climate change: policies designed to encourage innovation in alternative energy technologies range from emission regulations, to carbon taxes, to public funding for or incentives for private investment in targeted R&D). Political discourse under the Innovation Society ideology is about which of these strategies to pursue. It does not address the question of how to organize processes that will provide early detection of potentially negative consequences of innovation cascades. Nor does it address the even more fundamental question: how to organize processes that would pro-actively steer innovation cascades in socially positive directions.

We believe that these two questions should be placed on the table. The current set of detected endogenous social crises generated by the way in which our society organizes innovation processes – not to mention existing crises we haven't yet managed to detect or crises yet to emerge – challenges the very sustainability of our Innovation Society ([4]). Our analysis up to this point suggests it is unlikely that initiatives designed to reorganize innovation processes in order to construct a socially sustainable future will emerge from discourses or practices currently going on in either the economic or the political domain. Obviously, both must become engaged in the transformation process if such a reorganization can be achieved, but we believe that the leadership in designing and initiating such a process will be provided instead by *civil society*. For us, civil society is composed of people and organizations, the directedness of whose activities are provided primarily by attributions of the social good that will accrue from them. Civil society organizations are often defined in contradistinction to state and market organizations: unlike state organizations, civil society organizations do not have recourse to force to induce individuals and organizations to participate in the processes they initiate; unlike market organizations, the primary directedness of a civil society organization cannot be the pursuit of profit. Civil society organizations take many, engage in many different kinds of activities, and entertain a great variety of (often contradictory) attributions of what constitutes the common good. Morever, individuals may belong to (or participate in the activities of) a great many different civil society organizations – exiting and entering at will. As a result, the *organization* of civil society is exceedingly complex – much more so than the zones of agent-space pertaining primarily to state or market; thus, the idea of mobilizing civil society for anything – much less to change the way society organizes innovation, in which both state and market are so heavily invested – may seem at first sight fanciful in the extreme. We believe that the contrary is the case: the very complexity of civil society's organization – its heterogeneity and its heterarchy[2] – lies at the core of the two ideas we now present for how civil society can help reorganize innovation processes to induce socially sustainable innovation dynamics. In particular, they both involve reconceptualizations of innovation policy, different from governmental action to prime the pump of invention.

The first reconceptualization retains the conventional idea that the locus of policy making is government (be it local, regional, national or European). Its novelty follows from the contention that innovation policy should be based on a

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[2] With respect to values, unlike the market (where at least conceptually, value is just utility or profit); and with respect to control, unlike the state (where power – at least in the sense of permissions to issue orders and enforce adherence to them – concentrates the higher one ascends in the governmental hierarchy; while the information on the basis of which the orders are issued flows in the opposite direction).

systemic understanding of innovation cascades, and in particular on the intertwining of *design* and *emergence* in those dynamics. That is, innovation policy should be directed not just towards encouraging the design of new technologies and artifact types, but also towards uncovering and generating rapid responses, when appropriate, to emergent consequences as tokens of these new types get incorporated into new patterns of interaction among agents and artifacts. Collectively, precisely because of the heterogeneity and heterarchy of civil society, it can play a fundamental role in organizing the monitoring activities associated with such a policy, through its links to practice, its potential capacity to identify social transformations in practically any zone of agent-artifact space, and its embodiment of competences that could potentially be combined to become expertise in interpreting causal linkages between artifact innovation, social transformation and attributional shifts. The problem is how to recruit networks of civil society organizations that can initiate activities directed towards detecting untoward social consequences of innovation cascades. There are at least two reasons to believe that in the long-term this problem may be solvable. The first is that social values are paramount for these organizations; if the metanarrative about the unsustainability of the Innovation Society resonates with them, they will have a strong incentive for aligning their activities with other civil society organizations in a network such as we just described. The second is that there already exists considerable experience and competence in facilitating the formation and functioning of networks of civil society organizations, to launch and carry out socially innovative initiatives. Indeed, there are an increasing number of organizations that regard this as their principal activity. We call these organizations Distributed Innovation Policy Organizations (DIPOs); the reason we do so will be clear as we introduce our second reconceptualization of innovation policy in the next paragraphs.

Innovation policy, like all government policy, reflects the control hierarchy from which it arises. Policy is set at the highest level of that hierarchy. The policy is usually justified in the discourse that leads to its approval by some kind of narrative, which describes what its effects will be. The policy does not specify all the details of its implementation, which happen later and are planned, and then carried out, at successively lower levels of the governmental hierarchy. The policy's effects of course depend on these details, as well as many other factors, which may or may not have figured in the justifying narrative. By the time the effects are evaluated (if they ever are), the policy-makers' attention is elsewhere, and the narrative that justified the policy is generally long forgotten. None of this implies that policy doesn't matter – of course it does; just that if we want to understand how processes play out, we need to follow those processes, not concentrate our attention on the story that the people who initiated the process tell about it.

As we have seen, innovation processes are anything but linear and predictable, full of false starts and redirections on the part of their participants. What makes them "work" is the capacity of these participants, through their interactions to one another, to keep generating new ideas of how to interpret what is going on and what to do next. A distributed, rather than a top-down, approach to innovation policy would promote innovation by enhancing the *generative potential* of relationships among participants in innovation processes. This is what DIPOs do. Of course, to do this successfully, DIPOs must constantly monitor interactions among all the agents in their purview, in order to evaluate changes in generative potential, to determine actions to enhance it where appropriate and possible, and to discover emergent outcomes that may require new interpretations about which kinds of transformations the DIPOs would really like to encourage, in which zones in agent-artifact space. The ways in which this monitoring and constant re-interpretation are carried out becomes then a fundamental part of what constitutes the DIPOs' contribution to innovation policy. DIPOs are mesolevel organizations that enact policies at the microlevel; by promoting the proliferation of social innovation DIPOs, civil society seems to be enacting a distributed macrolevel policy to organize innovation processes that are guided by social values.

Both the macrolevel systemic innovation policy model and the microlevel DIPO model involve recruiting, monitoring and coordinating the activities of networks of social innovators and civil society organizations. In both cases, ICT will have an important role to play in enabling these functionalities. Indeed, inspired by successful models like open-source software production and Wikipedia, some DIPOs have been already begun integrating web-based ICT into their practice, making it possible to create ever-larger networks of innovators, many of whose interactions are virtual rather than face-to-face. The ICT systems they employ could in principle capture valuable information about patterns of interaction and even emerging attributions, the analysis of which could suggest changes in the interaction modalities that the organizations could implement to enhance generative potential in the network. That is, they could serve to support network interactions, to monitor them, and to guide the hosting DIPO toward implementing more effective innovation-enhancing policies – even helping to nudge the resulting innovation cascades in directions favored by the host DIPO.

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