Making
the digital and environmental transitions converge

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Abstract:
The environmental transition sets an inevitable time frame for our societies while the digital transition is the driving force of our times. The environmental transition has a clear goal but is straining to find a way, while the digital transition is affecting everyday life and impelling change but without any clear collective goal. The one has a goal to reach; the other, a way to go. They need each other! However the agents in these two domains usually move in separate spheres without fully realizing the power for change that their convergence would bring. How to make these two major contemporary transitions converge?

What does "digital" mean?

Let us start by clarifying what we mean by "digital".[1] In the corporate world and the sphgere of public interventions, stakeholders, whether in the environmental or digital realms, face the same difficulty: they bear changes that cut across several fields. These changes are affecting all dimensions of organizations, including jobs. They originate in techniques but also in everyday practices and group actions. Once specialized, they become sterile.

The input from the digital realm into the environmental transition is too often seen only from the technical angle of "smart", *i.e.*, of optimizing processes for improving the productivity of resources (for example, using sensors to better manage water systems or public lighting).

The "digital" now takes up so much room because it is so much more than just digital. It is also:
— a way of producing and sharing knowledge. Data are now the principal medium for producing information and decisions. For example, the UN's *"data for climate action challenge"* uses large volumes of data produced by private parties in order to "catalyze" actions.[2]

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[1] This article has been translated from French by Noal Mellott (Omaha Beach, France). Web addresses have been verified and, if need be, completed or updated.
[2] www.dataforclimateaction.org

— new individual and collective practices (SMS, social media, file-sharing, etc.). Despite their sometimes apparent futility, these uses might signal the start of bigger trends in sharing, exchanges and coordination. Notice the speed at which the social media have come to play a major role in election campaigns. Yet another example: the burgeoning of on-line shopping platforms.

— new forms of collective action and coordination ranging from the local to the global scale. Wikipedia shapes and shares knowledge among millions of cybernauts; on-line platforms in the "sharing economy" help people exchange (or share) vehicles, housing, gardens, etc.; and crowdfunding raises money for projects of all sorts.

Digital technology — taken in its full diversity and, therefore, beyond applications that merely involve computers and calculations (to which it is still too often reduced) — helps us explore the paths toward the environmental transition in a completely different way, by taking account of the social and collective dimensions.

How to place the digital, in all its dimensions, at the service of a more sustainable production or consumption of objects and services (of traveling for example)? How can the policies and strategies for the environmental and energy transitions adopt a "digital" perspective? For ecology, digital technology is both a necessity and a source of opportunities. These opportunities to explore are as complicated as they are exciting. But this calls for clarifying the links between the two transitions.

Reckoning with both the risks and opportunities of using digital technology for sustainable development

The environmentalist community is wary of the promises borne by technical innovations. One of its pillars has been the critique of technology and economic growth. Environmentalists tend to focus on: the wastes resulting from manufacturing, the consumption of energy and the risks of rebounds as, for example, savings from improvements in automobile technology were immediately reinvested in more horsepower and comfort. They are not wrong. At present, the production of digital equipment and the use of information and communications technology (henceforth ICT) and of the Internet leave a huge environmental footprint.[3] Besides, current trends in digital technology are making the footprint heavier. For instance, the growing demand for computing power speeds up the obsolescence of equipment; but as we know, much of this technology's environmental impact is concentrated in the manufacturing phase for making equipment. The general movement toward the cloud and the Internet via connected devices risks multiplying the energy consumed to manage and process data. All this convincingly argues for a new approach. The digital realm must better take account of environmental issues in both the design of its services and its effects on society.[4]

Digital technology, even in the form of a collaborative platform for exchanging goods, does not by itself enable us to change our consumption patterns and thus curb our use of resources. As the PICO project has demonstrated,[5] reselling used goods over the Internet to cybernauts may push buyers to purchase new objects more frequently. Digital technology is now the preferred medium for our life-styles; but as we know, our way of life is too expensive for the planet's equilibrium. In the current system, the gains in efficiency due to ICT risk being reinvested in ever more consumption and material growth, a trend observed over the past decades.

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[3] *Cf.* GDS EcoInfo (http://ecoinfo.cnrs.fr).
[4] This figures in our project "Ecology by design by transitions" (http://fing.org/?Parution-du-Cahier-d-exploration&lang=fr & http://www.transitions2.net/catalogue/view/1104/cahier-dexploration-ecology-by-design-by-transitions%C2%B2).
[5] www.iddri.org/Themes/01-PicoPaper_ISSUE-BRIEF_13juillet.pdf

On the one side, the environmentalist community must broaden its view of digital technology. This technology bears promises; it provides tools and applications for measuring and understanding not only climate change but also pollution from day to day — tools for shared forms of consumption or transportation, for "citizen sciences" (the collaborative efforts in favor of biodiversity, not to mention open-source, low-tech programs in energy and agriculture), for a massive mobilization (for example, to replace fossil fuels with renewable energy sources)[6] and for managing the complex flows of transactions in a circular economy. Our environmentally friendly actions stand to make major gains by relying on this technology for: information, the involvement of citizens and stakeholders, collaboration, organization, changes of scale, etc.

On the other side, the players in digital technology consider themselves to be environmentalists by nature; the characteristics that stand out in their self-perception are immateriality and efficiency. Surfing on a wave of ongoing innovation unfurling in all directions, these economic agents instantly see the opportunities but, only much later, the risks. After all, innovating cannot occur without a wisp of optimism. Some of them have gradually come to use current environmental issues as a stimulant for their quest for innovations. Many innovators are now coming to grips with environmental issues by using the tools for dematerialization, sharing, reducing wastes and changing behaviors[7] or by trying to disrupt markets (energy, transportation or the manufacturing and distribution of merchandise). Regardless of the power of their ideas, they usually lack the tools for measuring how much their honestly made promises would, if kept, reduce their environmental footprint.[8] In a system of innovation still entirely focused on the corporate potential for growth and making a profit, reducing the environmental footprint is an objective that — when it is treated like a positive externality — will not survive the first difficulties encountered or the shifts in business strategies.

Despite the still fragile convergence between the digital and environmental transitions, we do notice the emergence of decisive knowledge and methods in several fields. Are the methods for "green computing" robust enough to reduce the environmental footprint of computer services in big corporations? Several studies have demonstrated the potential of car-pooling and -sharing for short rides[9] and of multimodal transportation systems for a more sustainable geographical mobility. The Agir Local project in France has shown how, at the local level of government, the persons working on environmental and digital issues can usefully collaborate.[10] The Innovation Facteur4 project has shown how digital tools now available can help innovators and investors to see to it that the environmental footprint has a serious place in their programs. Furthermore, platforms for crowdsourcing or for open government, as in Paris,[11] have enabled citizens to take an active part in local affairs. Digital technology can boost citizen participation, which is essential for realizing the environmental transition, which concerns all of us.

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[6] https://350.org/

[7] CivicTech, for example (http://civictechno.fr/tag/civictech/).

[8] As we observed in the Innovation Facteur4 project (http://www.transitions2.net/catalogue/view/1134/a-la-recherche-de-linnovation-facteur-4), which is part of the Transitions2 Program).

[9] http://www.iddri.org/Publications/Mobilite-collaborative-des-promesses-aux-enjeux-pour-les-pouvoirs-publics?fr

[10] http://www.neolab.bretagne.developpement-durable.gouv.fr/article52.html &
http://www.transitions2.net/catalogue/view/1020/kit-agirlocal

[11] http://citiscope.org/commentary/2017/04/yes-govtech-can-change-way-cities-function

New public policies for making the environmental and digital transitions converge

Although many a question remains standing, we are already sufficiently informed to start making the two transitions converge.

For innovators in digital technology to massively turn toward the environmental transition, there must be a firm intention, embedded in their business model and based on a system of innovation for measuring success with indicators that are not merely financial. How to do this? By, first of all, modifying the tools of selection and support used by public and private parties[12] and, too, by modifying our methods of measuring value and assessing impacts. The objective is twofold: design digital solutions that, instead of fueling the trends toward planned obsolescence and more energy orient the finality of innovations toward the environmental transition. The government seems to have understood the need for such efforts; evidence of this is its fostering of GreenTech incubators.[13]

Focused, as they are, on their tools and values, innovators do not necessarily have either the visibility of, or control over, the complex interactions that lead to the invention of their solutions or on which these solutions depend. Beyond its rebound effects, an innovation will not achieve the hoped-for results if there is no system for deploying it. For example, an application for pooling cars for short-distance rides cannot have a major impact if it is not part of a locally organized transportation system. Such solutions lead to gains only if they fit into an adapted system. Public authorities at various levels must intervene to foster virtuous cycles of this sort.

For sure, local authorities have a key part to play in supporting the most profitable digital innovations and integrating them into sustainable development at the local level. Our work has pointed in a few relevant directions. Local authorities must gradually try to better understand and apprehend the slew of innovations, to be capable of identifying those that might be useful and that square with their actions in various fields of urban policy. It is necessary to organize the pooling of resources and e exchange of experiences among public authorities. This is necessary to cope effectively with the continuous flow of innovations streaming toward them in quest of backing. This multiplication of exchanges should lessen the cultural differences between entrepreneurs and public authorities, which often make it complicated for them to work together.

Local authorities must also know how to back local experiments so as to orient them toward the goals of sustainable development. Innovators would thus test their innovations and come to understand the problems related to a large-scale diffusion — all the more so since the solutions best in line with the general interest are often those that have the most difficulty developing alone. Behind the catchall of experimentation, deeper changes are taking place in "digital culture": the acceptance of failure as a learning experience, openness, the sharing of data in order to better evaluate and understand experiences, the iteration lemma, etc. The project Etalab has the ambition of introducing this mentality in French government services.[14] If it is missing, there can be no real transformation through digital technology.

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[12] The Innovation Facteur4 project is working on this, as well as Bpifrance, which published in 2015 a handbook, "Innovation Nouvelle Génération", for its account officers (available on the web site: http://www.bpifrance.fr).

[13] https://www.ecologique-solidaire.gouv.fr/reseau-dincubateurs-greentech-verte

[14] https://www.etalab.gouv.fr/qui-sommes-nous

The solutions borne by digital technology and the sharing economy are a reservoir of innovations that authorities can tap to breathe new life into public services.[15] Recycling policies, for example, should gradually be hooked up to on-line platforms. However collaborating with new parties, in particular platforms, necessitates inventing new forms of governance and of partnerships. Several questions thus arise about the new urban social contract.[16]

Finally, the strategies and policies for backing digital innovations must be both more demanding and more creative. More demanding by taking account of an innovation's environmental footprint, its potential impact, both positive and negative. More creative by focusing less narrowly on technological and economic performance and turning toward the exploration of alternatives: open source technology as a vector for virtuous solutions; the commons and sharing as positive alternatives to overconsumption; peer-to-peer technology and alternative systems for transactions.

A change of mentality

Beyond these principles, a fruitful alliance between ecology and digital technology calls for each of us to make changes from within. "Geeks" must establish an agenda for innovations that takes account of our planet's finiteness; and "ecofreaks" must take advantage of digital technology's incredible driving force. For a year now, our Transitions Program[17] has been exploring the changes borne by the alliance between ecology and digital technology: how does this alliance change us? But we have just started this exploration. We now want to invite other actors from the environmental and digital fields to join us in reexamining their priorities.

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[15] http://www.lemonde.fr/idees/article/2016/06/23/user-l-economie-collaborative-pour-enrichir-les-services-publics_4956561_3232.html#5CTrBBrshp4eAltU.99

[16] Program launched by FING and IDDRI (https://www.lesechos.fr/idees-debats/cercle/0211947985234-pour-un-nouveau-contract-social-urbain-2077737.php).

[17] http://www.transitions2.net/