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Abstract

In this text, based on an interview carried out on March 2, 2011, Annalivia Lacoste asks Michel Callon to clarify his vision of responsible innovation. The relevance of this notion is discussed and, more particularly, its potential use in the field of financial innovation is explored. A longer, more elaborate version of this text appears in French in this same issue. Michel Callon is a researcher at the Centre de Sociologie de l'Innovation at Mines ParisTech and the honorary president of the Observatory for Responsible Innovation. A specialist in the sociological, political and economic analysis of science and technology, Michel Callon has contributed extensively to the advancement of democracy in technical issues. Annalivia Lacoste works at the Observatory for Responsible Innovation and is the chief editor of *Debating Innovation*.

AL (Annalivia Lacoste): What is your stake on the notion of responsible innovation and its contemporary uses?

Michel Callon (MC): I myself have not quite used this notion in my own research positions, I admit. But it is a very convenient way to refer to the different problems that innovation can foster, especially in relation to social consequences. And the notion does also make sense to non-specialists. Responsible innovation is, in a way, a collective statement: an expression that gathers together a variety of communities, groups and viewpoints around a shared concern.

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The first advantage that I see with this notion is thus its aggregative aspect. It connects different worlds around a common conscience, a shared idea that consists in saying that we have to reflect on innovation. The notion of responsible innovation organizes and structures these concerned communities around one single preoccupation. The disadvantage of the notion, though, is its all-encompassing character. Different actors do project different interpretations and different requirements, and this can lead to misunderstanding, which means that the notion of responsible innovation needs to be handled with care and with discussion.

This notion can usefully be compared to other notions that did carry similar ambitions in the past. In the 1970s and 1980s, for example, a reflection emerged on the fact that technical progress could bring success but also problems: the preferred notion then was that of social acceptability of technology. It was not enough for a technology to exist; it also ought to be useful and acceptable. A number of important institutions emerged out of this idea.

AL: What triggered this sort of development?

MC: Environmental problems linked to chemical pollution, for example, or to the consequences of industrialization in general were pivotal in the debate. This debate emerged in the United States, and then was developed, perhaps more systematically, in Europe, also sometimes with strong institutional consequences such as in Scandinavian countries and the Netherlands, less in France. The resulting idea was that it was not enough to provide remediation once negative effects of technologies have been identified or issues have been raised. The idea was about focusing on innovation at the design stage. This translated in the 1980s into the priority of prevention and anticipation, as opposed to remediation. But this is possible only if one looks at the early stages of innovation and if one associates to the reflection parties potentially implicated in and affected by the technology and its effects.

AL: So what difference does the notion of responsible innovation make, compared to that of social acceptability of technology?

MC: It refers to a slightly different reality. Notice that the world "innovation" replaces the word "technology". New technologies do not always translate into innovations. The notion of innovation requires focusing on application, focusing on uses that shall be identifiable. For example, nanotechnologies or GMOs are technologies that can translate into very different products and processes. It is difficult to limit the analysis and the reflection to technologies alone without looking at their concrete manifestations.

For example, we can consider transgenesis as a technology that is neither good nor bad, neither acceptable nor unacceptable, but we can consider that transgenic soya is acceptable whereas transgenic wheat is not, for reasons linked to contamination and the dissemination of transgenic materials. Interest in the technology does not cover the entirety of questions and sometimes even misses moments in the process of innovation that are far more relevant. Talking about innovation leads then to a more concrete vision, a vision that is closer to the reality the public is exposed to.

AL: Is the notion of innovation closer to the public?

MC: Well, it is closer to what we actually get in ordinary life. Technology allows innovation, but a technology can be acceptable on general grounds and, at the same time, allow innovation with negative consequences. So the notion of innovation shifts attention to what alters ordinary life, and that is a first element that we need to take into account. A second element is that the meaning of innovation is not limited to technological innovation. You can have organizational innovation, purely commercial innovation, or social innovation. Take social entrepreneurship, for example: that is an innovation without technological content. This is not at all captured by the notion of acceptable technology.

But then there was a shift from the notion of acceptability to the notion of responsibility. Here, again, the scope is wider. Some things can be said to be acceptable, but this does not tell us anything about whether or not a responsible attitude is adopted. Why? Because we still do not know anything about the preoccupations of other actors that may intervene in the innovation process. An acceptable innovation is not necessarily a responsible innovation.

AL: But the notion of responsibility is quite ambiguous. What would be a fair definition of responsibility?

MC: There is a strong ethical dimension in the notion of responsibility. To be responsible is to be capable of responding of one's acts, but also of responding to all the objections, all the concerns and all the suggestions prompted by the event of an innovation. We are also close to the notion of "externality": an effect, a collateral event that can translate into damages and worries that were not foreseen at the design stage. Every time that a new product, a new device or a new service is put into circulation, an inquiry on possible critical voices should be conducted, an investigation on alternative analyses or potential suggestions for the transformation of the innovation. One innovation is responsible as soon as it is attentive to all concerns and suggestions that shall be expressed in relation to it. There surely exist a variety of methods, techniques and organizations that allow identifying these reactions. Responsible innovation is concerned by voicing, but also by the processes that allow for the anticipation, the listening and the taking into account of these reactions. To me, this is what the notion of responsible innovation brings.

AL: But the dynamics of innovation have been often characterized by some degree of closure, with decisions being taken by small groups of experts, with users, consumers or citizens usually playing a passive role. Are we heading today towards a more "distributed" innovation process, towards a "culture of externality"?

MC: Yes, we are. But innovation can be distributed without being responsible. That said, once one innovation is distributed, it has more chances of becoming responsible because the responsibility of the innovator is some sort of a natural continuation of the movement of distribution. Innovation regimes have changes a lot in the past decades. Roughly, from the 1950s to the 1980s there was a strong belief in a linear view of innovation, strictly focused on technology, with engineers and researchers considered as the sole initiators of the innovation process, operating with a "one best way" view and with low preoccupations about what people want. Consumers, on their side, were not very much concerned by the lack of consultation. This type of process has progressively been replaced by another innovation regime. In a regime of distributed, participatory innovation the idea is that success in innovation requires associating users as early as possible in the design stage, in order for example to avoid dissonance between supply and demand.

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AL: But what kind of actors are to be associated to the process and how?

MC: The idea is to associate all the actors from which the success of the innovation shall depend. This movement can be called a movement of democratization. We can see today in several industrial sectors a stronger integration of users, intermediaries and critics - as compared for example to the early days of the mass car industry. Innovation design is carried out in forums or platforms in which several groups intermingle. Innovation appears today more often as an ongoing compromise. In biotechnologies or medical research, for example, the fact that patients are directly associated to the innovation process is now usual. Patients' organizations contribute directly to the elaboration of therapies.

The shift between a technological, linear regime of innovation towards a distributed, participatory regime of innovation is a form of democratization. This type of vocabulary is inspired by political science and transposed to an economic context. Markets need to cope with the question of equity, that is, with the taking into account of excluded parties - with voicing. To care for markets is to care for democratization, which means to care for all stakeholders. Innovation is a way for markets to go beyond their limits and to cope with their externalities. Democratizing markets means that technical and expert knowledge needs to be enriched by knowledge produced by other involved actors.

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AL: How do you conceive of the enrichment of voice and deliberation? The development of responsible innovation requires the construction of spaces for collaboration and debate.

MC: In a usual situation of innovation, there is clearly one stakeholder that holds a privileged position. That is the "prime contractor", the initiator, the actor that assembles forces and interests, that associates to other stakeholders but that determines also a perimeter beyond which other groups shall not be invited. The innovation collective is limited, and determined by the interests of the initiator. A situation of responsible innovation introduces a variation. It starts with the idea that some potential effects of innovation cannot be properly forecasted and that, hence, proper monitoring devices are required. This is what we can see in the field of pharmacovigilance, for example. Vigilance and precaution are crucial in responsible innovation.

AL: So reflection on negative externalities, anticipation of consequences, and vigilance are key features of responsible innovation, together with participation and democratization. But let us now turn to a particular case in which these topics can be usefully put to the test of concrete measures. The 2007 financial crisis and its current aftermaths have been analyzed at length in terms of negative externalities and unintended consequences of financial innovation. What can be said on responsible innovation in finance? Sophisticated financial products are usually crafted in closed worlds and put into circulation without a proper

discussion on the responsibilities that ought to be attributed in case of devastating consequences.

MC: Absolutely. It is in fact very interesting that chemical and environmental notions have been used in order to characterize financial products: we have been hearing about "toxic products" or "toxic assets", for example. The financial industry has engaged into a phenomenal, unprecedented innovation venture in the past years. There has been an anarchic proliferation of products and services with no concern for systemic effects. What happens today to the financial services industry is an accelerated version, a far too accelerated version of what happened in other industrial sectors in the past: first innovation at a slow pace and then a stage of acceleration with the proliferation of new molecules, to take the example of the pharmaceutical industry. These sorts of processes can take sixty years. It took less than twenty-five in the case of finance, a sector that was not yet prepared to think the consequences and processes of innovation. Twenty or thirty years ago it would not have been easy to think that sophisticated trajectories of innovation could have affected finance. There were some investment and insurance products, some simple valuation formulas, and that was it.

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AL: What caused this acceleration? Was it the computerization of financial markets? Progress in financial models? Macroeconomic situations? Speculation?

MC: That is a difficult question. It is essential to ask how the financial industry came to that level of exacerbated innovation. Liquidity and the consequences of international commerce played probably an important role. And a culture of speculation perhaps too, but let us not forget that financial speculation is not an irresponsible conduct by definition. Speculation can be responsible speculation.

AL: What do you mean by "responsible speculation"? The notion of responsibility in finance is often tackled through a moral angle, and through a critique of speculation.

MC: The word "speculation" is a beautiful word. To speculate is to reflect, to imagine possibilities and scenarios, to ask questions about the future and about the meaning of events. We should not get rid of that notion. One of the dimensions of money, so to say, is the capacity to make the future hold, through investment. If speculation is reflection on the future it is fine that money, which is a tool for the orientation of the future, enters into that frame of analysis. Every act of financial speculation that fails from asking the question of its meaning is an act of irresponsible speculation. Responsibility is anticipation. And serious speculation is necessarily responsible. If we tend to consider financial speculation today in terms of immorality and irresponsibility it is because it fails to do so, focusing only on self-profit.

But let us focus again on the reasons of the crisis. A second, evident reason was deregulation, especially in the United States. This gave financial institutions a large margin of maneuver, and the benefit of opacity. And then there is, or course, the raise of financial science and automation. The more you automate operations, the more you expose yourself to large-scale overflowing. This can result in some sort of a state of collective savagery in which nobody controls anything. The proliferation of financial products without any overhead vision also led to a situation in where incentives to look into collateral effects were missing.

AL: Was not there any way to anticipate risks?

MC: Calculating risk in a sound manner was in a way impossible. That was an industry that was creating potential risks permanently without introducing global risk assessment and prevention of chain reactions and systemic risks.

AL: But, still, the financial services industry positions itself as a legitimate provider of insurance services, services that aim at countering financial risks. This is certainly a paradox of what some have called "the risk society". You have yourself analyzed these sorts of situations in terms of "technological dreams".

MC: The notion of risk was born in Western societies with the emergence of finance and insurance, and these three things (risk, finance, insurance) are intimately intertwined. The notion of risk applies when an event is likely to occur, when it is possible to indicate what this event consists of, and when probabilities can be calculated in order to consider covering or cancelling that risk. Risk thus supposes metrology, that is, instruments for measurement and assessment. But the loans given to sub-prime borrowers during the credit crisis were not accompanied by a proper metrology. Instead of making things visible, discussable and calculable, a machinery of devilish proportions was set in motion.

AL: This of course leads us back to the question of externalities and their anticipation.

MC: Yes, absolutely. We see how procedures inspired by pharmacovigilance could have played a beneficial role. Recent scandals in the pharmaceutical industry, such as the Servier scandal in France, show very well what can happen when one misses the point, when one replaces observation, debate, the circulation of information and the taking into account of voice with meaningless epidemiologic calculations. What is required is a proper *ex ante* system of vigilance. And the notion of pharmacovigilance can very well be applied to the financial services industry. A number of useful parallels can be established between pharmaceutical and financial products, especially on the different levels of testing: laboratory vs. real scale, *in vitro* vs. *in vivo*.

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AL: Investment banks do usually have so-called "New Product Committees" inside which the characteristics of a financial innovation (and its potentially toxic features in particular) are examined and discussed by a number of internal stakeholders.

MC: The constitution of forums inside which innovation is exposed to discussion among concerned actors is now generalized in fields such as nuclear energy, healthcare and biotechnologies. You take a transgenic crop *in vitro*, you add new variables, you allow actors to intervene, and then you scale up to real *in vivo*. You invite affected actors to the experimentation, local committees, scientific experts, and so forth. All these actors constitute a "hybrid forum" inside which the innovation is considered. We could imagine similar procedures in the field of financial innovation.

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Proper institutions and structures need to be put in place in order to manage this process. In the case of GMOs, this has been made possible because of European regulations that were crafted in response to social movements, sometimes quite violent, spearheaded by farmers and environmentalists. These regulations make innovation processes socially plausible, and do also contribute to the construction of an ecosystem outside the laboratory.

AL: Well, this is the case for GMOs. But what about finance? It is hard to identify similar initiatives.

MC: Yes, it is perhaps far more difficult to put in place these types of experimentation in financial markets. That said, the notion of ecosystem is very important and there are sectors of financial innovation in which available regulation can allow these types of processes. New Product Committees inside investment banks can in effect serve the enhancement of this type of collective reflection. But then it is necessary to identify the type of products for which responsible innovation will not create a competitive disadvantage.

AL: Today, following the traumatic effects of the financial crisis, some investment banks are in favor of more transparency.

MC: Yes, but regulation can also stabilize this incentive for transparency in the long run. The will for transparency can very well disappear as an effect of the post-crisis stigmatization of investment banks.

AL: We are also in a world on the move, a system in which national sovereignty loses weight and, at some points, a cluster of hedge funds can be more powerful that an indebted sovereign state.

MC: That is a real problem. National spaces are clearly overflowed. International measures and structures are necessary. Areas for responsible innovation in finance need to be identified and incentives need to be concentrated there in order to implement, in a stepwise manner, the proper procedures.

AL: What about innovators themselves? You have been interested for long in the education of engineers and innovators, especially in the context of your role at the Ecole des Mines de Paris, the Paris School of Mines. You insist on the new dimensions of the professional life of engineers coming out of that school, and on how they are called to face the challenge of socio-technical controversies.

MC: The mission of the engineer is to put her or his skills at the service of socio-technical compromises. Today, we witness such an important level of sophistication in technological innovation that it is absolutely unthinkable that an engineer fails to see the need for compromise. Resources are there to analyze and discuss complicated issues. It is easier to respond to concerns, and thus easier to engage into responsible innovation. The fine engineer is the one who responds through technical means to the issues expressed by concerned groups, and who is able to anticipate dialogue.

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AL: You seem also to praise for a stronger role of the social sciences in this vision of engineering.

MC: The social sciences are critical in this process. Responsible innovation requires mechanisms for the organization of projects and for the expression of concerns. To innovate is also to conduct a social analysis of the innovation underway, and here the social sciences come to the forefront. I think that this intervention of the social sciences is now fully legitimate, contrary to thirty years ago; a time in which "the social" was just meant to follow innovation, without being active at its center. Today, good technique requires good sociological interpretation.

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