Chapter 1

Inventing the Future

"Tomorrow will not be like yesterday. It will be new and will depend on us. It is less to discover than to invent. The future of the ancient man had to be revealed. The future of the 19th century scholar could be forecast. Our future is to be built by invention and work. We have been progressively freed from material job by our machines, only to be asked to provide more and more intellectual work, really human work, that is, invention" [BER 64].

When reading this quotation from Gaston Berger, father of the French "prospective", one immediately understands the very close link between futures thinking and innovation, thus breaking with a future-oriented thinking, which is traditionally more retrospective (projecting the past onto the future) than "prospective" (imagining new futures).

What are we talking about? Fashionable notions today, innovation and future thinking are in fact very complex objects that are not easy to categorize; the effort to explain them before describing them is seldom taken. That is why we will first undertake to define some concepts and then explain some of the basics of futures thinking.

An innovative look through futures thinking on innovation and a future-oriented contribution of innovation to futures thinking: the cross-fertilization of these two attitudes towards the future – indissolubly linked – can restore meaning and purpose to the shaping of our future.

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So, first of all, we will precisely define the notion of innovation and show the profile of the innovator; then we will introduce the field of futures thinking and the notion of change. Finally, we will show what futures thinking can bring to innovation and how the former contributes to the latter in order to invent the future.

1.1. Innovation

"The problem of the future transforms itself and, to some extent, simplifies itself when, rather than over-emphasizing the prospective discoveries, one thinks on the basis of manifested needs or satisfaction of deep expectations" [BER 60].

What are we talking about when we speak of innovation today? Let's define the nature of innovation itself before we turn to the more human-oriented profile of the innovator.

1.1.1. *How should innovation be designed?*

Three distinctive approaches help to encompass the topic and reveal its main points.

1.1.1.1. *A change*

First of all, an innovation is a change. As such, it directly engages futures thinking, which is a field of studying, creating and leading change.

The word "innovation" comes from the verb "to innovate" which means to "introduce something new" or to introduce "a new idea, method, or device".

The introduction of this novelty goes through various different processes according to its domain. In the economy, this is the introduction within the process of production or sale of a new product, equipment or process, which presupposes a phenomenon of integration of the novelty into the existing process. In sociology, innovation is defined as a process of influence that leads to a social change and whose effect is the rejection of the existing social norms and the adoption of new ones. Within this framework, the problem is less about integrating innovation with what already exists than substituting a new system for the previous one.

Alongside these definitions are two fundamental approaches to innovation. The first one helps to distinguish between innovation and invention; the second one between two different natures of innovation: incremental innovation and radical innovation.

1.1.1.2. *A contextualized process*

Innovation is different from invention, although it also manifests itself in change. Yet a change occurring at the level of the object itself creates only a change "in itself", independently of specific contexts, while the change induced by innovation modifies a set of strongly differentiated processes (e.g., from the assembly line to the final use of the product). For if invention is defined as "the action to imagining, inventing, creating something new" or "the faculty to find something, to create by imagination", then innovation, especially in the economy, defines itself as "the whole process proceeding from the beginning of an idea until its materialization (the launching of a new product), through market research, the development of the prototype and the first steps of the production".

Moreover, innovation can change the modes of distribution, of consumption, even the recycling of the innovative object. In doing so, innovation can extend its ramifications, induced impacts, even to its modes of payment, transportation or interpersonal communication. This is how it constitutes a process, at the opposite end of invention which is only a specific moment whose effects are limited to the object of invention.

Indeed, this makes innovation a lot more complex, much more so than invention. Because innovation is not only the expression of the emergence of change (as invention is), but is also the expression of adequacy to this change in the world, it can only exist in conjunction with the social and economic acceptability of change. Thus, if invention can be considered as disconnected from time and space, innovation is, on the contrary, the reflection of its time and a specific space through the culture of this location.[1]

1.1.1.3. *From incrementation to rupture*

The generic word "innovation" encompasses two distinct phenomena: an incremental change and a radical change. One often forgets to remember this fundamental distinction, thus erasing a cleavage intrinsic to the very notion of innovation.

Incremental innovation concerns a change brought to an already existing product (in the broad sense of the word). It improves the product, according to a specific use, or attaches complementary functions to it, transforming it into a slightly different object.

Radical innovation creates a product that is rarer and very different from those which existed before. This is not only because it must be the fruit of an invention in

1 As demonstrated by Thierry Gaudin in [GAU 78].

rupture with what has been already existing before – which is the most difficult because it comes from scarce effort of imagination – but above all because the environment will accept less easily a whole novelty as opposed to a simple improvement, as novelty often induces a chain reaction of change. So the advent of a real novelty and its economic and social acceptability is an infrequent phenomenon.

Considering the current pressure coming from the need to reduce the "time to market" and from the shortening of return on investment, incremental innovation is most favored by companies. It usually provides fewer benefits, but does so more quickly, and it is generally less risky than radical innovation whose parameters, in addition, are less well understood and less easily controlled.

Indeed, incremental innovation can be guided thanks to methods such as functional analysis or morphological analysis [REY 93] or more specific methods like TRIZ, for example. Radical innovation is less amenable to such an analytical and systematic approach (see below).

1.1.2. *Profile of the innovator*

Whether an independent innovator (innovating almost by chance) or a researcher within an industrial research center (innovating by professional duty), cognitive phenomenon related to innovation is not well known. It is often said that innovation is the fruit of the marriage between invention and its market. However, the skills of the innovator are generally due to some features of their personality profile.

1.1.2.1. *The liberating role of ignorance*

Most innovators share unique, perhaps strange, similarities which suggests that some qualities are correlated to the faculty of innovating.

Among them, ignorance plays a special role. In fact, too much knowledge would reduce imagination, learning substituting itself for invention, the mind closing itself over what it has already gained, refusing to imagine solutions which, filtered by the current theories, would not appear to conform to the body of knowledge. Moreover, one observes some intellectual laziness over building novelty from a certain level of learned knowledge.

It is easy to test this on students for example: to ask them to work on a topic they do not know anything about. At the end, you will always get some nuggets from smart brains that have entirely rethought the problem according to new criteria. Doing so, they have gone beyond the usual analysis of most of the well known experts, simply because they have considered the problem from a new and more innovative approach. However, if you ask them to work on a topic they know

something about or about which they can access information, the best result will be a good compilation with the least personal contribution.

Researchers, writers and other intellectuals know well the phenomenon of the "white paper" whereby, after a very intensive period of documentation, everything seems have been said on the topic and nothing new can be added. Only when enough time has passed for this information to have been forgotten can the brain work again by itself.

This "distancing" from knowledge or information is often seen as a capacity for critical judgment, an aptitude for discernment. By taking a critical look backwards at acquired formal knowledge, the innovator opens the door to other kinds of knowledge which is more intuitive and more subconscious.

1.1.2.2. *The quality of the listening for signals*

So, although he should be ignorant – at least partially – the innovator must be attuned to societal needs and expectations in order to differentiate himself from the inventor. That is why he usually possesses an ability to "listen for signals". This intuition allows him to read the weak signals hidden within the informational noise of our societies, to distinguish between what is the real and structural, and what are only mass media constructions or "lifestyle" fashion effects.

This listening ability expresses itself through a capacity of problematization, a means of transforming scattered, often ill-assorted data into a coherent whole carrying meaning or significance. Innovation then comes from the research of an answer to a problem, such as the Tetrabrik® system replacing the traditional glass bottle.

The innovator's ability to listen for signals does not limit itself to intuition of the societal expectations. It is also tuned, even unconsciously, on his environment: colleagues, hierarchy, personal relations, etc. So the innovator can mobilize his network for the benefit of his idea – to test it, or for its diffusion – to achieve it.

Thus, while the inventor is rather solitary, enclosed in his garage, the innovator is an integral part of the thickness of the world: he thrusts his offshoots, his tendrils, his extensions deep into it. It is as if the quality of his listening for signals would give him access to a new dimension within which his mind can easily build new solutions.

1.2. Futures thinking

Moore's Law extends computer memory capabilities; "nomadic objects" (things are built to be easily moved everywhere); electronic objects perform ever more functions without an end in sight; the Internet every day spins the McLuhan global village web; the effects of an acceleration of the pace of change are felt everywhere, even in our everyday life, jamming our bearings and perceptions of time.

Time, change, novelty, future: the scene is set. As Janus, futures thinking presents many facets: "interdisciplinary discipline" to study the future, "science for action", "science of change", "philosophical attitude" toward the future; futures thinking is all this and much more, hence the urgent need for some definition.

1.2.1. *Futures thinking: a tool to build the future*

As is the case with every complex object, futures thinking is very often sliced into various sections in order to be better understood. Industrial futures thinking (the French *prospective industrielle*) is different from State futures thinking. Strategic futures thinking is different from organizational or managerial futures thinking. Exploratory futures thinking is dedicated to the exploration of the future, while the normative futures thinking is dedicated to the building of the future. Global futures thinking (whether industrial or strategic) contrasts with territorial futures thinking (used to build or plan a territory or community project), regional futures thinking (also called "regional foresight"), urban futures thinking (also called "urban planning"), technology futures thinking ("technology foresight"), thematic futures studies (according to economic sectors or resources, such as food sector or energy), etc. Futures thinking is a simple food that can be eaten with various spices. However, it has a history and a corpus, which are not well known, that make it a rightful discipline.

1.2.1.1. *A French orientation*

Both a philosopher and head of a company, then head of the Higher Education at the French Ministry of Education, Gaston Berger (1896-1960) formulated the notion of "futures-oriented anthropology" as early as 1955, followed by the concept of "*prospective*" in 1957, which we translate today as futures thinking [BER 57].

He defined futures thinking as field of study; it is different from forecasting as it only concerns the very short term, it must be very precise to be useful, and it is built on quantitative data. In contrast, futures thinking is oriented toward the mid- and long-term (10 to 20 years ahead); it must scan the comprehensive environment very broadly, be "free and bold" in order to help the decision-maker to understand the

transformations happening in front of them, and give more importance to qualitative information and analysis.

Since the 1960s, futures thinking has deeply influenced the captains of industry and most of the senior civil servants and government officials in France (Louis Armand, Pierre Masse, Jerome Monod, etc.), organizations that institutionalized futures thinking, as well the public sector (Commissariat Général au Plan (1946), Délégation à l'Aménagement du Territoire-DATAR (1963), Ministère des Armées (1964), etc.) and in large corporate companies (CDC, Ciments LAFARGE, KODAK, SAINT GOBAIN, SNCF, SNECMA, etc.).

1.2.1.2. *A discipline in expansion*

Since this golden age, several generations of futurists (namely the prospectivists) have followed one another, each one bringing its own contribution to the corpus of futures thinking. The first generation of these pioneers grew up within the spirit of the 19th century scholars (G. Berger, P. Masse, J. Fourastie, B. de Jouvenel, etc.). The second generation (1970s) was that of the engineers, providing a large toolbox for futures thinking (from American methodologies, such as DELPHI, to made-in-France methods, such as MICMAC, MACTOR, etc.). The third generation (1990s) has reconnected itself with the values of the first generation: multidisciplinary, global thinking, and humanistic (sustainable development, democracy, etc.).

While the American orientation of futures thinking (forecasting) looks for the "colonization of the future" [BAR 93], based on a very deterministic vision of the future, the French orientation has shown the way of the "*futuribles*" – the possible futures that one can create if one is willing to do so. A large number of developing countries, especially in Africa and South America, have adopted this "French prospective" as a tool to invent their own, desired futures.

1.2.1.3. *Operational thinking about change*

Futures thinking can be defined by several characteristics: it is global, systemic,[2] taking into account both the object of the study and its environment (context); it puts the person at the core of its work, taking an interest in the relationship between the

2 A system is a complex of interacting elements. The elements are open to, and interact with, their environments. In addition, they can acquire qualitatively new properties through emergence and thus are in a continual evolution. System thinking is both part-to-whole and whole-to-part thinking about making connections between the various elements so that they fit together as a whole.

person and the object studied; it looks "far ahead and far away",[3] adopting a critical distance thanks to the practice of macro-history[4] and far futures scenarios.

Futures thinking goes through a logical and rigorous three-step process. The first step makes it possible to acquire the information needed to produce a dynamic diagnostic (diachronic) of the studied system and also an anticipation of the possible (trends, breakthroughs). The second step helps to formulate the problem that justifies the study: what is the problem (subjective approach), what are its components (objective approach), why is it a problem (values- and outcome-based approaches)? The third step aims to elaborate the most desirable solutions and to discuss them from a strategic point of view (return on investment, mid- and long-term impacts) and a operational point of view (about implementation: who, what, when, where, how). Then the decision-maker has all the cards in hand to make the correct decision.

1.2.2. *Profile of the futurist*

When a discipline is not frozen, its "orthodoxy" is not clearly defined or recognized, and the role of those practicing it is crucial. Although most of the concepts and methods of futures thinking can be learned,[5] the real value of a futurist usually dwells in what cannot be learned: cognitive behaviors and approaches that education does not usually teach.

1.2.2.1. *A behavior "in and outside the world"*

Like the innovator, the futurist needs a critical distance from knowledge, especially because it is too often built on a snapshot, a state of the art at a very precise moment in time. Indeed, the specific contribution of a futurist is both his fresh look (an outside look) and his dynamic (non-static) approach that, whilst deeply anchored in time, is also well beyond the apparent source of the studied facts. That is why the futurist is often an efficient macro-historian, able to identify the pattern of evolution over millennia.

Like the innovator again, the futurist is continuously listening to the world, less to perceive the immediate expectations than to grasp the "big picture", to see the structure of the final image of a puzzle, the pieces of which could never fit together. He spends a significant part of his life listening to, searching, scanning, rummaging, etc., in his quest for evolving social and cultural mutations and their understanding,

3 As it was prescribed by his "inventor" Gaston Berger [BER 57].
4 Johan Galtung and Sohail Inayatullah (eds), *Macrohistory and Macrohistorians*, Greenwood Press, 1997.
5 It is taught in several universities around the world.

for developing, declining or stagnating trends, for hidden weak signals, for probable ruptures and breakthroughs, and for all the consequences of these elements on the future of humanity or of a very specific population, a city or a firm, for example.

1.2.2.2. *A "post-industrial" way of thinking*

If one admits that modern thinking is characterized by processes analogous to industrial processes (products/tasks assembly line, products/ideas mass production, reduction of complex processes/tasks into their simplest versions, products/graduates, standardization), then one can call it "post-industrial" thinking, thinking that uses complex approaches [MOR 99], systems approaches, methodologies such as spiral dynamics, multi-layered analysis, futures wheels and various other methods usually very different from methods taught in traditional training, education or learning.

Futurists and innovators are a product of this very post-industrial way of thinking. This way of thinking presents, amongst other characteristics, the following four characteristics.

A distancing approach to knowledge: in a world where the most important thing is the accumulation of information, even if the information is already obsolete, creativity is very often curbed by this intellectual formatting. To escape this, the futurist looks for knowledge that is synthetic rather than analytic, comparative or applied rather than *in abstracto*, within which the critical analysis can find its best place.

An unfailing curiosity is essential because it makes it easier to absorb multiple sources of information, including those that have nothing to do with the studied topic. The futurist's work is based on intentionally broad general knowledge. This curiosity also allows the futurist to progress because his universe undergoing a rapid evolution: evolution of the discipline itself that must adapt itself to the various problems encountered; evolution of change itself which is in ongoing transformation. That is why the futurist must constantly evolve and adapt himself as quickly as possible, in order to keep pace with the evolution of change.

The alternative thinking relates back to the assessment that there is no longer a unique truth, but a large number of roads by which one can reach the same point. Alternative thinking often encounters a form of totalitarianism of thought that forbids the alternatives and unique ways of thinking, a type of "intellectually correct" thinking.[6] For example, some very innovative systems of thinking, smarter

6 As we sometimes see at school when children are forbidden to recite a lesson in their own words rather than in the words of the book; or when it is decided, in higher education, that

than most of the intellectually-correct ones, such as the general system theory [BER 68] and the theory of general semantics [KOR 33], have been prevented from spreading due to such resistance. However, the alternative thinking approach, which enables pluralistic thinking, imagining possible alternatives, is the closest to the specific human capability to grasp facts, to interpret them, and then to create the most adaptable solution, according to the context and all the differential elements (culture, values, etc.). This is the same alternative thinking that the innovator displays.

Last but not least, inductive thinking has been proven to be as rich, if not more so, than deductive thinking: in the evolution of humanity, practice has usually come before theory, and not the other way round. Technical change, for example, comes more often from innovators' initiative than from the implementation of scientific theories [GAU 98]. This is likely the reason why there is a correlation between the Anglo-Saxon pragmatism and the American leadership in the field of patents, etc. [PER 81].

Critical and alternative thinking, curiosity and induction are many of the complex tools that the futurist uses to understand the world and its various evolutions, hence his proximity to the innovator who shapes the world by transforming it.

1.3. Change and network

What kind of relationship do innovation and futures thinking have? As seen in the definitions and profiles above, each deals with change. Innovation creates change and futures thinking studies it and advises on it. Innovation is a breeding ground that feeds futures thinking, while futures thinking helps to facilitate innovation, both as an individual act and as a social practice.

1.3.1. *When innovation feeds futures thinking: the study of change*

Innovation literature has flourished in France, English-speaking countries and the rest of the world, and has been covered widely by the mass media. A large number of clubs, meetings, workshops and conferences are organized on the subject. Specific training and degrees are established and attract many students.

This general interest in innovation raises questions for those who observe the evolution of society: why has innovation come so much into demand [GIG 98]?

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deductive thinking is the only rigorous thinking and that inductive thinking should not be used.

The futurist's first answer – used to scrutinize the signals of any kind of change, especially the weal signals anticipating the future – will not be "because of current global competition", but "because change itself is needed". But why is change needed? And what kind of change are we looking for?

1.3.1.1. *Why should we change?*

As early as the 1950s, Gaston Berger, when inventing the French futures thinking, explained to the French public and private-sector leaders that the reconstruction of the country after World War II was a great opportunity to fundamentally change France in order to modernize both minds and organizations; this conviction was the source of French futures thinking [BER 59, 61].

This vision of French futures thinking was rooted in the observation, on the one hand, of the acceleration of the pace of history – already pointed out at the end of 19th century by the evolutionists[7] – and, on the other hand, of a growing gap between this accelerating pace of change and the slowness in adaptation of French institutions, especially educational institutions. Consequently, Gaston Berger suggested a change of organizations and ways of thinking, towards greater openness, improved action and efficiency, so that they could more quickly and efficiently adapt to the new needs of humanity as a whole.

This approach is still valid 50 years later, because the gap is still there. In France, the gap is all the more obvious due to the resistance to change in institutional structures traditionally oriented to centralized state planning, and also, probably, to the weigh of a strongly rooted, 1,000-year-old culture, which leans towards conservatism rather than towards novelty[8].

Yet this is the same French society, so easily denounced as fossilized, that has welcomed radical innovations such as the first department store in 1869, with the first hypermarket, almost one century later in 1963, the smart card (1974) which is used today for money and health care, and the participatory democratic processes used to build territorial strategic projects, at the end of the 1980s, before the fall of the Berlin Wall that paved the way for participatory democracy and citizenship. It is also an important source of futures thinking itself, introduced in France at the same time as in the USA (1950s), and which other European countries only began to discover during the 1990s. Thus, France enjoys a high potential for invention and innovation, but too many restraints prevent it from benefiting from this potential. That is why a change in organizations and ways of thinking is still needed.

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7 See [MEY 48, 54, 74].

8 That is why we needed a devastating revolution to end up with a monarchy, rather than to evolve quietly towards more freedom.

The case of France is not unique; many countries are in the same situation, which creates a global state of emergency. Not only does the pace of history still continue its acceleration, increasing the stress on society within which the gaps grow in number and depth and making it more and more difficult for each individual to keep the pace with it, but the paradigm shift that has occurred during the last half of the 20th century is hardening the conditions of globalized competition between firms and states. States feel a growing need to intervene in the market in order both to smooth the consequences of this evolution and to protect their own economy and firms, which, in turn, creates tensions at the geopolitical level.

"In the last resort, however, it is always a system of values, of ideas, of ideologies – choose whatever word you like – that is decisive."[9] If a country, an organization or an individual wants to change, the reason is that they implicitly believe in progress, whether it is human, technological, social, political or economic; they hope that tomorrow will be better than today, thanks to the introduction and diffusion of new inventions[10]. This thinking is not so obvious as it might seem to be. In fact, it is the fruit of a very difficult balance of the recognition of the state of the current situation (diagnosis), the assessment that this situation is not good and needs to be improved, the belief that this improvement will not be the result of a mechanical adjustment (such as the market laws, for example) but of an adjustment that demands human will and action for implementation, and this deep inner hope or confidence in the fact that "progress" exists (versus a technological doom, for example). If you are too optimistic, you will not be aware of the disaster early enough; if you are too pessimistic, you will not mobilize your energy to act against the trend. Moreover, you must also cultivate a special relationship with openness in order to accept assessment as well as uncertainty; assessment of the current situation and uncertainty of the future (from the futurist's point of view) and of the consequences of the novelty's introduction (from the innovator's point of view).

Inventing the future means includes self-confidence, openness, ability to integrate novelty and to adapt oneself to it, and, above all, ambition for humanity and a willingness to secure a better future.

1.3.1.2. *What change to look for?*

With this perspective, change has value only if it is a catalyst leading to improvements, such as modernity, progress, and improvement of the general welfare of humanity. Change is a means, not an end.

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9 Ludwig Von Bertalanffy, **"**The world of science and the world of value" in *Teachers College Record* 65: 244–55 at p 245 (1964).

10 Which is the characteristic of the thermodynamic societies according to Claude Levi-Strauss.

Innovation is nested in the core of this vision of change, which, unfortunately, is not unique, thus explaining the different attitudes towards change. If innovation is indeed the process by which invention can meet the economic and social acceptability that enables it to spread itself, it can emerge only at the moment when it is ready to be heard, or is expected, often in a subconscious way [GAU 98].

This societal dimension of innovation, the fact that "the seed will germinate where the soil is favorable" is often missing in innovation theory. Heads of companies, inventors, discoverers, creators, marketers, etc., are used to thinking that a good idea will impose itself on the market whatever the needs or the expectations of the market. From a short-term point of view this is not wrong as supply has pulled demand for at least half a century. Yet such a demand is neither sustainable nor truly "progressive".

Concerning product innovation, this is exactly where the shoe pinches in the innovation race between firms. A firm will not look specifically for an innovation that brings an improvement to the social welfare or that corresponds to an implicit societal expectation. Its aim will rather be to promote an innovation that will give an acceptable return on investment and that has a competitive benefit that will lead to a larger market-share or even that will just keep its market position for longer. The short life of the product is not a problem, considering the quick turn-over of the market. This explains why the quick launching of innovative products (the time to market) is more important than the degree of innovation within the product itself, the marketing budget often being privileged over the R&D budget.

Process innovation, being organizational or technical, comes from a different change objective. Its main aim is to improve the efficiency of a given system (whether technical, economic, social or political), usually in relation to improved productivity. As it answers expectations in terms of improvement, this kind of innovation is often more durable than the product innovation. Process innovation aims to deliver a product with a higher quality than the previous one on the market, at the same price (than the previous one) and even, sometimes, a higher quality with a lower cost of production than the previous product, for the greater satisfaction of the organization and its clients, all of which is significant in such a competitive world. This is perhaps the reason why one can observe a lack of innovation in the public services when they are in a monopolistic situation.

Beyond these two basic needs for change (making money and keeping pace with the global competition), what other motives can justify innovation?

In most cases, innovation is dedicated to greater efficiency and is a means of reaching the aim with the maximum of gain and the minimum of loss, not only for the firm, but also for the clients (hence, the notion of "service"). This is why the

postal service must not only quickly and safely take your letter from one point to another, but also provide the shortest possible waiting time at the post office. Further, innovation means that the need to improve energy efficiency cannot be limited to acquiring a high-performance generator, but also extends to all the systems that protect against energy loss, such as pipe insulation, the use of specific devices, building materials and "smart" architecture.

Finally, technological innovation can be motivated by the will to access the same – even better – products (or services) than other countries or clients. See, for example, the difference between France and the USA, in the 1980s, the advantage of France in the field of telephony and at the advantage of the USA in the field of the Internet, opening the road to innovations such as the Minitel and the Bi-bop (the first cell phone).

Futures thinking learns from these lessons so as to inform the various futures scenarios it must create or assess: to identify what is sustainable or not; to advise specific forms of change; to assess the impact of specific forms of change.

Yet, it is not enough to have a new idea, even if it meets an expectation: it must arrive when the right person is able to implement and/or sell it. Futurist and innovator share the problem that the resistance to change is deep-rooted and powerful, as well as the question of how to diminish the resistance.

Sidebar: on innovation

Much work has been devoted to explain why things are as they are, but very little work has been undertaken in order to understand how things change, and even less work to learning how to accompany their transformation.

How can we explain that in such a well-educated community of business and civil service officials, who are able to adapt to the vicissitudes of power, instinctive resistances appear in contradiction with the discourse on principle in favor of novelties.

I think it comes from deep reflexes, acquired at school, which give priority to conformist mental attitudes and mistrust creative processes. In a way, these reflexes assume that knowledge emanates only from the institution. The institution is already there, overhanging human beings in a transcendent way.

Experience shows that creation proceeds from the opposite movement. Creative flux moves up, like the sap of the tree, toward light. Its chemistry is not one of transcendence, but the one of immanence.

From Thierry Gaudin (with the assistance of Jean-Eric Aubert), *De l'innovation*, 1998, La Tour-d'Aigues: Editions de l'Aube.

1.3.2. *When futures thinking helps innovation: opening the road to change*

It is easy to believe that the use of futures-oriented methodologies is enough to open the road to change, especially scenario-building. Yet, much more than exploratory futures thinking, the real driver to innovation is the normative approach of the future. Indeed, the leading of change goes through a preliminary awareness of the need to change. From the simple refusal to change one's habits to the aggressive anxiety provoked by the fear of possible dangers, including the traditional inertia regarding every fashion, resistance to change is significant.

The role of futures thinking, in its daily use, is to put in evidence the present and future difficulties that could influence the future in a significant way. It shows the possible ways of change that can be taken. Usually problems are well known, generating diagnostic after diagnostic, but old, obsolete models that are no longer adequate are applied to solve them.

Futures thinking is the right tool to promote novelty, to encourage the development of new ways of thinking, to observe and act over the world, whatever the geographical scale. For the conditions of implementation, the context is much more important than the scale.

Therefore, futures thinking and innovation are on the same side. If innovation appears today as a key factor in business and society, this is because we are aware more than ever of our need to change. This one comes from a dissatisfaction of the societal expectations – in advance of its institutions and organizations – as well as from the imperative of ongoing adaptation imposed by technological and economic competition. [WEL 98]. Another emerging factor that also motivates this need for innovation is the creation of organizations and products able to satisfy the trends peculiar to the current society, such as mobility, hedonism, and the increasing speed of our activities. Therefore, the close relationship between futures thinking and innovation opens the way to change that is most likely to improve human life (chosen change) and to help novelty insert itself into common practices without causing too much damage.

To do so, futures thinking acts on innovation at several levels. Indirectly, it favors the development of a favorable context, for example by raising awareness of the need to create and maintain "agents" of innovation, such as venture capital, or the conditions to create a climate of trust. Directly, it can intervene via various creativity methods or radical ways of thinking. Although innovation cannot be conjured up on demand (you cannot say to someone "innovate now" and them innovate immediately; it is not an order that can be given and obeyed instantly!), it is possible to assist its appearance by altering the context within which it will occur.

1.3.2.1. *Promoting a favorable context*

Consider, for example, two elements of the context essential to the transformation of invention into innovation: venture capital and trust.

Money is the sinew of war. Indeed, product innovation is a long process, which begins with a pilot product to test the feasibility of the product, followed by the adjustment of the industrial chain that will produce, then pack, distribute and sell the final product. Organizational innovation is slightly less expensive: the difference is in hidden costs, direct or indirect (workers' training, time lost in transition from the old to the new system, initial errors, and the struggle against resistance or inertia). The classic firm, in a time of very high competition, hesitates to launch risky initiatives. When the innovator is also the entrepreneur,[11] the situation is even more critical: most importantly, he must be able to protect his discovery by a patent (which can be expensive), then develop a persuasive argument to convince either a firm to buy his patent or an investor to help him put it on the market.

Taking into account this difficulty and the decreasingly favorable context coming from the growth in such demands (hyper-requests) and the consequences of a speculative financial failure (e.g., when Silicon Valley start-ups ran short of capital because of the speculation on the stock exchange), alternative solutions have been developed.

In the USA, venture capital has become an institution with its "venture-capitalists", ready to bet on the future of specific innovations, its own financial stock exchange (NASDAQ), its criteria and assessments, its business angels and all the interested professionals those who look for investment opportunities to finance their projects, as well as those who look for projects to maximize their investments.

In France, venture capitalism is less developed. Admittedly, it has existed since 1996 as a "new market" (NM) for innovative enterprises or for those enterprises that have a high potential for growth, as well as for networks of business angels. However, there seems to be less openness to innovation than in the USA, mainly for cultural reasons, such as the weakness of entrepreneurship, bureaucratic constraints, and a very reticent attitude toward risk-taking. This has prompted the development of mechanisms of substitution such as the National Agency for the Promotion of Research (ANVAR) or the local government agencies that help to fundraise for innovation or to facilitate spin-off development.

11 The innovator is either an independent innovator, seeking to produce and market his own invention, or an entrepreneur having bought a patent and who is trying to develop a new product based on the patent.

The European Union supports innovation within the framework of mega-projects, including, in the main, large corporations, government agencies and universities, or within the framework of actions dedicated to SMEs.

Slowly, venture capital is strengthening itself, perhaps too slowly considering the fast pace of evolution.

The second very important element of the context is the climate of trust.

"We believe in all our stakes (joint venture), otherwise we could not invest!"[12] Whatever the operations to support the fundraising needed to implement an innovation, trust is always crucial.

The notion of trust is defined as "a positive anticipation attached to an assumed risk: a trusting actor assesses favorably the intentions and the capability of another person to achieve a given action and estimates that the non-achievement of this given action would be prejudicial to him" [ALI 98].

This trust manifests itself in various forms that can be brought together in two categories: rationalized trust and intuitive trust.

Rationalized trust is based on a series of indicators that help the "business angel" to form his opinion of a given project [MAI 99]. Those indicators (business plan, investment, size of the market ratio, etc.) give a more objective view of the innovator and his capability to run a business, thus avoiding the possibility that his business community (investors, bankers, etc.) will be seduced by an idea or a person (the project-holder). Consequently, the choice and evaluation of the indicators are major parameters in the building of this trust, a rationalized, reasonable and justifiable trust.

It would be a negation of the reality – as sometimes management theory or economic theory does – to limit the phenomenon of trust to this rational aspect because, whatever its justifications, trust is fundamentally subjective and, as such, includes a part of the irrational (emotion, belief, etc.). Even a business plan, read by two different people, will have two interpretations, a rather optimistic one and a rather pessimistic one. Each of reader of the plan will consolidate his own initial feeling – trust or distrust – spontaneously felt towards the man or his project. We call this feeling the intuitive trust because it comes before any rationalization and escapes to justification.

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12 Bernard MAITRE, President of Galileo Partners, in an interview available at http://www.neteconomie.com/perl/navig.pl/neteconomie/infos/article/20000317010555.

If trust plays such a role within the process of innovation [ALI 98], how can it or the factors that give rise to it be detected? What are its drivers?

Three structuring factors of this trust mechanism are linked all along the process of innovation: the innovator's self-confidence; the support of "trust intermediaries"; and the care and maintenance of "trust-capital" (this is, capital that is in trust rather than in monetary form).

The first element, preliminary to the process itself, is the self-confidence the investor must feel and communicate to others, not only because it is very likely to be one of the sources of his innovation [EME 41], but also because it forces him to undertake the long road from the idea to the market. Self-confidence is the strength of his conviction, which will ultimately feed his energy, despite all the obstacles he will meet, and will mobilize his partners around him (self-confidence being part of the innovator's charisma).

The second element lies in the transitivity that characterizes the phenomenon of trust: it is easier to trust someone recommended by an acquaintance than another person not known by any means, even by the intermediary of an acquaintance. Hence the importance of the personal networks within which the innovator must be immersed; these networks are part of his credibility. This is the reason why the innovator looks for trusted, well known persons, and includes them in the project as president, associates, sponsors, members of the scientific committee, etc. Well known organizations are also "seals of trust", for example government agencies, university laboratories, business angels, and financial organizations. Trust is transitive, spreading from one player in the innovator's environment to another.

Once acquired, this trust-capital must be maintained and nurtured. This is most important as trust is likely to weaken during the evolution of the project. Causes of this weakening are numerous: interpersonal tensions arise as the number of actors involved in the process increases; conflicts of interest occur when the product is about to be realized; conflicts arise when associates feel envy, jealousy, pride, greed for gain, distrust; and some partners, tired of difficulties, quit the project. Also, as the implementation moves ahead, the entrepreneur will take the lead over the innovator and his attention will switch from his partners to his team.

Therefore, rules for a healthy trust are required in order to avoid most of these difficulties. Among the most important rules, two are provided by technical principles and two by ethics.

The two first rules are technical and can be considered as principles. The first one, "formalization", can be summed up as follows: whatever the degree of trust between the innovator and members of his business community (associate, investor,

member of the team), the expression of this trust must be formalized, usually as a contract. This formalization should be considered as a symbolic step to strengthen the agreement, if it can be made easily. However, above all, the formalization is a guarantee against the violation of trust on the part of one or other of the parties.

The second rule is more difficult to define: we will call it "donation/counter-donation", following a very well known anthropological principle. It concerns information that the innovator must communicate to promote his "trust-intermediaries" when he introduces his project. Indeed, if an innovator has such people around him, he should promote the fact in order to increase the trust-capital he needs, this maximizing the benefit of having trust-intermediaries. Therefore, communication about trust-intermediaries will be crucial. However, this process must not be one-sided: the trust-intermediaries must also reciprocate. Each partner of this exchange must find an interest, a motivation, for mutual satisfaction. The challenge is to maintain this equilibrium so that no party feels injured; that's the logic of donation/counter-donation.

The two other rules are of an ethical nature. The first one is transparency because trust is by nature deeply rooted in it. Suspicion about things that are hidden, even by simple omission, is the most powerful encourager of systematic distrust, which can never be wholly erased. This is the breakdown of a moral "trust agreement". The danger in the process of innovation is that the innovator will naturally tend to maximize the positive aspects and to minimize the negative ones, in order not to scare his partners; but nobody will forgive him if the slightest accident or setback happens during the course of the process.

Finally, the last rule is ethics itself. Innovators' speech and actions must be guided by strong ethics. What can appear obvious in a routine situation is far less obvious when the stakes are very high; not only financial stakes, but also – and sometimes more importantly – the stakes linked to credibility. The emotive factor then tends to prevail over any other considerations: "the end justifies the means". However, when the process of innovation is made possible only by the interconnections of various partners for whom the network amongst them is based on trust, the ethics concerning the means is as important as the end itself.

Therefore, futures thinking tends to identify the innovator as the central point of the network that spins around him in order to successfully handle the process of innovation. As such, the innovator is a captor of the societal expectations, an entrepreneur, and a promoter of change. As a keystone to this network, trust reveals both the tremendous fragility of innovation – this subjectivity – and the amazing power of the human will as soon as it manifests itself in a synergy of participants who are together ready to take the same gamble with the future.

1.3.2.2. *Thinking the novelty*

Beyond this context, can futures thinking facilitate innovation itself? There is no certainty; however, futures thinking can at least contribute through two approaches: specific methodologies and specific ways of thinking.

Futures thinking draws from the creativity toolbox methods, such as TRIZ[13] (Theory of Inventive Problem Solving), morphological analysis, multi-criteria analysis, and other instruments.[14] These methods are part of a common corpus, in a more or less derivate form, adapted to each aim. In technology firms where these tools are well known, futures thinking brings no specific added value. On the other hand, in service-based firms or local government (including agencies and all the public sector organizations), futures thinking can bring innovative thinking, thanks to these situation-adapted tools.

Beyond these tools, the main asset of futures thinking in this field is probably its capability to build a collective intelligence. The systems approach, whatever the method used, sparks off a synergy in which the intelligence of several people is greater than the intelligence of only one, which in turn favors introduction and appropriation of novelty. The elaboration of dystopian scenarios, the designing of trees of competences, and the utilization of "future histories" are some ways to explore paths likely to produce novelty. Futures thinking does not interest itself in the present: it extends the research of innovation by moving the problem or the given data in the flow of the time in order to broaden the "possible" and the "visible".[15]

By the same logic, working with the "desirable" (meaning desirable futures from the point of view of a firm's social body or a territory's stakeholders, for example), futures thinking tries to orientate innovation toward improvement or novelty as expressed by visions of desirable futures.

At the same time, as an observatory of emerging trends, futures thinking performs the function of an early detection system because it listens for weak signals. As such, innovations can occur by associating existing problems with means in embryonic form, or by hybridizing new developments in radically different fields.

13 See a description at http://www.mazur.net/triz.
14 See an overview of these methods at http://erwan.neau.free.fr/outils_innovation_3.htm.
15 The "visibles" are problems hidden in the present, but that can be seen, or are made visible, when you look at them from the future or from a broader perspective.

Thus, futures thinking offers a way of thinking more adapted to this new paradigm we have entered during the last half century: a paradigm where complexity, global thinking, and the role of complex interactions are becoming dominant. Unfortunately our traditional ways of thinking do not evolve as fast. It always aims to reduce a complex phenomenon to its simplest elements, as if the sum of the solutions brought to each of these elements would be the solution for the whole [GAU 03]. This is to reckon without the synergies produced by the interactions of the different components; in fact, the whole is greater than the sum of the parts. Henceforth novelty can be drawn from this new source.

Finally, the most original introduction of futures thinking to the process of innovation, as a creation of novelty, is the "time shift". What does that mean? Futures thinking works on change as a material to build the future, whether desirable or not. Consequently, the future interests the futurist if it is different from the past. In order to recognize this difference, one does need to know the past well.

The futurist is not interested only in the factual past, but also in the scope of social evolution, the changes it reveals or contains, the causal chains it gives us to understand. To study this human evolution, the historical scale is nothing less than millennia, as macrohistory shows.

Thus, the macro-historical synthesis teaches us that our current state of evolution is one of integration: integration of men and machines, integration of different cultures, economies, nations and disciplines. Interdisciplinarity and multidisciplinarity are at the core of the developments to come and, consequently, of the underlying innovations.

In the same way, with a mirror effect, futures thinking works well in macro-futures; these futures are so far away that they free the creative imagination. This could be an essential skill especially for fields and industries in crisis and chaos, for example the technology research and video game industry,[16] where innovation is mainly incremental. Exploration of far futures is a better way to test various configurations of possible scenarios that the current constraints prevent us perceiving. By opening the mind to various novelties, futures thinking promotes a state of creativity which facilitates innovation.

Mobilizing all the disciplines to integrate the long term into our thinking, anticipating the evolutions to come, identifying the current ones, and grasping the possible breakthroughs are the objectives of futures thinking.

16 For the evolution of the video game industry, see http://www.gdconf.com/archives; for the European program NEST, see http://www.futura-sciences.com/sinformer/n/news3204.php.

Therefore, futures thinking aims to give everyone – be they head of a company, civil servant or citizen – the means to be responsible for their own future, both individual and collective, a responsibility that is shared by the innovators, as inventors of the future.